Electrical

III/I

Question BanK

TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2080 Bhadra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BEL	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: - Electric Machine Design *(EE 603)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. a) What are the different classes of insulator used in Electric Machine? Classify them based on their thermal stability and materials used. [5]

   b) Explain the advantages of cold rolled grain oriented steel laminations over hot rolled steel laminations in transformer. [5]

2. a) Derive the expression for internal temperature (hot spot) of the core. [6]

   b) The temperature rise of a transformer is 25°C after one hour and 37.5 °C after two hours of starting from cold conditions. Calculate its final steady temperature rise and the heating time constant. If temperature falls from final steady value to 40°C in 2.5 hours when disconnected, calculate its cooling time constant constant. The ambient temperature is 30°C. [8]

3. a) Differentiate between core type and shell type transformer on the basis of construction, mechanical design, leakage reactance and cooling. [6]

   b) The design parameter for 1000 kVA, 50 Hz, 66/11 kV, 3-phase, delta/delta, core type, oil immersed natural cooled power transformer are given below. [18]

   Constant for output voltage per turn = 0.6

   Maximum flux density in the core = 1.45 Wb/m^2

   Current density in conductor = 2.75 A/mm^2

   Core type = cruciform two stepped

   Window space factor = 0.13

   Stacking factor = 0.9

   Ratio of window height to width = 2.75

   Take hot rolled steel and area of yoke is 20% greater than gross aea of core

   Width of LV winding = 40 mm

   Width of HV winding = 50 mm

   Width of duct between HV and LV winding = 20 mm

   Resistivity of copper = 0.021Ω-mm^2/m

4. a) Explain the factors that should be considered while estimating the length of air gap in induction machine. [6]

   b) For a 2.2 kw, 440 V, 3 phase, 50 Hz, 1430 rpm squirrel cage induction motor having efficiency of 0.8 and power factor 0.85 designed for its best power factor. [12]

   Given, Bar = 0.44 wb/m^2, ac = 21000 A/m, slot space factor = 0.4, ratio of slot depth to width = 4, stator slot pitch = 12 to 15 mm, $\delta_s = 4A/mm^2$. Calculate

   (i) Main dimension.

   (ii) T_s (Turns per phase of stator conductor).

   (iii) a_s (area of stater conductors).

   (iv) no.of stater slots.

   (v) Area and dimension of each stator slot.

   (vi) Minimun width of stater teeth.

   (vii) Find stater loading.

   Note : For best power factor, use [$\tau = \sqrt{0.18L}$]

5. a) Explain, various factors should be consider while selecting the value of specific electrical and magnetic loading in dc machine. [8]

   b) A design is required for a 30 kW, 4 pole, 900 rpm dc shunt generator, the full load terminal voltage being 220V. Assume that the full load armature voltage is 3% of the terminal voltage. Calculate the main dimensions of the machine if the maximum gap density is 0.85 wb/m^2, specific electrical loading of 20,000 ampere conductor/meter and field resistance is 120Ω. The ratio of pole arc to pole pitch is 0.7. [6]

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2081 Baishakh

Exam.	Back		
Level	BE	Full Marks	80
Programme	BEL	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: - Electric Machine Design *(EE 603)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. a) Differentiate between soft magnetic materials and hard magnetic materials in brief with necessary diagrams. [5]

   b) What is ageing? How it can be minimized? Enlist the merits and demerits of addition of silicon with iron. [5]

2. a) Derive the expression for calculation of internal temperature of a homogeneous material of thickness 't', length 'l' and width 'w'. Other necessary data's can be assumed. [4]

   b) A 400kVA transformer has its maximum efficiency at 80% of full load and when this transformer is working in an ambient temperature of 40°C on full load, its oil temperature is observed to be 60°C after 1 hour and 72°C after 2 hours. Calculate its heating time constant and final steady temperature rise of the transformer. If the rate of heat dissipation is improved by 20% with the help of external fan, find the new KVA rating for same steady temperature rise. [10]

3. a) What are the differences between power transformer and distribution transformer from design aspect point of view? [6]

   b) For a 100Kva, 11000/400V, 50Hz, Delta-star three phase core type oil immersed natural cooled distribution transformer, assuming all other parameter whenever necessary: [18]

   Maximum flux density (B_m) = 1.36Wb/m^2

   Current density = 2.4A/mm^2

   Constant for output voltage per turn (K) = 0.4

   Core type = cruciform

   K_w = 0.3, K_i=0.9, H_w/W_w=2.5

   Width of low voltage = 20mm

   Width of high voltage = 25mm

   Duct between them = 15mm

   Calculate

   (i) Dimension of core, window and yoke.

   (ii) Overall dimension of frame.

   (iii) Perunit resistance and leakage reactance.

   (iv) Perunit regulation at 0.8pf.

   Given that ρ at 75°C = $0.021\times10^{-6}\Omega$-m

4. a) What are the various factors to be considered for the rotor design in squirrel cage induction motor? Explain in detail. [4]

   b) Determine the main dimension, turns per phase, no of slots, conductor size and slot area of a 250HP, 3-phase, 400V, 50HZ, 1410 rpm slip ring induction motor. Assume B_{av} = 0.5Wb/m^2, ac=30000 ampere conductor/m,η= 0.9, pf = 0.9, current density = 3.5 A/mm^2, slot space factor = 0.4 and the ratio of core length to pole pitch = 1.2. The machine is delta connected and winding factor = 0.955. [12]

5. a) Explain the factors to be considered while selecting the number of poles in a dc machine. [8]

   b) A design is required for a 25kW, 4 pole, 900 rpm dc shunt generator, the full load terminal voltage being 220V. Assume that the full load armature voltage is 3% of the terminal voltage. Calculate the main dimensions of the machine if the maximum gap density is 0.85Wb/m^2, specific electrical loading of 20,000 ampere conductor/meter and field resistance is 110Ω. The ratio of pole arc to pole pitch is 0.7. [8]

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TRIBHUVAN UNIVERSITY
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2080 Baishakh

Exam.	Back		
Level	BE	**Full Marks**	80
Programme	BEL	**Pass Marks**	32
Year / Part	III / I	**Time**	3 hrs.

Subject: - Electrical Machine Design *(EE 603)*

280

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
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- ✓ *Assume suitable data if necessary.*

1. a) Differentiate between soft magnetic materials and hard magnetic materials in brief with necessary diagrams. [4]

   b) Classify the insulating materials on the basis of their thermal stability. [4]

2. a) What are heating time constant and cooling time constant? Explain. [6]

   b) An induction machine has a temperature rise of 25°c and 40° c after 1 hr and 2hr respectively while operating at full load of 7.5 kw. The constant losses are 80% of full load copper loss. Determine how long the motor can be operated at twice the rated output without overheating. [8]

3. a) For 5000 KVA, 3-phase, 50 Hz, 66/11kV, delta/star, core type, oil immersed natural cooled power transformer are: [16]

   Maximum flux density in the core = 1.6 wb/m^2
   Constant for output voltage per turn = 0.6
   Core type = cruciform
   Current density in the conductor = 2.5 A/mm^2
   Window space factor = 0.22
   Stacking Factor = 0.9
   Ratio of Window height to width = 2.75

   With of duct between LV and core, LV winding, HV winding and duct between HV and LV are 10 mm. 50 mm, 60 mm, 20 mm respectively.

   Assuming all other required parameters, calculate:

   (i) Overall dimension of core.
   (ii) Overall dimension of frame.
   (iii) Per unit resistance and leakage reactance drop.
   (iv) Per unit voltage regulation.

   b) How magnetic-flax density choosen in transformer design? [6]

4. a) What are the various factors to be considered for the rotor design in squirrel cage induction motor? Explain in detail. [6]

   b) Determine the main dimension, turns per phase, no of slots, conductor size and slot area of a 250HP, 3-phase, 400V, 50HZ, 1410 rpm slip ring induction motor. Assume Bav = 0.5, Wb/m^2, ac = 30000 ampere conductor/m,η=0.9, pf = 0.9, current density = 3.5 A/mm^2, slot space factor = 0.4 and the ratio of core length to pole pitch = 1.2. The machine is delta connected and winding factor = 0.955. [14]

5. a) Derive output equation of DC machine. [8]

   b) Determine the main dimensions and the number of poles of a 37 KW, 230V, 1400rpm shunt motor so that a square pole face is obtained. The average gap density is 0.5 Wb/m2 and the ampere conductors per meter are 22000. The ratio of pole arc to pole pitch is 0.7 and the full load efficiency is 90 percent. [8]

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2079 Bhadra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BEL	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: - Electric Machine Design *(EE 603)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. a) What are the fundamental requirements of a good insulating material? Explain the application of insulating materials in machines in brief. [5]

   b) What is ageing of core of electrical machine? What are the advantages and disadvantages of adding silicon with iron? [5]

2. a) Derive the expression of temperature gradient in conductors placed in slot if

   (i) Slot insulation is thick
   (ii) Overhang is considerably not [2+2]

   b) A 350 kVA transformer has its maximum efficiency at 85% of full load. During a short full load heat run the temperature rise after one hour and two hours is observed to be 24°C and 34°C respectively. Find thermal time constant and final steady temperature rise of the transformer. If by use of fan, cooling is improved so that heat dissipation per unit area per degree rise in temperature is increased by 15%, find the new kVA rating possible

   (i) for same, final temperature rise as before
   (ii) if the allowable temperature rise taken as 50°C. [10]

3. a) Derive the output equation of a single phase transformer. [6]

   b) The design parameter for 150 kVA, 50 Hz, 6600/400 V, 3-phase, delta/star, core type, oil immersed natural cooled distribution transformer are given below. [18]
   Max. flux density in core = 1.35 Wb/m^2
   Current density in conductor = 2.75 A/mm^2
   Constant for output voltage per turn = 0.45
   Core type = cruciform two stepped
   Window space factor = 0.27
   Stacking factor = 0.9
   Ratio of window height to width = 2.5
   Take hot rolled steel and area of yoke is 20% greater than gross area of core
   Width of LV, HV winding and duct between them are 20 mm, 25 mm and 15 mm respectively
   Assuming all other required parameters, calculate:
   (i) Dimension of the core, window and yoke
   (ii) Overall dimension of the frame
   (iii) Per unit resistance and leakage reactance drop
   (iv) Per unit voltage regulation at 0.85 pf

4. a) What are the factors to be considered while determining the ampere conductor per meter of an induction machine? [4]

   b) Determine the main dimension, turn per phase number of slots and slot area of a 200 kw, 400 V, 4-pole, 50 Hz slip ring induction motor. Assume B_{av} = 0.5 wb/m^2, ac = 3000 AC/m, η = 0.9, p.f. = 0.9, current density = 3.5 A/mm^2. The slot space factor is 0.4 and ratio of core length to pole pitch is 1.2. The machine is delta connected. [12]

5. a) Explain the factors to be considered while selecting the number of poles in a dc machine. [8]

   b) Calculate the diameter (D) and length (L) of armature for a 7.5 KW, 4 pole, 1000 rpm, 220 V shunt motor. Given full load efficiency = 0.83; maximum gap flux density = 0.9 Wb/m^2; specific electric loading = 30000 AC/m; field form factor = 0.7; Field current is 2.5% of rated current. The pole face is square. [8]

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2079 Baishakh

Exam.	Back		
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Year / Part	III / I	Time	3 hrs.

Subject: - Electric Machine Design (*EE 603*)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. a) Briefly discuss about the soft magnetic material and hard magnetic material. [5]
   b) Classify the insulating materials on the basis of their thermal stability. [5]
2. a) Derive the temperature rise-time curve of the machine under heating condition and also define heating time constant. [6]
   b) A 220v, 2kw single element resister is made of cylindrical microme wire. The temperature rise of strip should not exceed 1200°C over the ambient temperature of 20°C. Determine the length and diameter of the strip assuming coefficient of emissivity = 0.9, radating efficiency = 1 and resistivity of microme wire as 0.424 Ωm. [6]
3. a) For a 4000kVA, 3 phase, 50Hz, 66kV/11kV delta/delta, core type oil immersed natural cooled power transformer with given data:
   Main flux density in core = 1.6Wb/m_2
   Constant for output voltage per turn = 0.6
   Resistivity of cooper = 0.021 ohmmm^2/m
   Core type = cruciform
   Current density in conductor = 2500000 A/m^2
   Window space factor = 0.22
   Stacking factor = 0.9
   Ratio of window height to width = 2.75
   Consider lamination is made by cold rolled oriented steel
   Width of duct between LV and core = 10 mm
   Width of LV wingding = 46 mm
   Width of HV winding = 42 mm
   Width of duct between LV and HV = 20 mm
   Assuming all the other required parameters, calculate:
      i) Overall core dimension
      ii) Overall dimension of frame
      iii) Per unit resistance and leakage reactance drop
      iv) Per unit voltage regulation at 0.85pf [18]
   b) Derive the output equation of three-phase transformer in term of dimensions and parameters. [6]

4. a) For a kW, 440V, 3 phase, 50 Hz, 1430 rpm squirrel cage induction motor using star delta starter and having efficiency of 0.8 and p.f 0.85 at full load, the following data are given.
Specific magnetic loading = 0.44 Wb/m^2
Specific electric loading = 21000 A/m
Winding factor = 0.955
Slot space factor = 0.4
Ratio of core length to pole pitch = 1.5
Ratio of slot depth to width = 4
Stator slot pitch = 12 to 15 mm,
Current density in conductor = $4A/mm^2$
Calculate:
   i) Main dimension
   ii) Number of turn per phase
   iii) Area of each stator conductor
   iv) Number of stator slot
   v) Area and dimension of each stator slot [12]

   b) Derive the expressions for output equation of three phase induction machine. [6]

5. a) Explain the factors to be considered while selecting the ampere conductor per meter in a dc machine. [8]

   b) Determine the main dimensions and the number of poles of a 37 kW, 230V, 1400 rpm shunt motor so that a square pole face is obtained. The average gap density is 0.5 Wb/m^2 and the ampere conductors per meter are 22000. The ratio of pole arc to pole pitch is 0.7 and the full load efficiency is 90 percent. [8]

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2078 Kartik

Exam.	Back		
Level	BE	Full Marks	80
Programme	BEL	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: - Electric Machine Design *(EE 603)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. a) What are the fundamental requirements of high conducting material? Classify and explain the electrical conducting material in brief. [5]

   b) Give the advantages of cold rolled grain oriented steel laminations over hot rolled steel laminations in transformer. [5]

2. a) If the ambient temperature is θ_a, determine the maximum temperature of conductor placed in slot if the slot insulation is comparatively very thick. [6]

   b) A 400 kVA 1100/400V three phase transformer is working in an ambient temperature of 35°C on full load, its oil temperature is recorded as follows 59°C after 1.5 hour and 71°C after 3 hours. Its full load copper losses is 2 times the iron losses. Calculate its heating time constant, final steady temperature rise and 1 hour rating. [6]

3. a) For 500 kV, 3-phase, 50 Hz, 66/11 kV, delta/star, core type, oil immersed natural cooled power transformer is: [18]

   Maximum flux density in the core = 1.6 wb/m^2
   Constant for output voltage per turn = 0.6
   Core type = cruciform
   Current density in the conductor = 2.5 A/mm^2
   Window space factor = 0.22
   Stacking Factor = 0.9
   Ratio of window height to width = 2.75

   With of duct between LV and core, LV winding, HV winding and duct between HV and LV are 10 mm, 50 mm, 60 mm, 20 mm respectively. Assuming all other required parameters, calculate:

   (i) Overall dimension of core
   (ii) Overall dimension of frame
   (iii)Per unit resistance and leakage reactance drop
   (iv)Per unit voltage regulation

   b) Why are distribution transformers designed to have maximum efficiency at loads much lower than full load? Derive the expression for calculating the number of tubes to be prosvided in a transformer tank. [3+3]

4. a) Prove that the output of a three phase induction machine can be expressed in terms of its main dimension, specific loading and speed. [8]

b) Determine the main dimension, turns per phase, number of slots, conductor cross section and slot area of a 250HP, 3 phase, 50 Hz, 400V, 1410 rpm slip ring induction motor. Assume average flux density = 0.5 wb/m^2
Ampere conductor per meter = 30000
Efficiency = 0.9 and power factor = 0.9
Winding factor = 0.95
Current density = 3 A/mm^2
The slot space factor is 0.4 and the ratio core length to pole pitch is 1.2.
The machine is delta connected. [10]

5. a) A design is required for a 30 kW, 4 pole, 900 rpm dc shunt generator, the full load terminal voltage being 240 V. Assume that the full load armature voltage drop is 2.5% of terminal voltage. Calculate main dimension of machine. Given that: [8]

Maximum gap flux density = 0.85 Wb/m^2
Specific electric loading = 20000 ampere conductor per metre
Field resistance = 120Ω
Ratio of pole arc to pole pitch = 0.7
Field form factor = 0.7

b) What are the factors that are to be considered while selecting the ampere conductor per meter (AC) in DC machine? [8]

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2078/06/13

TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2078 Bhadra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BEL	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: - Electric Machine Design *(EE 603)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. a) Classify the insulating materials on the basis of their thermal stability. [5]
   b) What are the advantages and disadvantages of adding silicon with iron? [5]
2. a) Explain the temperature gradient in an iron core with necessary figure and expression. [6]
   b) A transformer has a temperature rise of 30°C after 2 hrs and 40°C after 3 hrs on quarter load. What is the final steady temperature rise at full load? If the transformer is on 30% overload, how long will it take to attain the same temperature rise provided that maximum efficiency occurs at 70% of full load? [6]
3. a) The design parameter for 100kVA, 4000/433V, 50 Hz, 3-phase, Δ/Y core type oil immersed natural cooled distribution transformer are given below. [20]

Max. flux density in core	= 1.3 Wb/m^2
Current density in conductor	= 2.5 A/mm^2
Constant for output voltage per turn	= 0.45
Core type	= cruciform
Window space factor	= 0.25
Stacking factor	= 0.9
Ratio of window height to width	= 2.5
Width of LV winding	= 20 mm
Width of HV winding	= 25 mm
Width of duct between HV and LV	= 15 mm

Take hot rolled steel and area of yoke is 20% greater than area of core

Calculate:
(i) Dimension of the core, window and yoke
(ii) Overall dimension of the frame
(iii)Per unit voltage regulation at 0.8 pf

   b) Why is the low voltage winding of transformer is placed near to the core in core type transformer? [4]
4. a) What are the factors that must be considered while selecting the length of air gap of induction motor? [8]
   b) Determine the main dimensions, turns per phase, number of slots, conductor size and slot area of 200 kw, 3ϕ, 400 V, 50 Hz, 1420 rpm slip ring induction motor. Assume Bav = 0.5 Wb/m^2, ac = 30000 ampere conductors per meter, efficiency = 0.9, p.f = 0.9, current density = 3.5 A/mm^2. The slot space factor is 0.4 and the ratio of core length to pole pitch is 1.2. The machine is star connected. [10]
5. a) What are the disadvantages of higher specific electric and magnetic loading in design of DC machine? [6]
   b) Calculate the main dimensions and the numbers of poles of a 37kw, 230V, 1400 rpm dc shunt motor so that a square pole face is obtained. The average gap density is 0.5 Wb/m^2 and ampere conductor per meter are 22000. Take full load efficiency of 90% and the ratio of pole arc to pole pitch is 0.7. [10]

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2076 Ashwin

Exam.	Back		
Level	BE	Full Marks	80
Programme	BEL	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: - Electric Machine Design *(EE 603)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. a) What is electrical insulator? Write the various insulating materials used for different kinds of electrical machines? [5]

   b) What is ageing of core of electrical machine? How it can be minimized? [5]

2. a) What is hot spot? Derive the expression to find the hottest spot temperature in terms of surface temperature and thickness of plate. [8]

   b) The initial temperature of a machine is 40°C. Calculate the temperature of the machine after 1 hour if its final steady temperature rise is 80°C and the heating time constant is 2 hours. The ambient temperature is 30°C. [8]

3. a) For the design of a 25 KVA, 50 Hz, 11/0.433 KV, delta/star, 3-phase, core type, oil immersed, naturally cooled distribution transformer. The mean temperature of oil not to exceed 35 °C. The following parameters are choosen: B_m = 1.0 Wb/m^2, δ = 2.3 A/mm^2, constant for volt per turn=0.45, type of core-cruciform K_w=0.18, H_w/W_w =2.5, total loss at full load = 1.2 kw

   Winding dimensions:

	Insider diameter (mm)	Outsider diameter (mm)	Conductor Area (mm^2)
LV	138	156.2	14.9
HV	186.2	239	0.312

   Lc=253 mm, ρ=0.021 Ω-mm^2/m

   Take dimension: Ht=950 mm, Wt = 840 mm, Lt= 350 mm

   i) Calculate overall dimensions of frame.

   ii) Calculate per unit regulation at full load and 0.8 pf (lag).

   iii) Calculate the minimum number of tubes of diameter 50mm with average length of 1.35 m required for maintaining the mean temperature within the permissible limit. The rate of heat dissipation from plain wall is 6.5 and 6 for convection and radiation respectively. The provision of tube improves the rate of heat dissipation by 35%. [6+6+4]

   b) Derive the output equation of 3-phase transformer. Why are the windings of transformer made in circular form? [6]

4. a) Discuss the factors to be consider for the selection of stators slot in an induction machine. [6]

   b) Calculate: i) diameter ii) length iii) T_s iv) Full load current and a_s v) I^2R loss of stator of 3 phase, 120 KW, 2200 V, 50 Hz, 1480 rpm, star connected slip ring from the following particulars. B_{av}=0.8 Tesla, ac=26000, η=92%, p.f.=0.88, L=1.25τ, k_w=0.955, d=5A/mm^2, mean length of stator conductors = 75 cm, ρ=0.021Ω per meter and mm^2 section. [10]

5. a) Discuss the factors to be considered for the choice of number of poles in DC machine. [6]

   b) Calculate main dimensions of a 5 KW, 250V, 4 pole, 1500 rpm dc shunt generator having full load efficiency of 0.87 and designed to have a square pole face. Assume average flux density in gap= 0.42 Wb/m^2, ampere conductors per meter = 15,000 and ratio of per pitch = 0.66. [10]

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2075 Chaitra

Exam.	Regular / Back		
Level	BE	Full Marks	80
Programme	BEL	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: - Electric Machine Design *(EE 603)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. a) Differentiate Soft and Hard magnetic materials on the basis of B-H curve with sufficient examples. [5]

   b) Classify the materials of high resistivity on the basis of application. Briefly describe each of them with examples. [5]

2. a) Derive the expression for internal temperature (hot spot) of the core. [6]

   b) A transformer has a temperature rise of 40°C after 3 hrs and 50°C after 4 hours on quarter load. What is the final steady temperature rise at full load? If the transformer is working on 20% over load, how long will it take to attain the same temperature rise provided that maximum efficiency occurs at 65% of full load. [8]

3. a) Design a 125 KVA, 50 Hz, 6600/400V, 3-phase, Δ/Y, core type of oil immersed natural cooled distribution transformer. (Assume suitable data if necessary) [16]
   Maximum flux density in core = 1.35wb/m^2, core type=cruciform
   Current density=2.75 A/mm^2
   Window space factor=0.4
   H_w/W_w=2.5
   Take hot rolled steel sheet and area of yoke=1.2 area of core
   Axial depth of L.V. = 268 mm
   Axial depth of H.V. = 276 mm
   Radial depth of L.V. = 14 mm
   Radial depth of H.V. = 18 mm
   Width of insulation between L.V. and H.V. =11 mm
   Outside diameter of L.V. = 293 mm, Inside diameter of L.V. = 255 mm
   Inside diameter of H.V. = 314 mm, Outside diameter of H.V. = 351 mm
   Calculate:
   i) Dimension of core, window and yoke
   ii) Overall dimension of frame
   iii) Leakage reactance of transformer
   iv) Draw overall dimension of frame

   b) Why are windings of a transformer made into circular form? What is the advantage of using stepped cores in transformers? Derive the most economical dimension of a two-stepped core. [6]

4. a) Give reasons for the followings: [6]
   i) Stator slots should never be equal to the number of rotor slots

ii) The size of induction machine will be small if it is designed with higher speed for the same output.

b) For a 2.2 KW, 400V, 3 phase, 50 Hz 1420 rpm squirrel cage induction motor using star delta starter and having efficiency of 0.8 and power factor 0.825 at full load the following data are given. [12]
Specific Magnetic loading = 0.44 wb/m^2
Specific electric loading = 21000 A/m
Slot space factor = 0.4
Ratio of core length to pole pitch=1.5
Ratio of slot depth to width = 4
Stator slot pitch = 12 to 15 mm
Current density in conductor = 4 A/mm^2
Assuming all other required data, calculate
i) Main dimensions of the machine
ii) Size of stator turns per phase
iii) Size of stator conductor
iv) No. of stator slots
v) Area and dimensions of each stator slot.
vi) Minimum width of stator teeth.

5. a) Explain various factors should be consider while selecting the value of specific electrical and magnetic loading in dc machine. [8]

b) Calculate the diameter and length of armature for a 7.5KW, 4 pole 1000rpm, and 220V shunt motor. Given: full load efficiency = 0.83; maximum gap flux density=0.9Wb/m^2: specific electrical loading= 30000 ampere conductor per meter; filed form factor is 0.7. Assume that the maximum efficiency occurs at full load and the field current is 2.5% of rated current. The pole face is square. [8]

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16 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2075 Ashwin

Exam.	Back		
Level	BE	Full Marks	80
Programme	BEL	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: - Electric Machine Design *(EE603)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt <u>All</u> questions.*
- ✓ *The figures in the margin indicate <u>Full Marks</u>.*
- ✓ *Assume suitable data if necessary.*

a) Differentiate between transformer grade and dynamo grade steel. [4]

b) What are the advantages and disadvantages of adding silicon with iron? [4]

2. a) An induction motor is heated to a temperature of 60°C and is shut down. Calculate the temperature at a time 20 minutes after the shut down if the cooling time constant is 60 minutes. The ambient temperature is 30°C. [8]

b) Derive the expression for internal temperature (hot spot) of the core. [8]

3. a) Differentiate between power and distribution transformer. [4]

b) For a 500kVA, 50Hz, 6600/400V, single phase core type, oil immersed, natural cooled power transformer, the design parameters are:

Constant for output voltage per turn = 0.8
Resistivity of copper = 0.021 Ω-mm^2/m
Maximum flux density in the core = 1.5 Wb/m^2
Current density = 2.75A/mm^2
Core type = Cruciform
Window space factor = 0.27
Stacking factor = 0.9
Ratio of window height to width = 2.5
Ratio of yoke height to width = 1
Axial depth of LV winding = 402mm
Axial depth of HV winding = 377.5mm
Inside diameter of LV winding = 310mm
Outer diameter of LV winding = 348mm
Inside diameter of HV winding = 360mm
Outside diameter of HV winding = 418mm

Calculate:

i) Dimension of the core, window and yoke
ii) Overall dimension of the frame
iii) Per unit regulation at 0.8 pf lagging
iv) Taking iron loss = 1460W, copper loss = 3865W at full load, height of tank = 1.6m, length of tank = 1.05m, width of tank = 0.62m, find the temperature rise. If the mean temperature rise of oil is not to rise 35°C, find the necessary number of tubes and also show its arrangement. [20]

4. a) Derive the output equation for three phase induction motor. [5]

   b) What are the factors affecting the choice of specific electrical loading in induction machine? [5]

   c) A 90kW, 500V, three phase, 8 pole slip ring induction motor having 0.9 efficiency and power factor of 0.86 has 63 stator slots with 6 conductors per slot. If the slip ring voltage on open circuit is to be about 400V, find the number of rotor slots, rotor turns per phase, number of conductors per slot and appropriate full load rotor current per phase. Both stator and rotor are star connected. [6]

5. a) What are the factors affecting the choice of number of poles in DC machine? [4]

   b) Derive the output equation for the design of dc machine. [4]

   c) Determine the main dimensions, number of poles and length of air gap of a 600kW, 500V, 900rpm generator. Assume average gap density as 0.6 Wb/m^2 and ampere conductors per meter as 35,000 A/m. The ratio of pole arc to pole pitch is 0.75 and the efficiency is 91%.

   The following are the design constraints: peripheral speed $\leq$ 40m/s, frequency of flux reversal $\leq$ 50Hz, current per brush $\leq$ 400A, and armature mmf per pole $\leq$ 7500A. The mmf required for air gap is 50% of armature mmf and gap contraction factor is 1.15. [8]

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16 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2074 Chaitra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BEL	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: - Electric Machine Design *(EE603)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. a) Differentiate between hot rolled and cold rolled grain-oriented steel. [4]

   b) What are the different classes of insulation used in electrical machine? Mention their maximum working temperature and the types of material used in such classes. [4]

2. a) Derive the temperature rise-time curve of the machine under heating condition and also define heating time constant. [8]

   b) A 400 kVA transformer has its maximum efficiency at 80% of full load. During a short full load heat run, the temperature rise after one hour and two hours is observed to be 24°C and 34°C respectively. Find the thermal time constant and final steady temperature rise of the transformer. If, by use of a fan, the cooling is improved so that the rate of heat dissipation per unit area per degree rise in temperature is increased by 15%, find the new kVA rating possible

   (i) For the same final temperature rise as before
   (ii) If allowable temperature rise is taken as 50°C [8]

3. a) Differentiate between core and shell type transformer. [6]

   b) For a 4000 KVA, 3 phase, 50 Hz, 66 KV/11KV, 3 phase, 50 Hz, delta/delta, core type, oil immersed natural cooled power transformer are:

   Max flux density in core = 1.6 Wb/m^2
   Constant for output voltage per turn = 0.6
   Resistivity of Copper = 0.021 $\Omega mm^2/m$
   Core type = Cruciform
   Current density in conductors = 2.5 A/mm^2
   Window space factor = 0.22
   Stacking factor = 0.9
   Ratio of window height to width = 2.75
   Take hot rolled steel and area of yoke is 20% greater than area of core
   Width of duct between LV and core = 10mm
   Width of LV winding = 50mm
   Width of HV winding = 50 mm
   Width of duct between LV and HV = 20 mm

   Assuming all the other required parameters, calculate:

   (i) Overall core dimension
   (ii) Overall dimension of frame
   (iii)Per unit resistance and leakage reactance drop
   (iv)Per unit voltage regulation at 8.0 pf [18]

4. a). Determine the main dimension, turns per phase, number of slots and slot area of a 250HP, 400V, 4-pole, 50Hz slip ring induction motor. Assume, Bav = 0.5Wb/m^2, ac = 3000 Ampere conductor/m, efficiency (η) = 0.9, pf = 0.9, current density = 3.5A/mm^2. The slot space factor is 0.4 and ratio of core length to pole pitch is 1.2. The machine is delta connected. [8]

   b) Derive the expressions for output equation of three phase induction machine. Explain the separation of D and L. [8]

5. a) For a dc machine, derive the expression for calculating the minimum number of commutator segments. Note the number of commutator segment = number of coils in armature. [8]

   b) Calculate the diameter and length of armature of 7.5 kW, 4 pole, 1800 rpm, and 220V shunt motor. Given: full load efficiency = 0.83, maximum gap flux density = 0.9 Wb/m^2, specific electric loading = 30,000 ampere conductor per meter, field form factor = 0.7. Assume that the maximum efficiency occurs at full load and the field current is 2.5% of rated current. The pole is square face and consider all the possible losses in the machine. [8]

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26 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2074 Ashwin

Exam.			
Level	BE	Full Marks	80
Programme	BEL	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: - Electrical Machine Design *(EE603)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. a) Compare the characteristics of conducting and insulating materials used in DC machine. [5]
   b) What is meant by "ageing" in magnetic material? Enlist the merits and demerits of addition of Silicon with Iron. [5]
   c) Differentiate between core type and shell type transformer on the basis of construction, Mechanical design, Leakage reactance and Cooling. [6]

2. a) Derive the expression for calculation of internal temperature of a homogenous material of thickness 't' length 'l' and width 'w'. Other necessary data's can be assumed. [8]
   b) A 250 volt 1 kilowatt single elemental resistor is made from 0.2mm thick nickel chromium strip. The temperature raised of the strip is not exceed 300°C. Calculate the length and width of the strip. Assume e = 0.9 , Radiating efficiency = 0.75. Resistivity of nichrome = $1\times10^{-6}\Omega$-m. [8]

3. a) Derive an expression for KVA output of a single phase transformer from design point of view. [6]
   b) Design a 25kVA, 11000/433 V, 50 Hz, 3 phase, delta/star core type distribution transformer. [14]

The required data for design are given below:
- Maximum flux density in core= 1 Wb/m^2
- Current density in conductor= 2.3 A/mm^2
- Constant for output volt per turn, K=0.45
- Core type= cruciform
- Window space factor, Kw= 8/(30+kV)
- Staking factor =0.9
- Ratio of window height to width= 2.5
- Take area of yoke 20% more than area of limb.
- Width of LV winding=9.1 mm
- Width of HV winding=26.22 mm
- Total losses at full load =901 W

Calculate:
- i) Dimensions of core, window and yoke
- ii) Overall dimensions of the frame
- iii) Per unit resistance and leakage reactance drop
- iv) Per unit voltage regulation at 0.8 pf
- v) Full load efficiency at 0.8 pf

4. a) Discuss the factors to be considered for the selection of stator slots in an induction machine. [6]
   b) Determine the main dimensions of a 15kW, 3 phase, 400 V, 50 Hz, 2810 rpm squirrel cage induction motor having efficiency of 0.88 and a full load power factor of 0.9. Assume specific magnetic loading = 0.5 Wb/m^2 and specific electric loading = 25000 A/m. Take rotor peripheral speed as approximately 20 m/s at synchronous speed. [8]

5. a) Explain the factors to be considered when selecting the number of armature slots in dc machine. [6]
   b) Calculate the main dimensions of a 5 kW, 250 V, 4 pole, 1500 rpm dc shunt generator having full load efficiency of 0.87 and designed to have a square pole face. Assume average flux density in gap = 0.40 wb/m^2, Ampere conductors per meter= 15000 and ratio of per pitch =0.66 [8]

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27 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2073 Shrawan

Exam.	New Back (2066 & Later Batch)		
Level	BE	Full Marks	80
Programme	BEL	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: - Electrical Machine Design *(EE603)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. What are the fundamental requirements of high conducting materials? Classify and explain the electrical conducting materials in brief. [8]
2. Differentiate between soft magnetic material and hard magnetic material. [4]
3. Differentiate between natural and artificial convections in brief. Also derive an expression for the temperature rise-time curve for an electrical machine. [12]
4. Determine the main dimensions of the core, the number of turns and the cross sections of the conductors for a 5kVA, 11000/400 V, 50Hz, single phase core type distribution transformer. The net conductor area in the window is 0.6 times the net cross section of iron in the core. Assume a square cross-section for core, a flux density 1 Wb/m^2, a current density 1.4 A/mm^2, and window space factor 0.2. The height of window is 3 times its width. [12]
5. How is the flux density in the design of transformer is chosen? [4]
6. Derive the expressions for per unit resistance drop of a core type transformer. [8]
7. The following design data are provided for an induction motor. [12]

   Diameter of stator bore (D) =16cm, Length of stator core (L)= 8.5cm,Average flux density (Bav) = 0.44 wb/m^2,Power factor = 0.85,Efficiency = 86%,Frequency = 50 Hz ,Current density = $5A/mm^2$,Stator slots = 36,Rotor Slots = 30, Length of rotor bar = 15cm,Mean diameter of end ring = 12 cm, Resistivity of bar conductor = 0.020 Ohm-metre, Power out of 3-phase,4-pole, 400V,delta connected = 10kW,
   Calculate No-load maximum flux, Length of air gap, No. of turns per phase, Rotor bar current and area, End ring current and area, Losses in bars and end rings.
8. Derive the expressions for output equation of three phase induction machine. [8]
9. Calculate the main dimensions and the number of poles of a 37kW, 230V, 1400 RPM dc shunt motor so that a square pole face is obtained. The average gap density is 0.5 Wb/m^2 and ampere conductors per meter are 22,000. Take full load efficiency of 90% and the ratio of pole arc to pole pitch of 0.7. [8]
10. What are the factors for the selection of no. of poles in DC machine? [4]

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26 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2072 Chaitra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BEL	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: - Electrical Machine Design *(EE603)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. Discuss in brief about insulating material with their classification. What are the fundamental requirements of a good insulating material, electrical properties of insulating material? [8]

2. A generator has open slots each containing 3 strips of copper in the arrangement of three strips along the depth of the slot. The length of the slot portion of the conductor is 0.5 m, each strip has a cross section of $8\times10mm^2$ and current density in the strip is $4A/mm^2$. The electrical and thermal resistivities of the copper are $0.021\times10^{-6}\Omega$-m and 0.0025Ω-m respectively. The insulation between the strips and the slot walls is taken as 4mm thick and has a thermal resistivity of 3Ω-m. Calculate the temperature difference for the following cases: [8]

   i) Between the centre of the embedded portion of the strip and the overhang
   ii) Between the conductor and the slot walls

3. Design a 125KVA, 50 Hz, 6600/400V, 1-phase, core type oil immersed natural cooled distribution transformer. [18]

   Given that:
   Maximum flux density in the core = 1.35 Wb/m^2
   Current density = $2.75A/mm^2$
   Core type = cruciform two stepped.
   Window space factor = 0.30
   Stacking factor = 0.9
   Ratio of window height to width 2.5
   Take hot rolled steel sheet and area of yoke is 20 % greather than area of core
   Axial depth of L.V. winding = 268 mm
   Axial depth of L.V. winding = 276mm
   Inside diameter of LV winding = 255 mm
   Radial depth of LV winding = 14 mm
   Radial depth of HV winding = 18 mm
   Width of insulation between LV and HV = 11mm
   Outside diameter of LV winding = 293 mm
   Inside diameter of HV diameter = 314 mm
   Outside diameter of HV winding = 351 mm

   Calculate:
   i) Dimension of the core, window and yoke
   ii) Overall dimension of the frame
   iii) Leakage reactance of the transformer

   Appropriate values for additional data required may be assumed if necessary.

4. What are the factors for the selection of specific electric loading in induction motor? [4]

5. Calculate (i) diameter (ii) length (iii) number of turns per phase (iv) full load current and cross section of conductors and (v) total I^2R loss of stator of 3 phase, 120kW, 2200 volts, 50 Hz, 750 rpm (synchronous speed), star connected slip ring induction motor from the following particulars: [12]

   B_{av}=0.48 tesla, ac=26000ampere conductor per metre, efficiency=92%, power factor= 0.88, L=1.25τ, K_W=0.955, current density=5A/mm^2, mean length of stator conductors= 75cm, ρ= 0.021 ohm per metre and mm^2 section.

6. Explain the factors to be considered while selecting the number of poles in a dc machine. [8]

7. A design is required for a 30 KW, 4 pole, 900 rpm dc shun generator, the full load terminal voltage being 240 V. Assume that the full load armature voltage is 3% of the terminal voltage. [8]

   Calculate the main dimension of the machine. Given that:

   Maximum gap flux density = 0.85 Wb/m^2
   Specific electric loading = 20000 ampere conductor per metre
   Field resistance = 120 Ω
   Ratio of pole arc to pole pitch = 0.7
   Field form factor = 0.7

8. What is the importance of temperature as a factor in the life of insulating materials? [4]

9. For a transformer show that the emf per turn E_t is given by $E_1 = K\sqrt{KVA}$ where KVA = rating of transformer. [4]

10. Derive the expressions for output equation of three phase transformer. [6]

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26 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2072 Kartik

Exam.	New Back (2066 & Later Batch)		
Level	BE	Full Marks	80
Programme	BEL	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: - Electric Machine Design *(EE603)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. a) What are the fundamental requirements of a good insulating material? Explain the application of insulating materials in machines in brief. [5]

   b) What are the requirements of magnetic material for making transformer core? [5]

2. a) "Ventilating ducks are kept across the lamination to reduce the temperature rise within the material in electrical equipment." Justify the statement. [6]

   b) A 250 volt, 1 kilowatt single element resistor is made from 0.2 mm thick nickel chromium strip. The temperature rise of the strip does not exceed 300°C. Calculate the length and width of the strip. Assume e = 0.9, Radiating efficiency = 0.75, Resistivity of nichrome = 1×10^{-6} Ω-m. [6]

3. a) What are the difference between power transformer and distribution transformer from design aspect? [4]

   b) Design a 150 KVA, 50 Hz, 6600/400V, 1-phase, core type oil immersed natural cooled distribution transformer. Given that: [20]

   Maximum flux density in core = 1.35 Wb/m^2
   Current density = 2.75 A/mm^2
   Core type = cruciform two stepped
   Window space factor = 0.27
   Stacking factor = 0.9
   Ratio of window height to width = 2.5
   Take hot rolled steel sheet and area of yoke is 20% greater than area of core
   Axial depth of L.V winding = 268 mm
   Axial depth of HV winding = 276 mm
   Inside diameter of LV winding = 255 mm
   Radial depth of LV winding = 14 mm
   Radial depth of HV winding = 18 mm
   Width of insulation between LV and HV = 11 mm
   Outside diameter of LV winding = 293 mm
   Inside diameter of HV winding = 314 mm
   Outside diameter of HV winding = 351 mm

   Calculate:

   i) Dimensions of the core, window and yoke
   ii) overall dimensions of the frame
   iii) Leakage reactance of the transformer
   iv) Draw overall dimension of the transformer

4. a) Discuss the factors to be considered for selection of magnetic loading in induction machine. [8]

   b) Determine the main dimensions, turns per phase, number of slots conductor size and slot area of a 250HP, 3-ϕ, 400V, 50Hz, 1430RPM slip ring induction motor. Assume, B_{av} = 0.5Wb/m^2, ac = 30000 ampere conductors per meter, efficiency = 0.9, Power factor = 0.9, Current density = 3.5A/mm^2. The slot space factor is 0.4 and ratio of core length to pole pitch is 1.2. The machine is delta connected. **Appropriate values for additional data required may be assumed.** [10]

5. a) Explain the factors to be considered while selecting the ampere conductor per meter in a dc machine. [8]

   b) A design is required for a 50KW, 4 pole, 6000RPM, dc shut generator. The full load terminal voltage is 220V. If the maximum gap density is 0.83Wb/m^2 and the armature ampere conductors per meter are 30000, Calculate suitable dimensions of armature core to give a square pole face. Assume that the full load armature voltage drop is 3% of the rated terminal voltage and that the field current is 1% of rated full load current, ratio of pole arc to pole pitch is 0.67. [8]

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26 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2071 Chaitra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BEL	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: - Electric Machine Design *(EE603)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. a) What is ageing? How it can be minimized? Enlist the merits and demerits of addition of silicon with iron. [5]
   b) Discuss soft magnetic material in brief. Give their application from its commercial aspects. [5]
2. a) Explain the temperature gradients in conductors placed in slot with necessary figure and expressions. [6]
   b) The rise in temperature of a transformer after one hour and two hours of starting from cold conditions are 25°C and 40°C respectively. Determine its final steady temperature rise and the heating time constant. If its temperature falls from the final steady value to 45°C in 90 minutes when disconnected from the operation, determine its cooling time constant. The ambient temperature is 30°C. [6]
3. a) Derive an expression for KVA output of a single phase transformer from design point of view. [8]

b) For a 2.2 kW, 440V, 3 phase, 50 Hz, 1430 rpm squirrel cage induction motor using star delta starter and having efficiency of 0.8 and power factor 0.85 at full load the following data are given: [16]
Specific magnetic loading = 0.44 Wb/m^2
Specific electric loading = 21000 A/m
Slot space factor = 0.4
Ratio of core length to pole pitch = 1.5
Ratio of slot depth to width = 4
Stator slot pitch = 12 to 15 mm
Current density in conductor = 4 A/mm^2
Assuming all other required data, calculate:
i) Main dimensions of the machine
ii) No. of stator turns per phase
iii) Size of stator conductor
iv) No. of stator slots
v) Area and dimensions of each stator slot
vi) Minimum width of stator teeth

4. a) What will be the effect if air gap length is too wide in induction machine? Explain different factors to be considered when selecting suitable air gap length. [8]

   b) Find the main dimension number of stater turns size of conductor of a 5HP, 400 V, 3 phase, 4 pole, 50 Hz squirrel cage induction motor star delta starting. Use the following data. Average flux density in the air gap = 0.4 wb/m^2. [10]
   Ampere conductor per meter of armature periphery = 22000
   Full load efficiency = 83%
   Full load p.f. = 0.84 (lagging)

5. a) Derive the output equation of DC machine. [8]

   b) Calculate the main dimensions and the number of poles of a 40 KW, 240 V, 1450 RPM dc shunt motor so that a square pole face is obtained. The average gap density is 0.5 wb/m^2 and ampere conductors per meter are 22000. Take full load efficiency of 92% and ratio of pole arc to pole pitch of 0.7. [8]

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2080 Bhadra

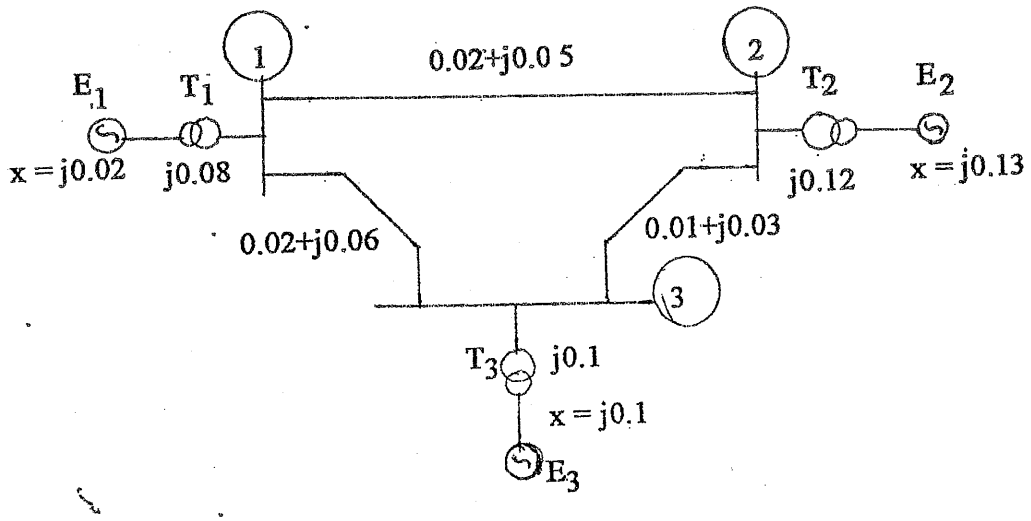
Exam.	Regular		
Level	BE	Full Marks	80
Programme	BEL	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: - Power System Analysis II *(EE 605)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt All questions.*
- ✓ *The figures in the margin indicate Full Marks.*
- ✓ *Assume suitable data if necessary.*

1. a) What is interconnected power system? Write its advantages. [4]

   b) For the network shown below obtain a bus admittance matrix. [4]



   c) An 11 kV 100 MVA alternator having a sub-transient reactance of 0.25 pu is supplying a 50 MVA motor having a sub-transient reactance of 0.2 pu through a transmission line. The line reactance is 0.05 pu on a base of 100 MVA. The motor is drawing 40 MW at 0.8 p.f. leading with a terminal voltage of 10.95 kV when three phase fault occurs at the generator terminals. Calculate the total current in generator and motor under fault conditions. [8]

2. a) Perform the two iteration of Gauss-Seidal load flow analysis for the data table given below to find the unknown variables of the buses. Line impedance of each line is (0.02+j0.11)pu. All data are in per unit and have usual meanings. [12]

Bus no.	P_G	Q_G	P_L	Q_L	Bus voltage	Configuration
1	?	?	1.0	0.5	$1.03 < 0$	1-2
2	1.5	?	0.5	0	1.03	2-3
3	0.0	0	1.2	0.5	?	3-1

   b) When and why power system engineer needs load flow study? Write the load flow equations for NR method and make suitable assumptions to write load flow equations for decoupled load flow highlighting its computational advantages over N-R method. [2+2]

3. a) What do you understand by symmetrical components? Derive an expression of 3-phase complex power in terms of symmetrical components of voltages and currents. [2+6]

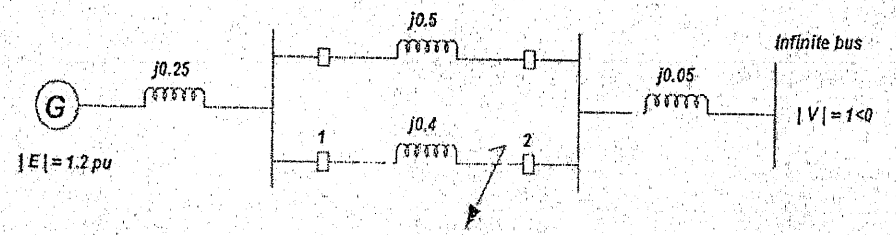
   b) Define sequence impedances. For the star connected load, verify that impedance matrix has non-zero elements on its diagonal matrix. Comment on zero sequence impedance. [8]

4. a) Draw positive sequence, negative sequence and zero sequence network of synchronous generator. Show that all three sequence currents of faulty phase are equal in case of single line to ground fault of unloaded synchronous generator. Also find the expression of fault current. [8]

   b) A 25 MVA, 13.2 kv alternator with solidly grounded neutral had a subtransient reactance of 0.25 pu. The negative and zero sequence reactances are 0.35 and 0.1 pu respectively. A line to line fault occurs at the terminals of an alternator. Determine the line to line voltages under fault conditions. Neglect resistance. [8]

5. a) What do you mean by steady state and transient state stability? Explain. Also discuss the transient stability enhancement techniques in power systems. [4+4]

   b) A three phase fault is applied at the point P as shown in figure below. Find the critical clearing angle for clearing the fault with simultaneous opening of the breakers 1 and 2. The reactance values of various components are indicated in the diagram. The generator is delivering 1.0 pu power at the instant preceding the fault. [8]



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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2081 Baishakh

Exam.	Back		
Level	BE	Full Marks	80
Programme	BEL	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

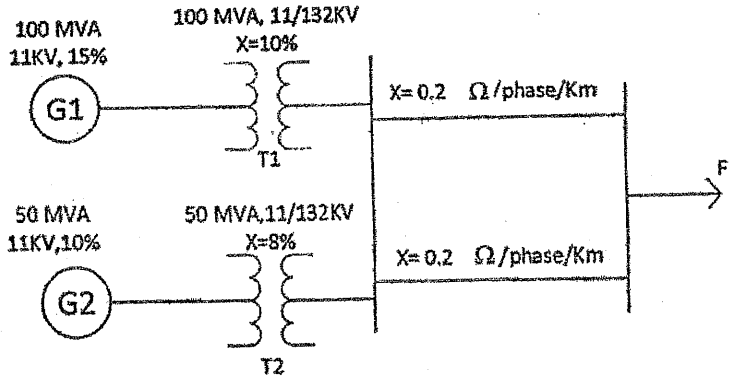
Subject: - Power System Analysis II *(EE 605)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. a) What are the advantages of interconnected power system? With help of schematic diagram, explain how load frequency (L-F) and reactive power voltage (Q-V) are controlled in the power system. [2+4]

   b) State the usage of bus admittance matrix in power system along with the methods to compute them. Clarify with an example. [4]

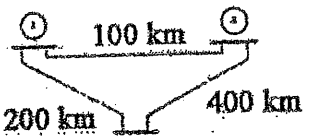
   c) For a power system network shown below, 3-phase to ground fault occurs at point F. Calculate fault level and fault current supplied by each generator. [6]



2. a) Derive the static load flow equations for 4-bus system. [6]

   b) The single line diagram of power system network is shown in the figure below. The Y-Bus of the system is. [10]

$$Y_{Bus} = \begin{bmatrix} 4-j2 & -2+j6 & -2+j6 \\ -2+j6 & 4-j12 & -2+j6 \\ -2+j6 & -2+j6 & 4-j12 \end{bmatrix}$$

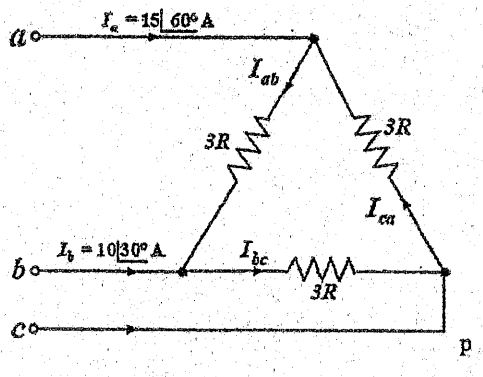


Bus	P_{Load}	Q_{Load}	P_{Gen}	Q_{Gen}	V	Bus Type
1	2.0	0.6	?	?	$1.05\angle 0$	Slack
2	0.7	0.5	1.2	?	1.0	PV
3	0.6	0.3	0	0	?	PQ

Assume limit on Q_{Gen} of $0.1 \le Q_{Gen} \le 0.4$. Carry out the load flow analysis upto two iteration using G-S method to compute the unknown parameters in above table.

3. a) Explain how the neutral grounding impedance Z_n appears as $3Z_n$ in the zero sequence networks. [6]

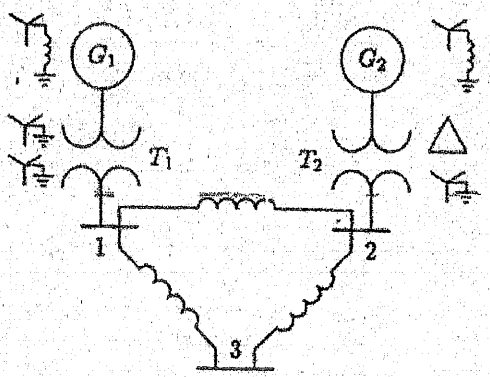
b) A delta connected resistive load is connected across an unbalanced three phase supply as shown in figure. Find symmetrical components of line currents. Also find symmetrical components of delta currents. [5+5]



4. a) A 40 MVA, 11 kV generator has $Z_1 = Z_2 = j0.3$ pu, $Z_0 = j0.4$ pu. A double line to ground fault occurs on the generator terminals. Find the fault current and line to neutral voltage at fault point. Draw the equivalent sequence network diagram for the system. [8]

b) A single line diagram of power system network is shown in figure. The neutral of each generator is grounded through a current limiting reactor of 0.25/3 per unit on a 100 MVA-Base. The system data expressed in pu on a common 100 MVA base is tabulated below. The generators are running on load at their rated voltage and rated frequency with their emf's in phase. Determine fault current and line to line voltages during L-L-G fault at bus 3. [8]

Item	Base MVA	Voltage Rating	X^1	X^2	X^0
G_1	100	20 kV	0.15	0.15	0.05
G_2	100	20 kV	0.15	0.15	0.05
T_1	100	20/220 kV	0.10	0.10	0.10
T_2	100	20/220 kV	0.10	0.10	0.10
L_{12}	100	220 kV	0.125	0.125	0.30
L_{13}	100	220 kV	0.15	0.15	0.35
L_{23}	100	220 kV	0.25	0.25	0.7125



5. a) Derive an expression for swing equation in terms of inertia constant and write about its importance in power system stability analysis using swing curve. [8]

b) An alternator is connected to a large power system and supplying 0.45 pu MW of its maximum power capacity. A three phase fault occurs and the effective terminal voltage of the alternator becomes 25% of its value before the fault. When the fault us cleared, the generator is delivering 70% of the original maximum value. Determine the critical clearing angle. [8]

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2080 Baishakh

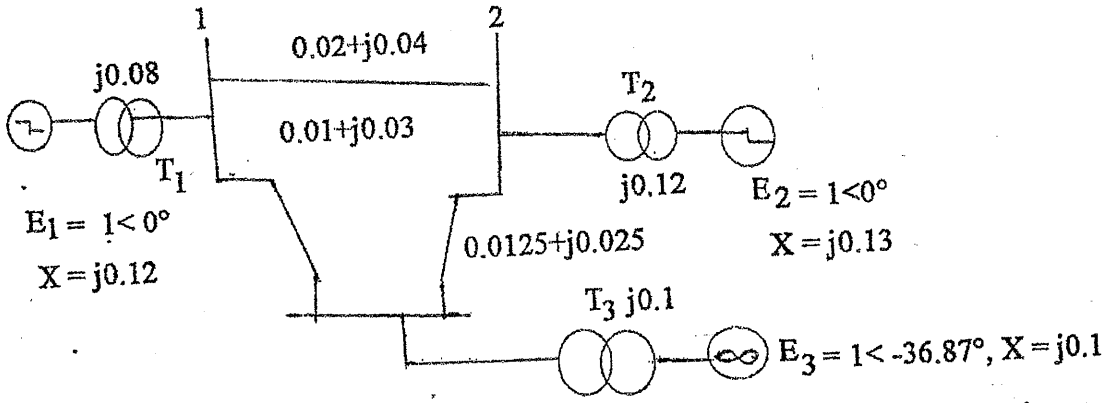
Exam.	Back		
Level	BE	Full Marks	80
Programme	BEL	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: - Power System Analysis II *(EE 605)*

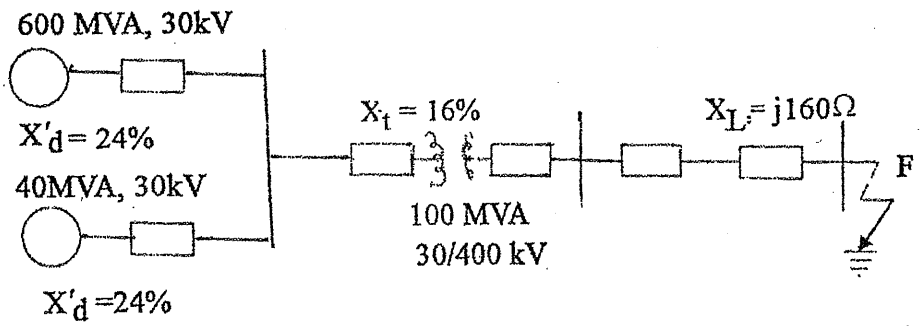
- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. a) How mismatch in the active and reactive power balance affect the operation of an interconnected power system? [5]

   b) For the network given below, obtain node equations and then form admittance matrix (Y_{BUS}). All impedances and voltages are marked in per unit. [5]

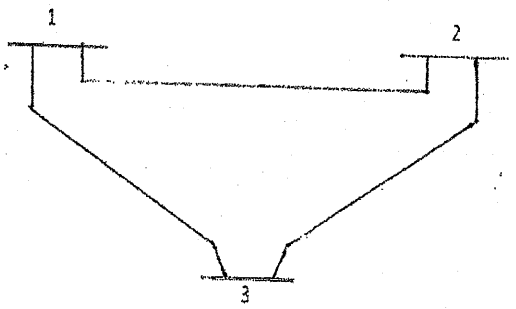


   c) The system shown in figure below is initially on no-load with generator operating at their rated voltage with their emfs in phase. The rating of the generators and the transformers and their respective percent reactances are marked on the diagram. All resistance are neglected. The line impedance is j 160 ohm. A three-phase balanced fault occurs at the receiving end of the transmission line. Determine the short-circuit current and the short-circuit MVA. [8]



2. a) Mention the various load flow techniques and hence compare them explaining their merits, demerits, usages and limitation. [6]

   b) A 3- bus power system is shown in figure. The series impedance and shunt admittance of each line are (0.026+j0.11) pu. and j0.04 p.u. respectively. [1+3+3+3]



Bus No.	Pg	Qg	P_1	Q_1	Bus Voltage	Bus type
1	?	?	1.0	0.5	1.03<0	Slack
2	1.5	?	0.5	0	1.03	PV
3	0	0	1.2	0.5	?	PQ

a) From Y bus
b) Find Generator reactive power at bus-2 using gauss seidel method (after first iteration).
c) Find voltage at bus 2 and bus 3 Using Gauss- Seidel method (after first iteration).
d) Find total network real power loss (after first iteration).

3. a) Obtain the sequence impedance matrix of the balanced star connected synchronous machine with neutral impedance Zn. [6]

   b) Discuss the significance of sequence components in power system fault analysis. How are the sequence components of voltages and currents used to determine 3-phase power in the system? [6]

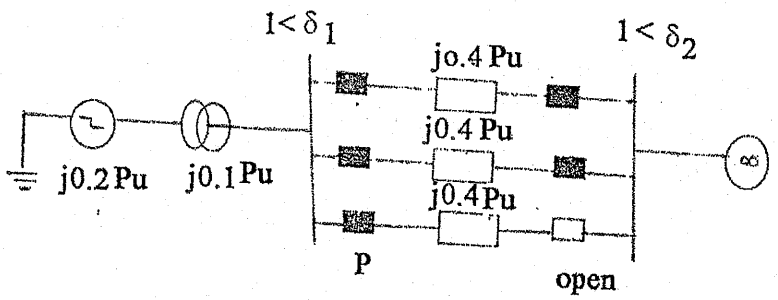
4. a) A generator having a solidly grounded neutral and rated 50MVA, 30kV has positive, negative and zero sequences of 25,15 and 5 percent, respectively. What reactance must be placed in the generator neutral to limit the fault current for a bolted line to ground fault to that for a bolted three- phase fault? [8]

   b) Explain with necessary mathematical expressions and diagram how fault current is calculated when a line to line fault occurs in a phase power system network. [8]

5. a) Define steady state and transient stability of power system. What are the methods of improving transient stability of a power system? [5]

   b) A transmission line connecting a generator to an infinite bus has a series reactance of 0.8 pu. Assuming the sending and receiving end voltage are at 1 pu each. Determine the series compensation required to bring the power angle to 30°. [5]

   c) An alternator of 5 MJ/Mva, 50 Hz is delivering a power of 1.0 pu to an infinite bus through a transmission line. The fault is at point P for the network, calculate critical clearing angle and critical clearing time. [8]



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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2079 Bhadra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BEL	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: - Power System Analysis II *(EE 605)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

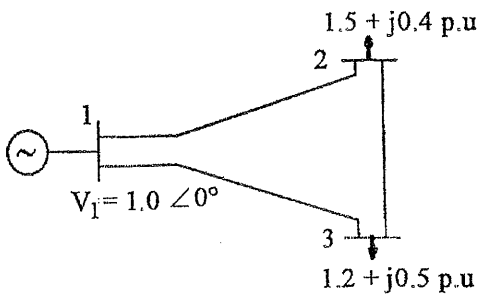
1. a) List out the advantage of interconnected power system over isolated system. How the changes in active power affect the system frequency in power system? [6]

   b) What are difference between bus impedance matrix (Z_{bus}) and bus admittance matrix (Y_{bus})? Develop Y_{bus} for regulating transformers whose off-nominal turn ratio is 1:t and draw the equivalent π-model for this transformer. [2+4]

   c) A synchronous generator is rated 500 MVA, 20 kV, 60 Hz with having subtransient reactance (Xd'') = 0.20 per unit. It supplies a purely load of 400 MW at 20 kV. The load is connected directly across the terminals of generator. If all the three phase of load are short circuited simultaneously, find the initial symmetrical rms current in the generator in per unit on a base of 500 MVA, 20 kV by using internal voltages of the machine. [4]

2. a) Describe about the assumptions to be made for decoupled load flow method, and write down its algorithm. [2+4]

   b) For a network given below, series impedance of each line is 0 + j0.12 p.u. Shunt admittance of the line is negligible. Calculate: [10]
   (i) Voltage at bus – 2 and bus – 3 by using G-S method (Upto 2 iteration).
   (ii) Slack bus real and reactive power.
   (iii) Network real and reactive power losses.

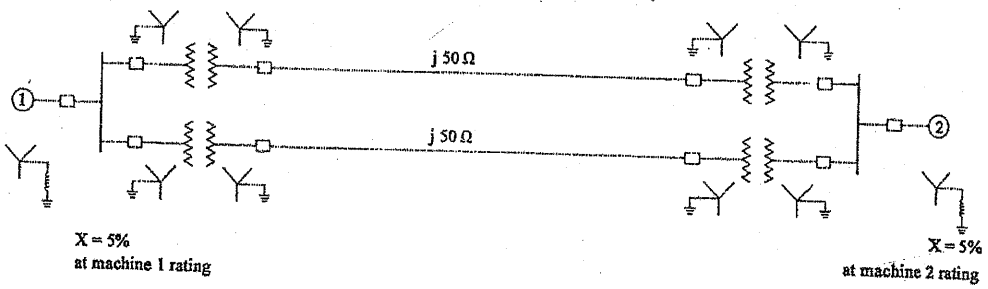


3. a) What is significance of sequence components? Deduce the sequence network for a loaded synchronous generator grounded through impedance Zn. [2+6]

   b) Draw the positive, negative and zero sequence impedance networks for the power system shown in figure below. Choose a base of 50 MVA, 220 kV in 50 Ω transmission lines and mark all reactances in pu. The ratings of the generators and transformers are:

   Generator 1: 25 MVA, 11 kV, X'' = 20%
   Generator 2: 25 MVA, 11 kV, X'' = 20%
   Three-phase transformer (each): 20 MVA, 11 Y/220 kV, x = 15%

The negative sequence reactance of each synchronous machine is equal to its substransient reactance. The zero sequence reactance of each machine is 8%. Assume that the zero sequence reactances of lines are 25% of their positive sequence reactances. [8]

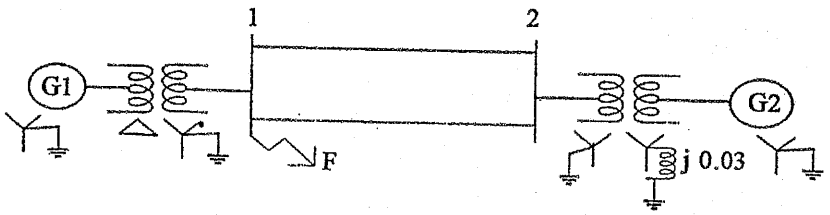


4. a) A 30 MVA, 11 kV solidly grounded generator has positive, negative and zero sequence impedance of j0.2 pu, j0.2 pu and j0.05 pu. Generator is under unloaded condition. [6+2]

   i) Calculate fault current and line to line voltages during fault condition if L-G fault occurs at the generator terminals.
   ii) Find the line current for 3-phase fault.

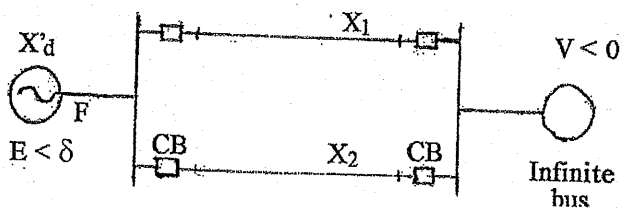
   b) Figure shows a power system network. Draw positive, negative and zero sequence network. If LG fault occurs at bus 1, find fault current. Assume fault impedance $Z_f = 0.05$ p.u. [8]

Equipment	MVA rating	Voltage rating	X1 (p.u.)	X2 (p.u.)	X0 (p.u.)
G1	50	11 KV	0.20	0.20	0.08
G2	30	11 KV	0.25	0.25	0.1
Transformer T1	50	11/132 KV	0.1	0.1	0.1
Transformer T1	30	11/132 KV	0.09	0.09	0.09
Line L1	45	132 KV	0.1	0.1	0.25
Line L1	45	132 KV	0.1	0.1	0.25



5. a) What is stability of power system? State and explain the steady state stability and also signify the importance of synchronizing power coefficient. [2+4+2]

   b) For the system shown in figure, the per unit values of different quantities are E = 1.1, V = 1, $X_d' = 0.15$, $X_1 = X_2 = 0.4$.
   The system is operating in equilibrium with Pm = 1.2 pu. Find the critical clearing angle if a 3-phase fault occurs on line-2 close to the generator. [8]



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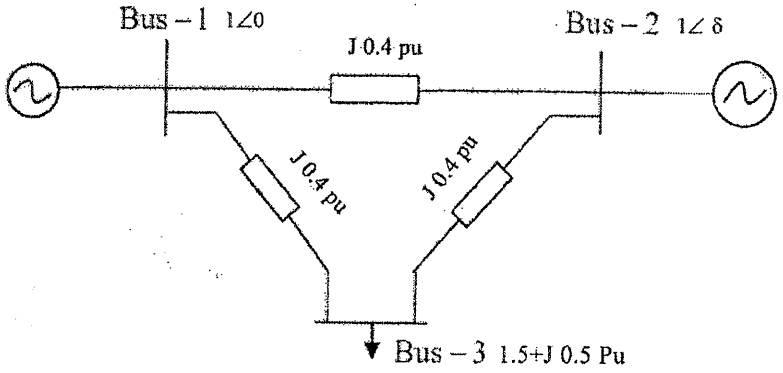
TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2079 Baishakh

Exam.	Back		
Level	BE	Full Marks	80
Programme	BEL	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

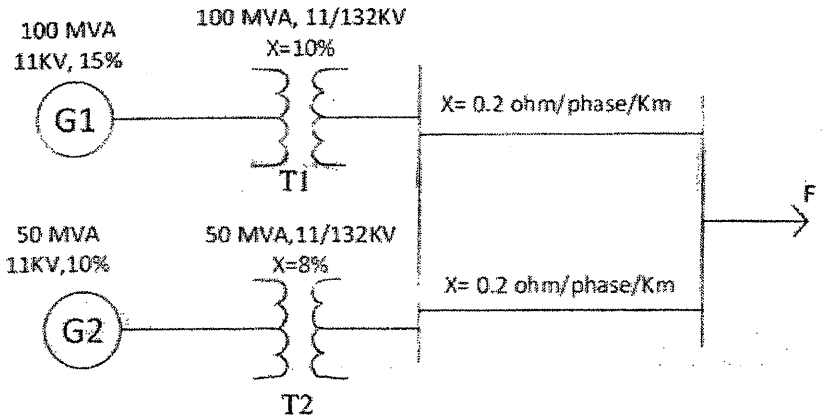
Subject: - Power System Analysis II (*EE 605*)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

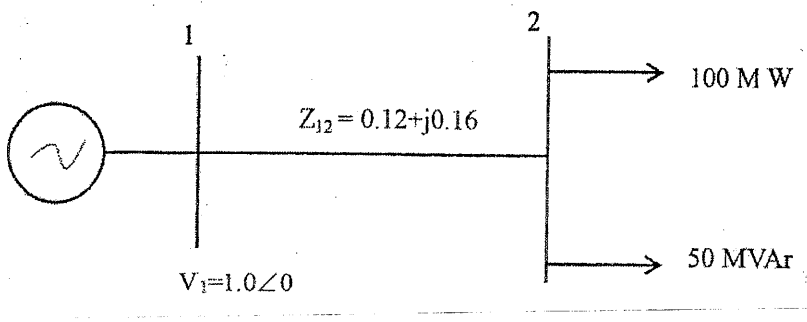
1. a) Explain why real power/frequency balance is important in an interconnected power system. [5]
   b) Compute Y-bus matrix for the following power system network shown in figure below. [5]



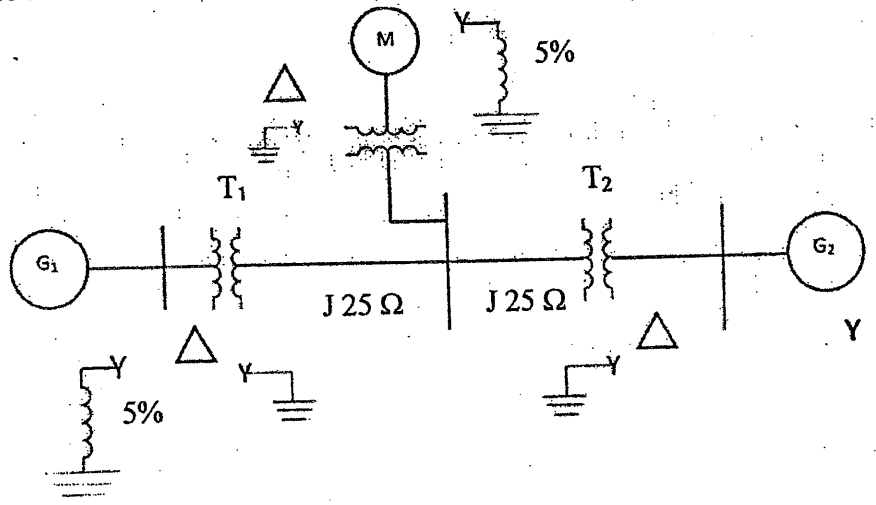
   c) For a power system network shown below, 3-phase to ground fault occurs at point F. Calculate fault level and fault current supplied by each generator. [6]



2. a) Is decoupled load flow method faster then the N-R method? Justify your answer. [6]
   b) In the two- bus system in figure below, bus 1 is a slack bus with V1 = 1.0<0° P.u. A load of 100 MW and MVAr is taken from bus 2. The line impedance z12 = 0.12 + J0. 16 pu on a base of 100 MVA. Using Newton-Raphson method, obtain the voltage magnitude and phase angle of bus 2. Start with an initial estimate of $|V|^\circ = 1.0$ pu and $\delta_2^{(0)} = 0°$. Perform two interations. [10]

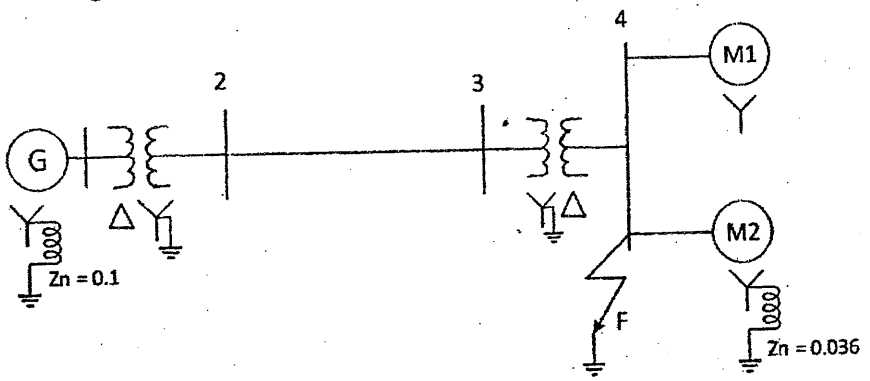


3. a) A power system network is shown in figure below. Draw positive, negative and zero sequence networks. The ratings of components are:
Generator G_1: 25 MVA, 11kV, $X_1 = 0.2$pu, $X_2 = 0.15$ pu, $X_0 = 0.03$ pu
Generator G_2: 25 MVA, 11kV, $X_1 = 0.2$pu, $X_2 = 0.15$ pu, $X_0 = 0.05$ pu
Motor M: 25 MVA, 11kV, $X_1 = X_2 = 0.1$ pu, $X_0 = 0.1$ pu
Transformer T_1: 25 MVA, 11Δ/120Y kV, X = 10%
Transformer T_2: 12.5 MVA, 11Δ/120Y kV, X = 10%
Transformer T_3: 10 MVA, 120 Y/11Δ kV, X = 10%
Choose a base of 50 MVA, 11 kV in generator G_1 circuit. [9]



b) In a 3- phase system, the phase currents are as follows:
Ia = 10∠0°A, Ib = 12∠ - 90°A and Ic = 9∠90°A. Determine the sequence component of Ia, Ib and Ic respectively. [5]

4. a) With the help of suitable mathematical aid verify that. For a SLG fault in a transmission line the zero-sequence component of the current is equal to positive-sequence current and the negative sequence component of the current. [6]
b) A single line diagram of a power system network is shown in figure below. [10]

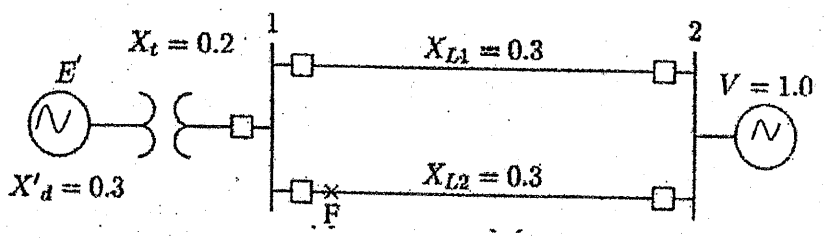


Equipment	MVA rating	Voltage rating (KV)	X_1 (p.u)	X_2 (p.u)	X_0 (p.u.)
Generator G	25	11	0.20	0.25	0.05
Motor M1	15	10.8	0.25	0.25	0.1
Motor M2	7.5	10.8	0.25	0.25	0.1
Transformer T1	30	11/132	0.1	0.1	0.1
Transformer T2	30	132/11	0.1	0.1	0.1
Transmission line	30	132	0.1	0.1	0.3

i) Draw sequence networks.
ii) Find fault current and line ground voltage for a line to line (LL) fault at point F.

5. a) What do you mean by steady state and transient state stability? Discuss the factors that affect transient stability. What are the methods of improving transient stability limit? [8]

b) A 60 Hz synchronous generator having inertia constant (H) = 5 MJ/MVA and a direct axis transient reactance $X'_d = 0.8$ per unit is connected to an infinite bus through a purely reactive circuit as shown in below figure. Reactances are marked on the diagram on a common system base. The generator is delivering real power $P_e = 0.8$ per unit and Q = 0.074 per unit to the infinite bus at a voltage of V = 1 per unit. A temporary three-phase fault occurs at the sending end of the line at point F. When the fault is cleared, both lines are intact. Determine the critical clearing angle and the critical fault clearing time. [10]



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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2078 Bhadra

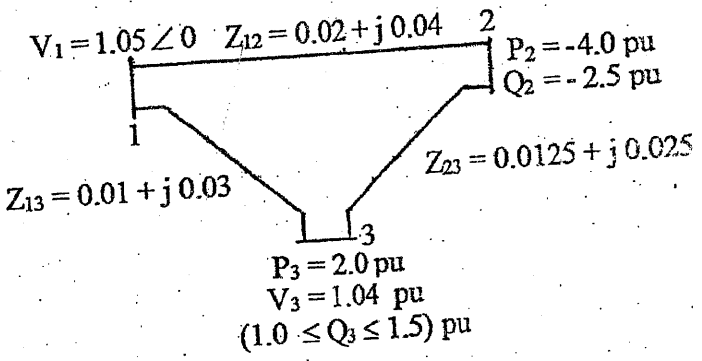
Exam.	Regular		
Level	BE	Full Marks	80
Programme	BEL	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: - Power System Analysis II *(EE 605)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

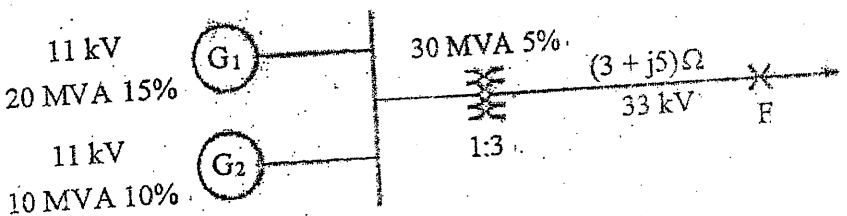
1. a) Starting from the equivalent circuit of a synchronous generator, explain the Principle how AVR (Automatic voltage regulator) control the bus voltage magnitude in a power system. [8]

   b) For a three phase system as shown in figure below, compute the Y_{Bus} Matrix. [8]



2. Starting from Bus injected real and reactive Power expressions as; $P_k = \sum_{n=1}^{N} |V_k V_n Y_{kn}| \cos(\theta_{kn} + \delta_n - \delta_k)$ and $Q_k = -\sum_{n=1}^{N} |V_k V_n Y_{kn}| \sin(\theta_{kn} + \delta_n - \delta_k)$ where all notations have usual meanings, obtain the general expression for computing bus voltage angle and magnitude corrections to be added to the initial guesses by N-R method. Also develop an algorithm to solve load flow using N-R method. [16]

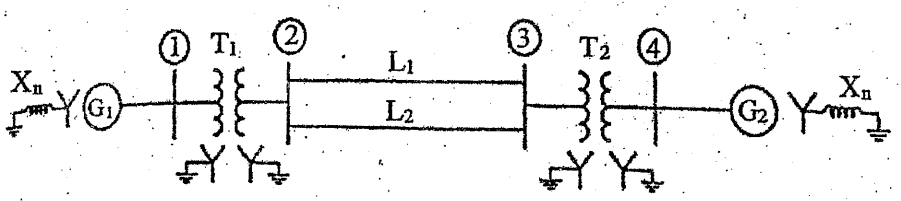
3. a) For the system shown in figure below, determine the fault current, fault level if three phase balanced short circuit fault occurs at the far end F. [8]



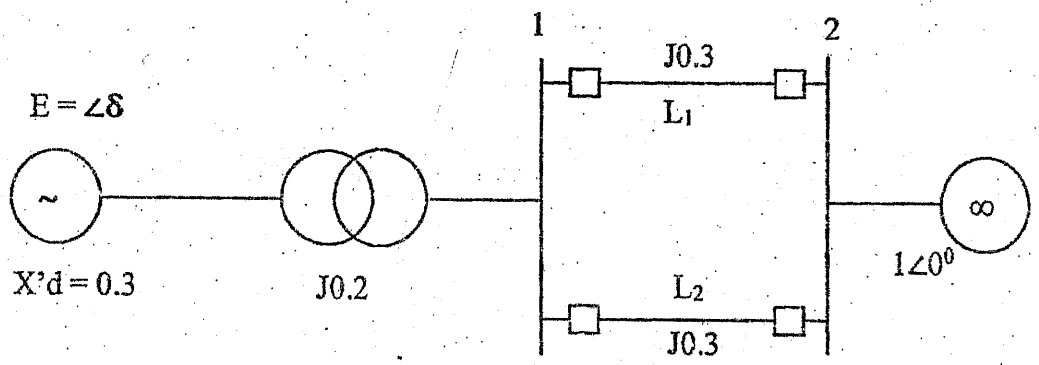
   b) Starting from suitable point, for a 3-phase star connected load with grounded neutral show that the sequence impedances are $Z_0 = Z_s + 3Z_n$, $Z_1 = Z_s$ and $Z_2 = Z_s$. [8]

4. Determine the Fault current when a line to ground fault occurs at Bus 3 as shown in figure below. [16]

G_1, G_2: 100 MVA, 11 kV, $X_1 = X_2 = 15\%$, $X_0 = 5\%$, $X_n = 6\%$
T_1, T_2: 100 MVA, 11 kV/220 kV, $X_{leak} = 10\%$
L_1, L_2: $X_1 = X_2 = 10\%$, $X_0 = 10\%$ on a base of 100 MVA



5. a) In the power system network shown below, if the generator delivers 1 pu real power at infinite bus 2. A 3-phase bolted fault occurs at the end of the 1st transmission line. The fault is isolated by simultaneous opening of circuit breakers on the both end of the line. Find the critical fault clearing time so that transient stability of the machine is maintained. Inertia constant of the generator is 8MJ/MVA. [12]



b) What are the techniques to improve transient stability in power system? Describe briefly. [4]

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Examination Control Division
2076 Chaitra

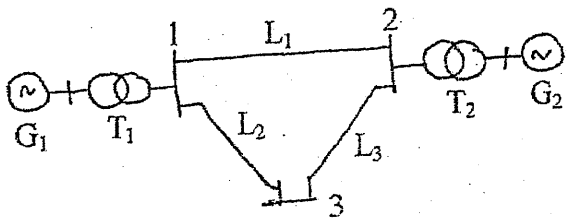
Exam.	Regular		
Level	BE	Full Marks	80
Programme	BEL	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: - Power System Analysis II *(EE 605)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt <u>All</u> questions.*
- ✓ *The figures in the margin indicate <u>Full Marks</u>.*
- ✓ *Assume suitable data if necessary.*

1. a) What are the consequences of mismatch between real and reactive power generation and demand in a power system? [4]

   b) Form the Y_{bus} matrix for the following network. All impedance values are in per unit system. [4]



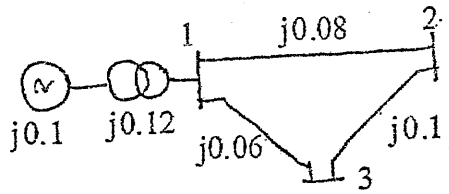
	Component						
	G_1	G_2	T_1	T_2	L_1	L_2	L_3
Z, pu	j0.1	j0.12	j0.1	j0.12	0.03+j0.08	0.02+j0.05	0.025+j0.06

   c) A 3-phase unbalanced source with voltage given by $V_{abc} = [200 < 25°\ 100 < -155°\ 80 < 100°]^T$ V is feeding a 3-phase star connected load with series impedance per phase of $Z_s = 8 + j24$ Ohms and load neutral impedance of $Z_n = j1.5$ Ohms. Determine the: [8]

   (i) Symmetrical components of voltage
   (ii) Symmetrical components of currents

2. a) How do the symmetrical components help us in analyzing unbalance electric power system? Explain briefly. [4]

   b) In the network given below, compute the short circuit MVA for a fault at bus 2. [6]

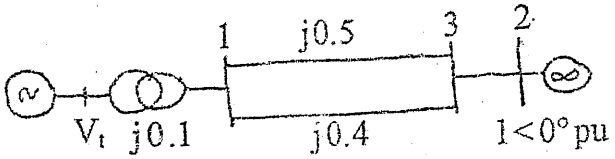


$S_{base} = 100$ MVA

   c) What is synchronizing power coefficient? Where it finds application? [6]

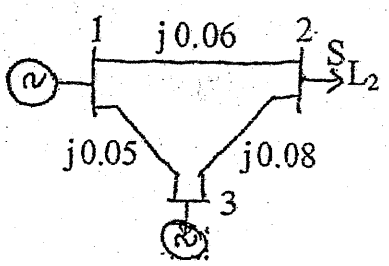
3. a) Derive the swing equation of rotor of a synchronous machine. [6]

   b) In the power system network shown below, find the rotor angle before occurrence of fault at bus 3 when the rotor was running at synchronous speed when the mechanical input to the generator is 1 p.u. Also compute the critical clearing angle. [10]



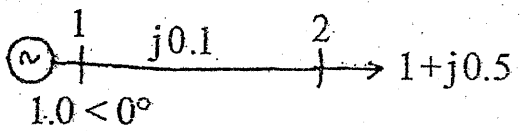
$|V_t| = 1.08$ pu
$X_d' = 0.2$ pu

4. a) For the network given below, compute the bus voltage magnitude and phase angles for 1 iterations by Gauss-Seidal method taking initial voltage magnitude estimates of 1.0 pu and phase angle estimates of for the required buses. [8]



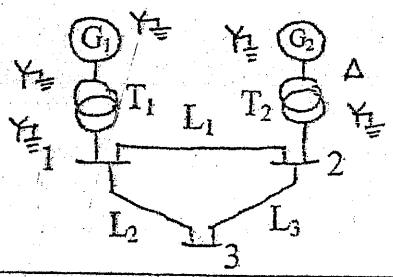
$V_1 = 1.05 < 0°$ pu
$|V_3| = 1.03$ pu
$Pg_3 = 2$ pu
$SL_2 = 3 + j\ 1.5$ pu

b) For the system given below, find the initial power mismatch matrix and initial Jacobian matrix. Take a flat start of $V_2^{(0)} = 1.0$ pu and $\delta_2^{(0)} = 0^0$. [8]



5. a) For a Double Line to Ground fault in an unloaded generator, show that the positive sequence network is connected series with the parallel connection of negative sequence and zero sequence networks. [6]

b) Compute the sequence currents for a LLG fault at bus 3 of the following network. The fault impedance is j 0.1 pu. All the parameters are in pu. [10]



Item	Base MVA	X_1	X_2	X_0
G_1	100	0.15	0.15	0.05
G_2	"	0.15	0.15	0.05
T_1	"	0.1	0.1	0.1
T_2	"	0.1	0.1	0.1
L_1	"	0.12	0.12	0.3
L_2	"	0.15	0.15	0.35
L_3	"	0.25	0.25	0.71

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Examination Control Division
2076 Ashwin

Exam.	Back		
Level	BE	Full Marks	80
Programme	BEL	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: - Power System Analysis II *(EE 605)*

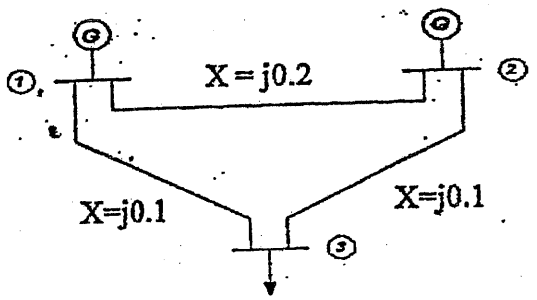
- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt All questions.*
- ✓ *The figures in the margin indicate Full Marks.*
- ✓ *Assume suitable data if necessary.*

1. Explain bus classification in power flow analysis with their known and unknown quantities and hence formulate the bus admittance matrix for four bus system. [8]

2. A synchronous generator and motor are rated 30MVA, 13.2kV and both have subtransient reactances of 20%. The line connecting them has reactance of 8% on the base of the machine ratings. The motor is drawing 20MW at 0.8 pf leading and terminal voltage of 12.8 kV when a symmetrical three phase fault occurs at the motor terminals. Find the subtransient currents in the fault occurs at the motor terminals. Find the subtransient currents in the generator, the motor and fault by using the internal voltages of machines. [8]

3. For the system in figure below, perform the load flow analysis for the first iteration by G-S method. [8]

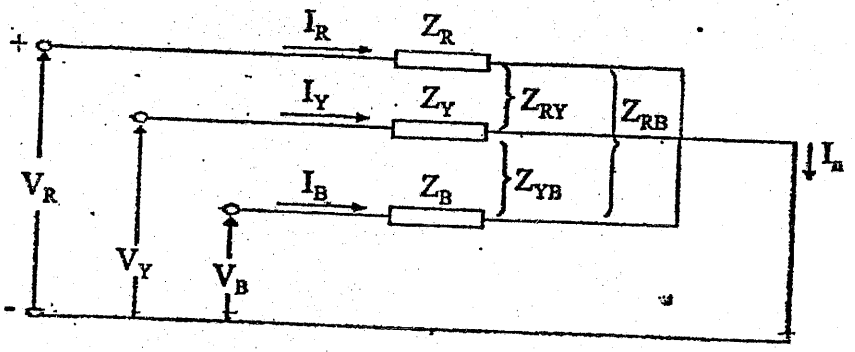
Bus No.	Voltage	Generator		Load	
		P	Q	P	Q
1	$1.03 < 0°$ pu	-	-	-	-
2	1.01 pu	0.3 pu	-	-	-
3	-	-	-	0.4 pu	0.2 pu



4. Consider a three bus system of figure, each of the three lines has a series impedance of (0+j0.08) pu. The specified quantities at the buses are tabulated below. Perform single iteration of load flow using N-R method. (Note: Reactive power limit is $0 \le Q_{G2} \le 1.5$ pu) [8]

Bus	Demand		Generator		Voltage
	Real Power	Reactive Power	Real Power	Reactive Power	
1	-	-	-	-	$1<0°$ pu
2	0	0	0.5 pu	-	1.02 pu
3	1.5 pu	0.6 pu	-	-	-

5. A three phase balanced Y-connected load with self and mutual elements is shown in figure below. The load neutral is grounded with Z_n=0.0. Determine the sequence impedance. [6]



6. Starting from a suitable point show that a 3-phase unbalanced system of voltages can be represented by a symmetrical components. [6]

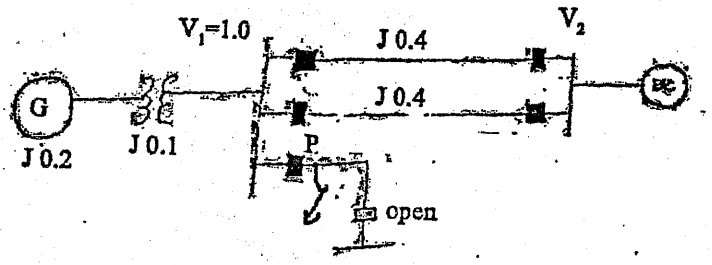
7. How do you represent 3-phase power of an unbalanced system in terms of symmetrical components of voltages and currents? [4]

8. A single line to ground fault occur at generator terminal of 20 MVA, 13.8 KV and having Z_1=j0.20 pu, Z_2=j0.3 pu. Find the fault current and line to line voltage under fault condition. [8]

9. Starting form suitable point, show that during a double line fault in a transmission line, zero sequence component is absent in the fault current. [8]

10. Derive an expression for the swing equation of a synchronous machine. Signify the importance of inertia constant in the machine. [6+2]

11. Calculate the critical clearing time and critical time and critical angle if the fault is at point P for the network having inertia 5 MJ/MVA shown below. The machine is delivering 1.0 pu and both the terminal voltage and the infinite bus voltage are 1.0 pu. [8]



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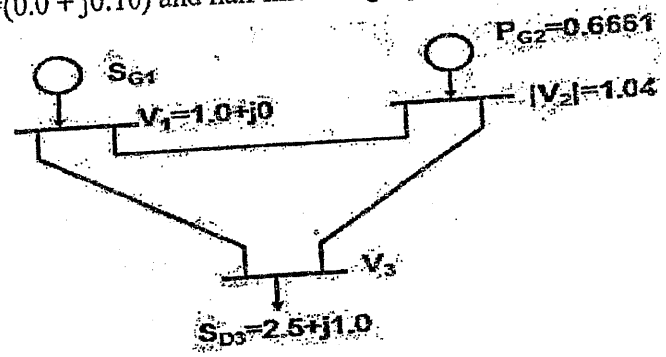
Examination Control Division
2075 Chaitra

Exam.	Regular / Back		
Level	BE	Full Marks	80
Programme	BEL	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: - Power System Analysis II *(EE 605)*

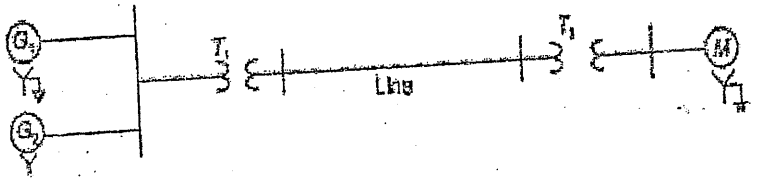
- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. Clarify the concept of real power with frequency and reactive power with voltage in power system network. [8]
2. What are the approximations in fast decoupled method? How does this method imporve the computational efficiency than the NR method in power flow problem? Write an algorithm for this method. [2+2+4]
3. Define Sequence impedances. For the star connected load show that impedance matrix has non-zero elements on its diagonal matrix. [8]
4. The bus 1 is assumed as slack bus for the 3-bus system shown below. Find $|V_3|$, θ_3, and Q_{G2}. The transmission line is represented as nominal π equivalent network with series impedance of $z_L=(0.0+j0.10)$ and half line charging admittance $y_c=j0.02$. [8]



5. Show that the sequence component are decoupled for complex power flow in a power system. [8]
6. Prove that the symmetrical component transformation is power invariant. Discuss also the significance of zero sequence circuit. [6+2]
7. Two alternators are operating in parallel and supplying a synchronous motor which is receiving 60MW power at 0.8 pf(lag) at 6kV. Single line diagram for the system and its data are given below. Compute the fault current when a single line to ground fault occurs at the middle of the line through a fault resistance of 4.033 ohm. [10]

Data:
G_1 & G_2 : 11 kV, 100MVA, $x_{g1}=0.20$ pu, $x_{g2}=x_{g0}=0.10$ pu
T_1: 180MVA, 11.5/115KV, $x_{T1}=0.10$ pu
T_2: 170 MVA, 6.6/115 KV, $x_{T2}=0.10$ pu
M: 6.3 KV, 160 MVA, $x_{M1} = x_{M2} = 0.30$ pu, $x_{M0}=0.10$ pu
Line:
$x_{LINE1}= x_{LINE2}=30.25$ ohm, $x_{LINE0}=60.5$ ohm



8. Obtain the sequence network for double line to fault at alternator terminal with zero fault impedance. [6]

9. Find the maximum steady state power capability of a system consisting of a generator equivalent reactance of 0.4 pu connected to an infinite bus through a series reactance of 1.0 pu. The terminal voltage of the generator is held at 1.1 pu and the voltage of the infinite bus is 1.0 pu. [8]

10. How power system stability is classified? Derive the swing equation for the rotor angle of the synchronous machine. [8]

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Examination Control Division
2075 Ashwin

Exam.	Back		
Level	BE	Full Marks	80
Programme	BEL	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: - Power System Analysis II *(EE605)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. a) Describe the merits of interconnected power system over an isolated system. [4]

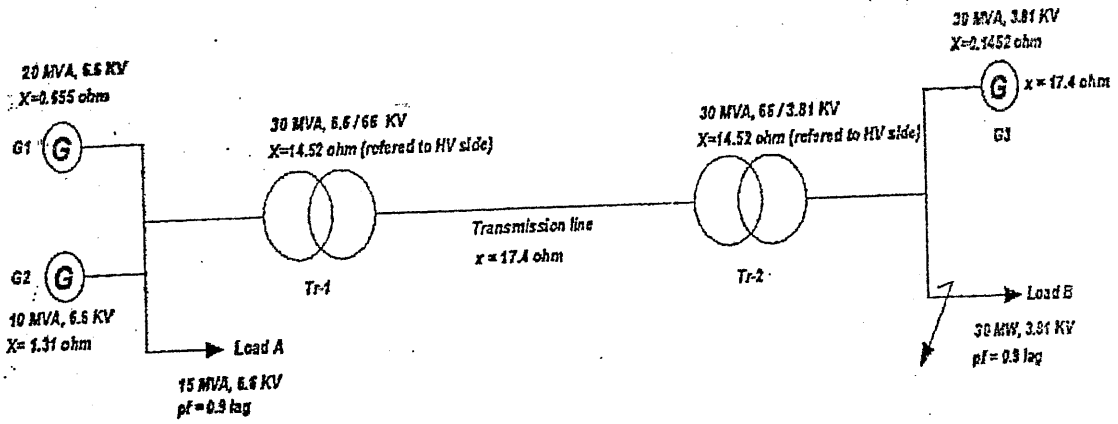
   b) Explain the steps of forming Bus Admittance (Y_{BUS}) with an example of a 3-bus power system network. [8]

2. a) Perform the two iterations of gauss-seidal load flow analysis for the data table given below to find the unknown variables of the busses after first iteration. Line impedance of each line is (0.026 + j0.11) pu. [12]

Bus no	PG	QG	PL	QL	Bus voltage	Type	Configuration
1	?	?	1.0	0.5	1.03 < 0	Slack	1-2
2	1.5	?	0.5	0	1.03	PV	2-3
3	0.0	0	1.2	0.5	?	PQ	3-1

   b) Make a comparison between G-S method and N-R method of load flow analysis. [4]

3. a) Calculate short circuit MVA and short circuit current when three phase fault occur at load B of the following single line diagram. [10]



   b) A 25 MVA, 13.2 kv alternator with solidly grounded neutral had a sub-transient reactance of 0.25 pu. The negative and zero sequence reactances are 0.35 and 0.1 pu respectively. A line to line fault occurs at the terminals of an alternator. Determine the line to line voltages under fault conditions. Neglect resistance. [8]

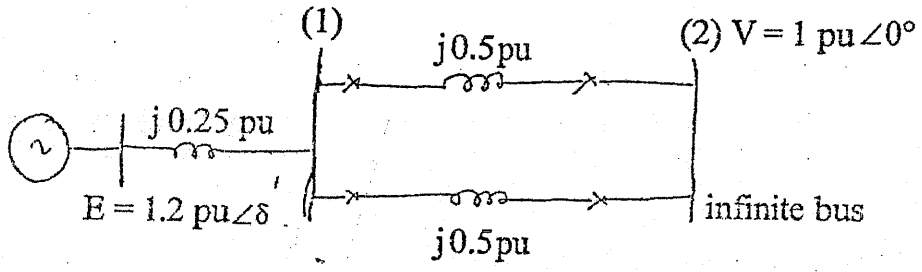
4. a) Derive the relationship to determine the fault current for a line-to-line fault on a power system. Draw a diagram showing interconnection of sequence networks for this type of fault. [6]

b) Three 6.6 kV, 3-phase, 10 MVA alternators are connected to a common bus. Each alternator has a positive sequence reactance of 0.15 pu. The negative and zero sequence reactances are 75% and 30% of positive sequence reactance. A single line-to-ground fault occurs on the bus. Find the fault current for the following cases:

(i) All the alternator neutrals are solidly grounded.
(ii) One alternator neutral is grounded through 0.3 ohm resistance and the other two neutrals are isolated. [12]

5. a) Discuss the difference between the transient stability, steady state stability and dynamic stability in power system. Also, explain the factors affecting transient stability of the system. [6]

b) The power system shown below is operating initially at power angle $\delta = 20°$. Calculate the power delivered to the infinite bus at normal operation. [10]



If a 3-phase to ground fault occurs at bus (1) and fault is cleared when the power angle δ reaches 45°. Determine, whether system come back to stable or not? If yes, calculate the maximum δ-swing angle.

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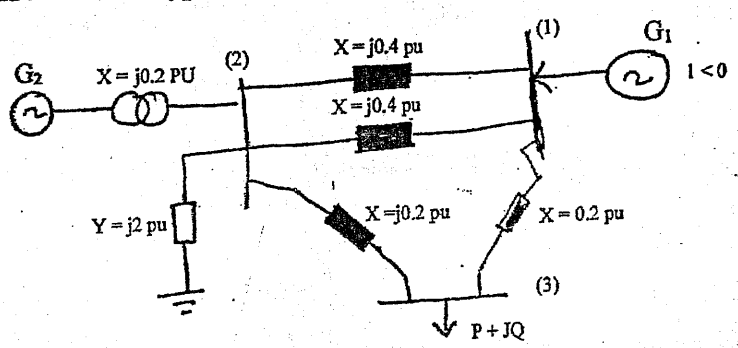
Examination Control Division
2074 Chaitra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BEL	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: - Power System Analysis II *(EE605)*

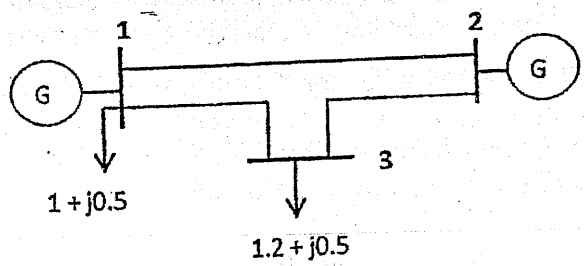
- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. a) Compute Y-bus matrix for the following power system network shown in figure below and list out the type of buses used in the network. [8]



b) List out the advantages of interconnected power system over isolated power system. [4]

2. a) A three bus power system network is shown in figure below. The series reactance of each line is 0.1 per unit. Line resistances and shunt admittances are negligible. The bus specification and power input, etc, at the buses is as under:



Bus No.	P_{Gen}	Q_{Gen}	P_{Load}	Q_{Load}	Bus Voltage	Bus Type
1	?	?	1	0.5	1.03+j0	Slack
2	1.5	?	0	0	1.04	PV
3	0	0	1.2	0.5	?	PQ

(i) Form $[Y_{bus}]$
(ii) Find the mismatch matrix [M°] and Jacobian Matrix [J°]
(iii) Perform 1st iteration of load flow Analysis by Newton-Raphson method and calculate the above unknown quantities. [12]

b) In what respect Fast Decoupled Load Flow Method is different from the Newton-Raphson method? Describe the assumptions to be made for FDLF method. [4]

3. a) Figure below shows a three-phase power system.

(i) Calculate the short circuit MVA and the fault current when a 3-phase balanced short-circuit fault occurs at the High Voltage (HV) bus.

(ii) Calculate the ohmic value of reactor 'X' to be placed on the secondary side of transformer 'T_2' to limit the Fault Level to by 25%.

Assume the system data as under: [14]

Generators:

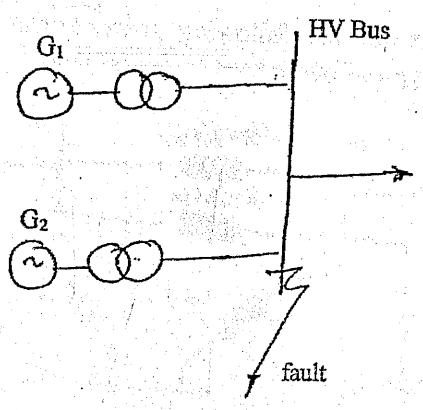
G_1: 20 MVA, 11 kV, $X_{G1} = 50\%$

G_2: 30 MVA, 11 kV, $X_{G2} = 50\%$

Transformers:

T_1: 20 MVA, 11/132 kV, $X_{T1} = 5\%$

T_2: 30 MVA, 11/132 kV, $X_{T2} = 5\%$

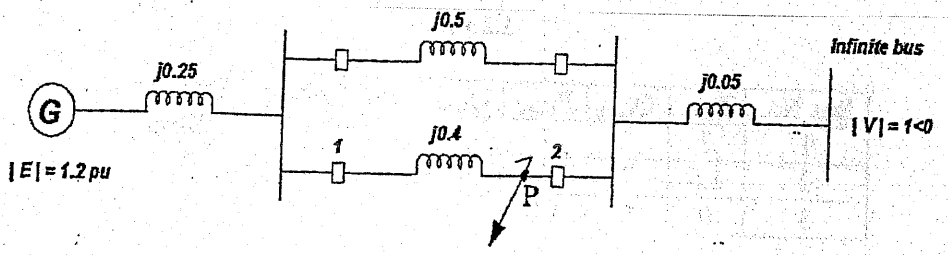


b) Describe the effects of short circuit faults on power system. Also, explain the importance of fault calculations. [4]

4. a) A double line to ground fault occur at generator terminal of 30 Mva, 11 Kv and having ZI = Z2 = j0.2 pu and Z0 = j0.05 pu. Find the line currents, fault current and line to neutral voltages under fault condition. [9]

b) Explain with necessary mathematical expressions and diagram how fault current is calculated when a line to line fault occurs in a three phase power system network. [9]

5. a) A three phase fault is applied at the point P as shown in below figure. Find the critical clearing angle for clearing the fault with simultaneous opening of the breakers 1 and 2. The reactance values of various components are indicated in the diagram. The generator is delivering 1.0 pu power at the instant preceding the fault. [10]



b) Describe the various method for improving transient stability of a power system. [6]

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2074 Ashwin

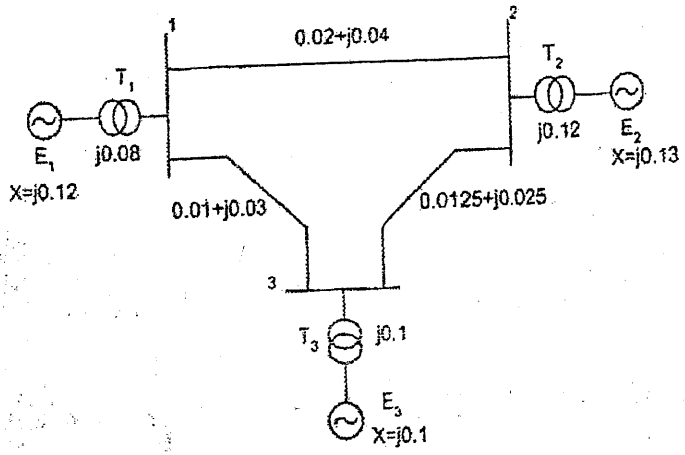
Exam.	Back		
Level	BE	Full Marks	80
Programme	BEL	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: - Power System Analysis II *(EE605)*

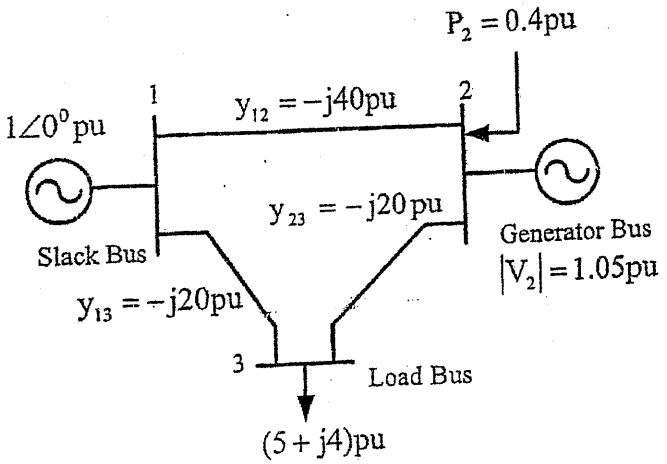
- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. a) Describe about the importance of interconnection in power system. Explain briefly about the real power – frequency balance and reactive power – voltage balance in [3]

... figure below, obtain node equations and then form bus ... impedances are marked in pu. [8]



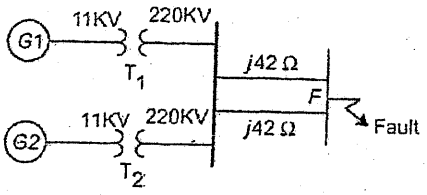
2. a) Figure below shows the single line diagram of 3 bus power system network. Determine the jacobian matrix, and perform load flow by N-R method up to one iteration. [8]



b) Suppose you are given a 3-bus power system network with one reference bus, one load bus and one generator bus with reactive power limits and asked to perform the load flow analysis to determine the unknown variables and total losses in the network using Gauss-Siedal method. How will you proceed? Explain step wise and mention mathematical expressions where it is relevant. [8]

3. a) Figure below shows a generating station feeding a 220 kV system. Determine the total fault current, fault level and fault current supplied by each generator for a three phase fault at the receiving end of the line. [10]

G_1: 11 kV, 100 MVA, $X''_{g1} = j0.15$
G_2: 11 kV, 75 MVA, $X''_{g2} = j0.125$
T_1: 100 MVA, $X_{T1} = j0.10$, 11/220 kV
T_2: 75 MVA, $X_{T2} = j0.08$, 11/220 kV



b) The phase voltages across a certain load are given as: [6]

$$V_a = (176 - j132)\text{Volts}$$
$$V_b = (-128 - j96)\text{Volts}$$
$$V_c = (-160 + j100)\text{Volts}$$

Compute positive, negative and zero sequence component voltages.

4. a) Explain with necessary mathematical expressions and diagrams how fault current and bus voltages are calculated when a line-to-line fault occurs in a 3-phase power system network. [8]

b) A 30 MVA, 13.2 kV synchronous generator has a solidly grounded neutral. Its positive, negative and zero sequence impedances are 0.30, 0.40 and 0.05 pu respectively. Determine the following: [8]

i) The value of reactance that must be placed in the generator neutral so that the fault current for a line-to-ground fault of zero fault impedance shall not exceed the rated line current.

ii) The value of resistance to be placed in the neutral that will serve the same purpose.

5. a) Derive swing equation of a synchronous machine to be applicable in the study of power system stability. What is meant by swing curve? What information is supplied by the swing curve? [8]

b) A generator is delivering 0.9 pu to an infinite bus through a purely reactive transmission line. Maximum power that could be delivered is 1.5 pu. A fault occurs such that maximum electrical power output reduces to 0.5 pu. When the fault is cleared, the maximum power that can be delivered is 1.2 pu. Determine the critical clearing angle using equal area criterion. [8]

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Examination Control Division
2073 Chaitra

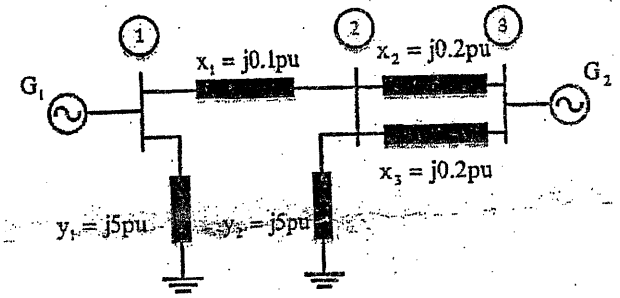
Exam.	Regular		
Level	BE	Full Marks	80
Programme	BEL	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

130

Subject: - Power System Analysis II *(EE605)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

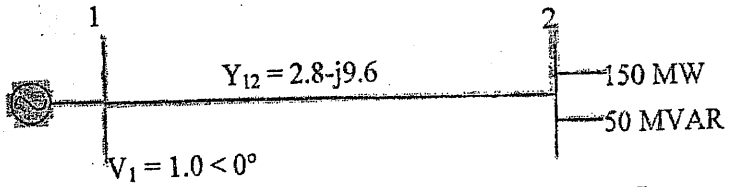
1. a) Compute Y-bus matrix for the following power system network shown in figure below. [8]



b) Explain how the mismatch in active power affects the system frequency and mismatch in reactive power affects the voltage magnitude in an-interconnected power system. [8]

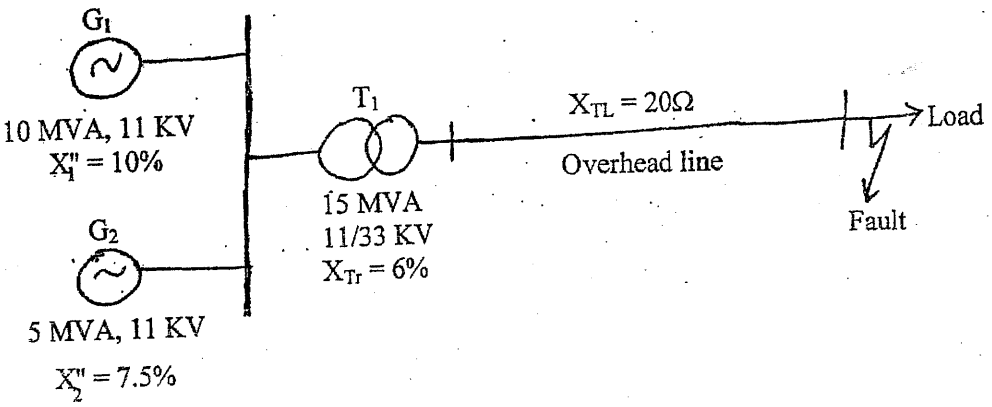
2. a) In the power system network shown in figure below, bus 1 is slack bus with $V_1 = 1.0\angle 0^0$ pu and bus 2 is a load bus with $S_2 = 150\,\text{MW} + j50\,\text{MVAR}$. The line admittance is $y_{12} = 10\angle -73.74^0$ pu on a base of 100 MVA. Perform two iterations of Newton Raphson load flow method to obtain the following: [10]

   i) Voltage magnitude and phase angle of bus 2
   ii) Real and reactive power supplied by slack bus and network losses



b) Describe about the assumptions to be made for decoupled load flow method, and hence derive the required equations. [6]

3. a) Figure below shows a three-phase system. Calculate the short circuit MVA and he fault current when 3-phase balanced short-circuit fault occurs at the load end of the transmission line. Also, determine the fault current supplied by each generator. [10]



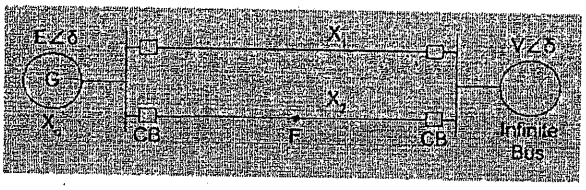
b) Derive an expression of 3-phase complex power in terms of symmetrical components of voltages and currents. [6]

4. a) Starting from suitable point, show that the three sequence networks are connected in series during a single line to ground fault in 3 phase power system network. [8]

b) A 30 MVA, 11kV generator has $Z_1 = Z_2 = j0.2\,pu, Z_0 = j0.05\,pu$. A line to line fault occurs on the generator terminals. Find the line currents, fault currents and line to neutral voltage under fault conditions. [8]

5. a) Describe about the concept of Equal Area Criterion in determining the stability of synchronous machines. [8]

b) A balanced 3-phase fault occurs at the middle point of line 2 when power transfer is 1.5 pu in the system shown in the figure below: [8]



Given: $E = 1.2, V = 1, X'_d = 0.2, X_1 = X_2 = 0.4$ pu

i) Determine whether the system is stable for a sustained fault.
ii) The fault is cleared at $\delta = 60°$. Is the system stable? If so find the maximum rotor swing
iii) Find the critical clearing angle.

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26 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2073 Shrawan

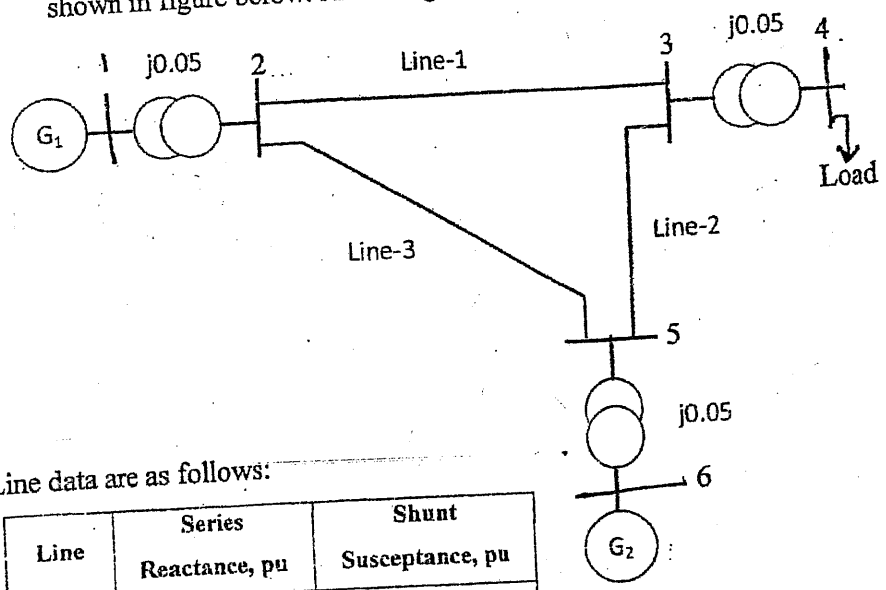
Exam.	New Back	Full Marks	80
Level	BE	Pass Marks	32
Programme	BEL	Time	3 hrs.
Year / Part	III / I		

Subject: - Power System Analysis II *(EE605)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. a) For a synchronous generator connected to infinite bus, discuss how the generator can supply or consume variable reactive power keeping its terminal voltage constant. [6]

   b) Obtain node equations and compute bus admittance matrix (Y_{Bus}) of the network shown in figure below. All voltages and impedances are marked in pu. [6]



Line data are as follows:

Line	Series Reactance, pu	Shunt Susceptance, pu
Line-1	0.40	0.02
Line-2	0.20	0.00
Line-3	0.40	0.02

2. a) Starting from Y-Bus, Bus voltage and injected current relationship deduce the basic load flow equations. [4]

   b) Classify and distinguish different buses used in load flow analysis. Mention the specified and variable to be obtained from load flow. [4]

   c) For the 2-bus power system, bus -1 is slack bus with $V_1 = 1.0 < 0°$. A load of 100 MW and 50 MVar is taken from bus-2. The line impedance is 0.12+j0.16 p.u on a base of 100 MVA. Using Newton Raphson load flow technique, determine the following after 2nd iteration. [10]

      i) Voltage magnitude and phase angle in degree of bus -2.
      ii) Real and reactive power supplied by slack bus and network losses.

3. a) Deduce the sequence networks for balanced Y connected load with neutral grounded through impedance Z_n and show also that current through neutral impedance is three times the zero sequence current. [8]

   b) For an unloaded 3-phase, ABC phase sequence, synchronous generator, starting from the boundary condition draw and justify the interconnection of sequence networks if a L-G fault occurs in phase B. [8]

4. a) A 3-phase generator rated 15 MVA, 13.2 kV has a solidly grounded neutral. Its positive, negative and zero sequence reactance are 40%, 30% and 5% respectively. [6]

   i) Find the value of reactance to be connected in neutral circuit so that fault current for a single line to ground fault (of negligible fault impedance) at No-load does not exceed line current.

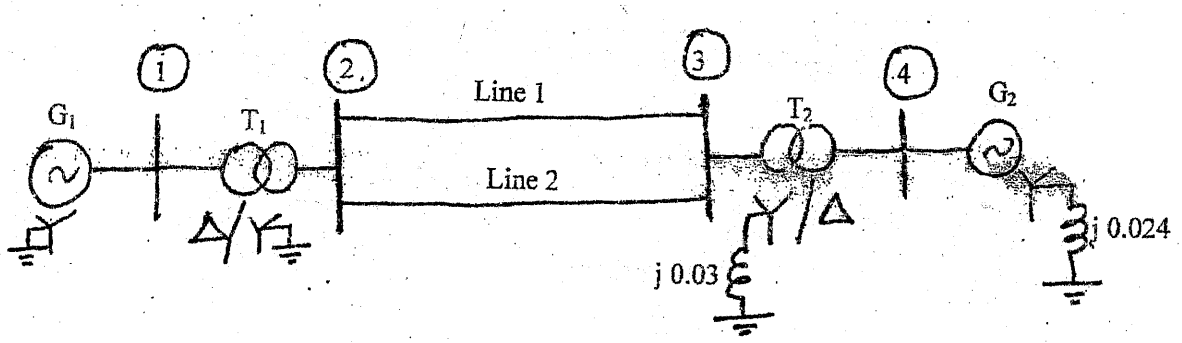
   b) Figure below shows the power system network. [10]

   i) Draw positive, negative and zero sequence networks
   ii) Determine fault current in kA if line to line fault occurs at Bus 3.

System Data:

Equipment	MVA rating	Voltage rating	X_1 pu	X_2 pu	X_0 pu
Generator, G_1	50	11 kV	0.2	0.2	0.05
Generator, G_2	50	11 kV	0.15	0.15	0.03
Transformer, T_1	50	11/220 kV	0.1	0.1	0.1
Transformer, T_2	50	11/220 kV	0.075	0.075	0.075
Line-1	50	220 kV	0.12	0.12	0.42
Line-2	50	220 kV	0.12	0.12	0.42

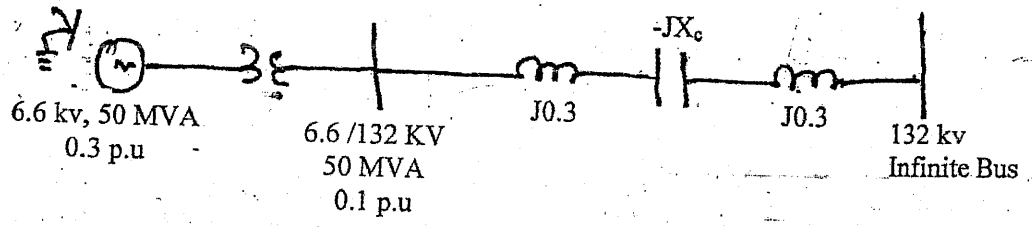
The pre-fault voltage at Bus -3 is 0.95 p.u at common base of G_1.



5. a) What do you mean by rotor angle? Derive the swing equation for a single synchronous generator connected to infinite bus. [6]

   b) Explain the Equal area criterion to study the transient stability of single machine system connected to infinite bus with proper mathematical aids and diagram. [6]

   c) For a synchronous generator connected to infinite bus as shown in figure below. Compute the value of series capacitor so that the power angle at steady state could be limited to 30° for generator supplying power of 1 p.u. [6]



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25 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2072 Chaitra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BEL	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: - Power System Analysis II *(EE605)*

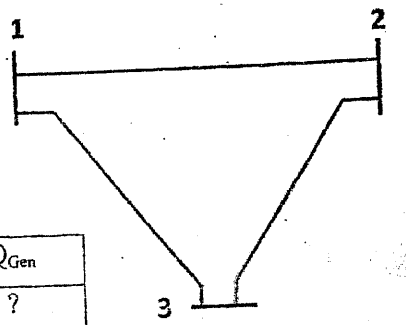
- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt <u>All</u> questions.*
- ✓ *The figures in the margin indicate <u>Full Marks</u>.*
- ✓ *Assume suitable data if necessary.*

1. a) List out the advantages of interconnected power system over isolated power system. Explain how real power and frequency balance is maintained in an interconnected power system. [6]

   b) With the help of suitable 3-Bus Power System Network, deduce the expression for Y-Bus Matrix elements. Also discuss how the consideration of line shunt parameter affects the Y-Bus Matrix elements. [8]

2. a) Taking suitable power system network, develop the algorithm for Gauss-Siedel technique for load analysis considering all three types of buses and generator reactive power limitation into account. [8]

   b) A three bus power system network in figure below. The bus admittance matrix (Y_{Bus}) of the system in per unit is; [8]



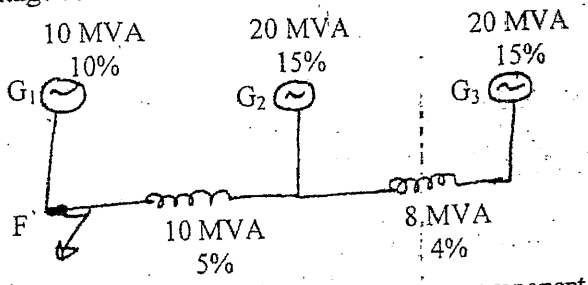
$$Y_{Bus} = \begin{bmatrix} 4-j12 & -2+j6 & -2+j6 \\ -2+j6 & 4-j12 & -2+j6 \\ -2+j6 & -2+j6 & 4-j12 \end{bmatrix}$$

The power and bus voltages in per unit are as follows;

Bus No.	P_{Load}	Q_{Load}	P_{Gen}	Q_{Gen}
1	0	0	?	?
2	0.7	0.5	0	0
3	0.6	0.3	0	0

The load flow analysis results are: $V_1 = 1\angle 0^0, V_2 = 0.9\angle -10^0, V_3 = 0.95\angle -5^0$. Compute the network real and reactive power losses.

3. a) An interconnected generator reactor system has been shown in figure below. The base values for the given % reactance are the rating of individual pieces of equipments. Determine the fault current and fault MVA for a 3-phase short circuit fault at F. Assume bus bar voltage as 11 kV. [10]

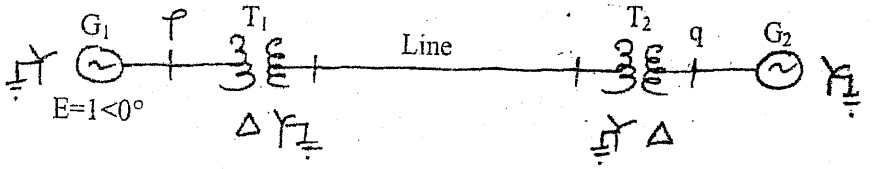


   b) Justify that in a delta connected system the zero sequence component of line currents are always zero. [6]

4. Calculate the fault currents in each phase for the system shown in figure below if (i) L-G (ii) L-L (iii) L-L-G fault occurs at (q) bus. Neglect the fault impedances. [16]

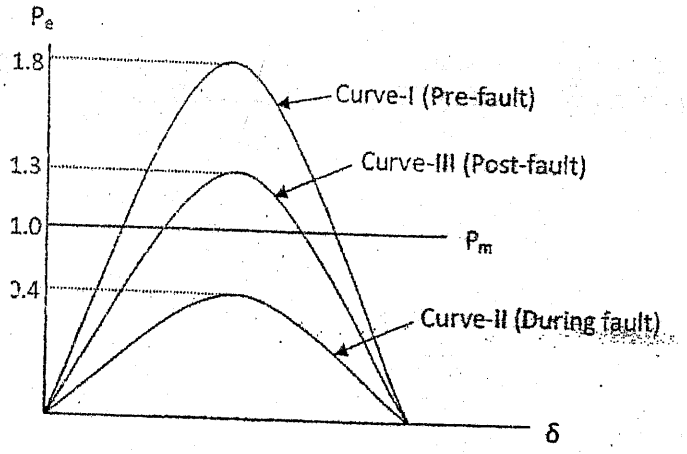
Data for equipments are (in p.u.):

G_1: X_d'' = j0.16, X_2= j0.17, X_1= j0.06	G_2: X_d'' =j0.2, X_2=j0.22, X_1=j0.15
T_1: $X_1=X_2=X_0$=j0.1	T_2: $X_1=X_2=X_0$=j0.1
Line: $X_1=X_2$=j0.11, X_0=j0.33	



5. a) Discuss the transient stability enhancement Techniques in a power system. [6]

b) A generator is operating at rated voltage and is connected to infinite bus at 50 Hz with power transfer of 1.0 pu. A three-phase fault occurs and it is cleared after some time. Power angle (P_e-δ) curves for the pre-fault condition, during fault and after the fault is cleared is shown in figure below. Use equal area criterion to check whether the system is stable or not. If the system is stable, determine critical clearing angle. [12]



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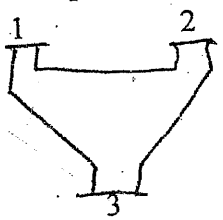
25 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2072 Kartik

Exam.	New Back (2066 & Later Batch)		
Level	BE	Full Marks	80
Programme	BEL	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: - Power System Analysis II *(EE605)*

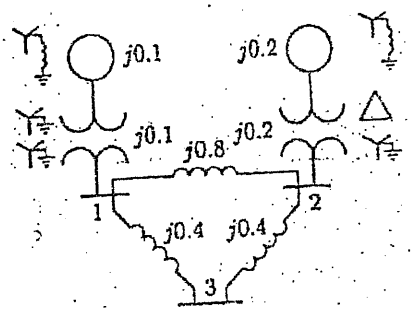
- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. a) Explain how reactive power and voltage balance is maintained in a power system. [5]
   b) What is a bus admittance matrix? Define its elements. [5]
2. a) What do you mean by decoupled load flow equations? List the assumptions to be made in Fast Decoupled load flow method. [6]
   b) In a 3-bus power system the series impedance and shunt admittance of each line are (0.015+j0.12) p.u. and (j0.02) p.u. respectively. Form Y bus and compute the magnitude and phase angles of voltage at bus 2 and 3 after 2nd iteration using G-S method. The data given below are in p.u. [10]



Bus	P_G	Q_G	P_U	Q_U	Bus voltage
1	-	-	-	-	$1.03\angle 0°$
2	1.5	-	0	0	1.03
3	0	-	1.2	0.5	-

3. a) What is the purpose of fault analysis in electric power system? What types of fault occur in a power system network? [4]
   b) A 3-phase symmetrical fault occurs at bus 3 in the given power system network. Determine the fault current. Per unit values of reactance are based on 100MVA base. [4]



4. a) Derive the expression to calculate symmetrical components of 3-phase un-balance currents. [5]

b) A 3 phase system has following voltage and currents: [5]

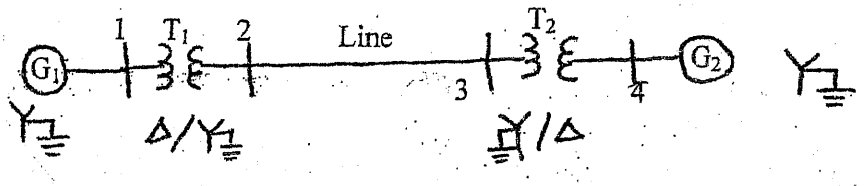
$V_a = 220V\angle 0°, V_b = 120V\angle -120°, V_c = 300V\angle -240°$

$I_a = 10A\angle -10°, I_b = 5A\angle -100°, I_c = 15A\angle -200°$

Calculate sequence voltages, currents and powers.

5. a) Starting from a suitable point, show that the three sequence networks are connected in series during a SLG fault in a 3-phase power system network. [6]

b) For the given power system network, draw sequence networks for DLG fault at bus no 2 and determine the fault current, short circuit MVA. [10]



G_1 :100mVA,15.75KV, $X_1 = X_2 = 0.15pu, X_0 = 0.05pu$

G_2 :100mVA,15.75KV, $X_1 = X_2 = 0.2pu, X_0 = 0.1pu$

$T_1 = T_2$:100mVA,15.75/138KV, $X_1 = X_2 = X_0 = 0.1pu$

Line : $X_1 = X_2 = 25\Omega, X_0 = 70\Omega$

6. a) What is the significance of H constant in stability of a synchronous machine? [4]

b) How Equal Area Criteria can be used to evaluate transient stability of a synchronous machine. [8]

c) A synchronous machine is connected to an infinite bus and the following condition exists during normal operation and the following relationship is valid during that period: [8]

$P_e = 2.1\sin\delta$

$P_m = 1.0pu$

Following a three phase symmetrical fault at the bus of synchronous generator, and fault is cleared at $\delta = 30°$. Check the stability. Calculate the maximum fault cleaning angle so as to maintain synchronism.

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25 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2071 Chaitra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BEL	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: - Power System Analysis II *(EE605)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt <u>All</u> questions.*
- ✓ *The figures in the margin indicate <u>Full Marks</u>.*
- ✓ *Assume suitable data if necessary.*

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1.a) For a 3-bus network, the bus admittance matrix is given as follows (5)

$$Y_{bus} = \begin{bmatrix} -j30 & j12 & j18 \\ j12 & -j25 & j13 \\ j18 & j13 & -j31 \end{bmatrix}$$ **pu, determine the respective branch impedances.**

b) What will be the impact of mismatch in active and reactive power balance in an interconnected power system? Briefly describe the mechanism, which leads to this phenomenon. (5)

2. a) What do you mean by load flow studies and list down their applications in electric power system. (3)

b) What is the basis for development of decoupled load flow method and what are the advantages gained from decoupling? (3)

c) The following bus and line data are available for a power system, determine the line flows by Gauss Seidel method using voltages obtained after 1 iteration. Consider flat voltage start for all the load buses. (10)

Bus data:

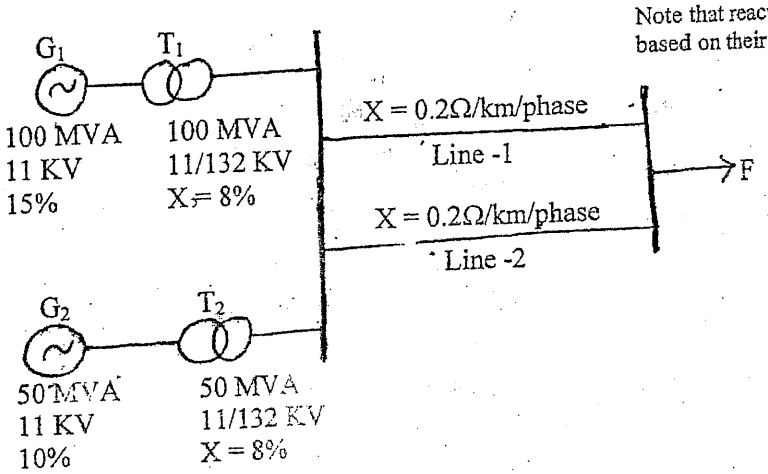
Bus No	P_G, pu	Q_G, pu	P_L, pu	Q_L, pu	|V|, pu	δ, degree
1	-	-	-	-	1.02	0
2	-	-	0.8	0.4	-	-
3	-	-	1.0	0.6	-	-

Line data:

Line	Series admittance, pu
1-2	0.01+j0.05
2-3	0.007+j0.037
3-1	0.012+j0.064

3. Figure below shows power system fed by two generators. The rating and reactances of the equipments are shown. A 3-phase balanced short circuit fault occurs at the receiving end bus of 132 kV. Find (a) Fault level and fault current at receving end (b) Fault current supplied by generators G_1 and G_2. (8)

Note that reactance of machines are based on their own rating.



4.a)A 3-phase supply system has following voltages $V_A=220\angle 120^0 V$, $V_B=120\angle 30^0$ V and $V_C=240\angle 210^0 V$ and the currents are $I_A=10\angle 150^0 A$, $I_B=5\angle 0^0 A$ and $I_C=15\angle 180^0 A$. Determine sequence currents, voltages and powers. (5)

b) How do the different vector groups of transformer affect the fault current in the power system network? (5)

5 .a) In a power system network shown in figure below, single line to ground (SLG) fault occurs at bus 3. (10)

i. Draw the positive, negative and zero sequence networks;

ii. Determine phase currents in per units and amperes;

iii. Phase voltages in per units and kilovolts.

Specifications of the equipments are as under:

G_1: 100 MVA, 13.8 kV, $X_1=X_2=15\%$ and $X_0=5\%$

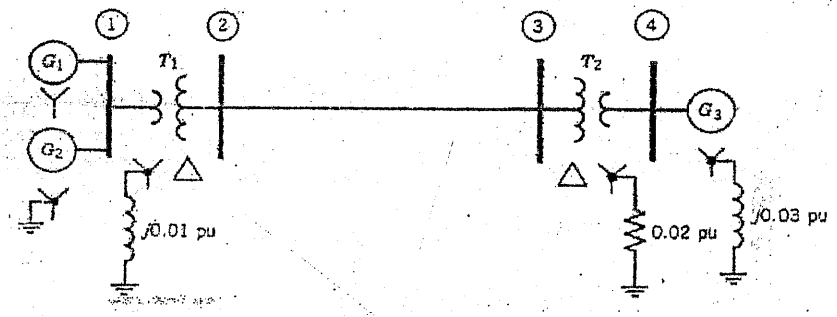
G_2: 100 MVA, 13.8 kV, $X_1=X_2=15\%$ and $X_0=5\%$

G_3: 100 MVA, 13.8 kV, $X_1=X_2=15\%$ and $X_0=5\%$

T_1: 100 MVA, 13.8/115 kV, $X_1=X_2= X_0=20\%$

T_2: 100 MVA, 115/13.8 kV, $X_1=X_2= X_0=18\%$

Line: 100 MVA, 115 kV, $X_1=X_2=30\%$ and $X_0=90\%$



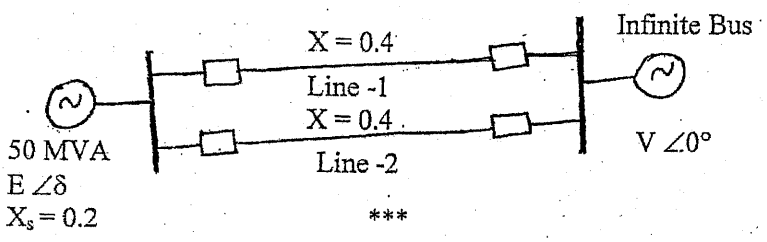
b) Show that positive and negative sequence currents are equal in magnitude but out of phase by 180° in a line to line fault on a power system network. Draw a diagram showing inter-connection of sequence networks for this type of fault. (6)

6.a) What do you mean by steady state and transient stability and their limits in a power system? Describe the factors affecting the transient stability of a power system. (8)

b) For the system shown in figure, the numerical values for different quantities are: E=1.04 pu, V= 1 pu, X_S= 0.2 pu, and reactances of each line is 0.4 pu. The generator is delivering a power of 1.2 pu to the infinite bus. If a 3-phase short circuit fault occurs at the mid point of one the transmission lines, perform the following: (12)

a) If the fault is cleared (swithing out of the faulted line) when power angle is 60^0, check whether the stable or not;

b) Determine the critical clearing angle.



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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division

2080 Bhadra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BEL,BEX,BCT BAG, BCH	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: - Probability and Statistics *(SH 602)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ ***Necessary tables are attached herewith.***
- ✓ *Assume suitable data if necessary.*

1. Describe the difference between mean, median and mode with suitable examples. The arithmetic mean and standard deviation of 100 items was 40 and 5. Later on, it was found that an item 53 was misread as 83. Find the correct mean and standard deviation. [3+3]
2. State Baye's Theorem. If there are three machines producing chips, first machine produce 2000, second machine produce 3000 and third machine produce 5000 chips per day. Past experience showed that they produce 95%, 97% and 99% non-defective chips. If a randomly chosen chips is found to be non-defective, what is the probability that it comes from [6]
   (i) First Machine
   (ii) Second machine
   (iii) Third machine
3. Define and compare Binomial and Negative Binomial distribution with similarity and differences. [5]
4. For the case of the thin copper wire, suppose that the number of flaws follows a Poisson distribution with a mean of 2.3 flaws per millimeter. Determine the probability of (i) Exactly 2 flaws in 1 millimeter of wire;(ii) At least 2 flaws in 1 millimeter of wire; (iii) At most 2 flaws in 1 millimeter of wire. [5]
5. A continuous random variable X has probability density function defined as follows. [5]

$$f(x) = \begin{cases} k\ e^{-\frac{9}{2}x} \text{ for } 0 \le x < \infty \\ 0, \text{Otherwise} \end{cases}$$

   (i) Find the value of constant k.

   (ii)Mean and the distribution function of X.
6. An industrial engineer has found that the standard household light bulbs produced by a certain manufacturer have a useful life that is normally distributed with a mean of 250 hours and variance of 2500. What is the probability that a randomly selected bulb from this production process will have a useful life (i) In excess of 300 hours (ii) Between 190 and 270 hours (iii) Not exceeding 260 hours? [5]
7. A population consists of four numbers 5, 9, 13, 17. [5]
   a) Write down all possible sample of size two without replacement.
   b) Verify that the sample mean is unbiased estimator of population mean.
   c) Calculate the standard error of sample mean.
8. If the resistance of resistors provided by a supplier follow Normal distribution with mean 23 Ohm and standard deviation of 5 Ohm. In a random sample of 40 such resistors, find the probability that the mean resistance of these sample is [5]

   (i) More than 26 Ohm

   (ii) Between 23.8 to 25.6 Ohm

   (ii) Less than 23.4 Ohm

9. A random sample of 12 records gives the average of 163.99 minutes with standard deviation of 3.043 minutes. Find the 95% confidence limits for population mean if population consists of 100 units. [5]

10. The following data are coded observations on the yield of a chemical process using 3 batches of raw material selected randomly:

Batch:	Yield					
I	9.7	5.6	8.4	7.9	8.2	7.7
II	10.4	9.6	7.3	6.8	8.8	9.2
III	15.9	14.4	8.3	12.8	7.9	11.6

Construct ANOVA table and test for the equality of the average yields of three batches of raw materials at a = 5%. [5]

11. In an experiment to study the dependence of hypertension on smoking habits, the following data were taken on 180 individuals:

	Nonsmokers	Moderate smokers	Heavy smokers
Hypertension	21	36	30
No hypertension	48	26	19

Test the hypothesis that the presence or absence of hypertension is independent of smoking habits. Use a 0.05 level of significance. [5]

12. Write down the fundamental steps of test of significance of difference of proportion of success for large samples. [5]

13. A study was done on a diesel-powered-light-duty pickup truck to see it humidity. Measurements were taken at different times with varying experimental conditions. The data are as follows: [5]

Nitrous oxide (Y)	0.90	0.91	0.96	0.89	1.00	1.10	1.15	1.03	0.77	1.07
Humidity (X)	72.4	41.6	34.3	35.1	10.7	12.9	8.3	20.1	72.2	24.0

a) Fit a straight line to the given data by the method of least squares and use it to predict the estimated amount of nitrous oxide for 50% humidity.

b) Find 95% confidence interval for slope of line β.

14. Define Karl Pearson Correlation coefficient and write down the basic properties of it. Also define and interprete the coefficient of determination. [5]

15. From the following records of randomly chosen day of a departmental store in millions of rupees. Use scientific calculator to compute the required sums. Also compute following measures by using the suitable statistical formulae. [8]

Sales	75	96	80	72	93	71	86	72	79
	98	77	84	70	96	85	84	94	71
	89	92	76	88	78	83	96	87	71
	66	97	76	64	77	89	73	75	85
	82	81	85	90	87	59	93	67	64
	94	77	66	62	92	56	58	82	75

(i) Sample mean and sample standard deviation.

(ii) Test the consistency of the sales.

(iii) Also find the 95% confidence limit of sales.

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division

2081 Baishakh

Exam.	Back		
Level	BE	Full Marks	80
Programme	BEL BEX, BCT, BAG, BCH	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: - Probability and Statistics *(SH 602)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ ***Necessary tables are attached herewith.***
- ✓ *Assume suitable data if necessary.*

1. What are the merits and demerits of arithmetic mean? Compute the five numbers summary of the following information and prepare the Box and Whisker diagram: 34,42,66,40,59,36,41,35,36,62,43,30,43,32,44,58,53,50,48 and 38. [2+4]
2. Describe addition and multiplication law of probability. A problem in statistics is given to three students A, B and C whose chance of solving it are 1/3,1/4 and 1/5 respectively. Find the probability that [3+3]
   (i) The problem will be solved.
   (ii) Only one of them can solve the problem.
   (iii) None of them will solve the problem.
3. Define Poisson distribution with example. Discuss the properties of Poisson distribution. [3+2]
4. From the past record, there is small chance of 1 in 500 will die due to certain disease? If 200 patients were admitted in a certain Hospital. Use suitable probability distribution to calculate the probability that [5]
   (i) No one will die from the disease.
   (ii) Exactly one patient will die.
   (iii) At least two of them will die.
5. In a certain city the daily consumption of water (in millions of gallons) follows approximately a gamma distribution with $\alpha = 2$ and $\beta = 3$. If the daily capacity of this city is 9 million gallons of water, show that the probability that on any given day the water supply is inadequate is 4. [5]
6. The breakdown voltage x of randomly chosen diode of a particular type is known to be normally distributed with mean 40 and standard deviation 1.5 volts. What is the probability that the breakdown voltage will be [5]
   (i) Between 39 and 42 voltage.
   (ii) At most 43 volts.
   (iii) At least 39 volts.
7. From the population of size 5 as:22, 23, 24, 25 and 26. [5]
   a) List out all the samples of size three without replacement.
   b) Find the sample proportion of even number.
   c) Prove that, sample proportion is unbiased estimator proportion of even number. $E(p) = P$.
   d) Also find the standard error of sample proportion of even number.
8. The time at the counter for a customer to be served at a post office can be modeled as a random variable having mean 176 seconds and variance 256. The sample mean will be obtained from the times for a random sample of 100 customers. What is the probability that sample mean will be (i) Less than 177 seconds; (ii) Between 175 and 178 seconds? (iii) More than 178 seconds. [5]
9. Describe the procedure of test of significance between two means for small samples. [5]

10. Four salesmen were posted in different areas by a company. The numbers of units of computer hard disk sold by them are as follows. [5]

Salesmen	Sales units					
A	20	23	28	29	-	-
B	25	32	30	21	29	-
C	23	28	35	18	26	28
D	15	21	19	25	32	30

Is there a significance difference in the performance of salesmen?

11. From a lot of units produced by machine A, a sample of 500 is drawn and tested for a quality characteristics. It is found that 16 units are not meeting the specification. Another samples of size 100 is drawn from the lot of similar units produced by machine B and tested. In this case, only 3 units are found to be not meeting the specification. Test at 1% level of significance, whether there are in any significant difference of the proportions of defective units produced by the two machines. [5]

12. In a recent survey 1,072 Engineers were classified according to their intelligence (GPA in Bachelor) and economic conditions after graduation. Test whether there is any association between intelligence and economic condition. [5]

Economic condition after graduation	Intelligence in BE			
	Excellent	Good	Mediocre	Dull
Good	48	199	181	82
Not good	81	185	190	106

13. A sample of 10 values of three variance X_1,X_2 and X_3 were obtained as [5]

$\Sigma X_1=10$	$\Sigma X_1=20$	$\Sigma X_1=30$	$\Sigma X_1^2=20$	$\Sigma X_2^2=20$	$\Sigma X_3^2=20$
N=6	$\Sigma X_1\Sigma X_2=10$	$\Sigma X_1\Sigma X_3=15$	$\Sigma X_1\Sigma X_3=64$	-	-

Find (i) Partial correlation between X_1 and X_3 eliminating effect of X_2.

(ii) Multiple correction between X_1, X_2 and X_3 assuming X_1 as dependent.

14. Compute the regression Line dependent variable Y on the independent variable X. Also estimate the probable value of Y if the given value of X is equal to 26. [5]

X	18	10	9	10	21	12	21	9
Y	38	34	29	48	24	29	28	49

15. A study was done on a diesel powered light duty pickup truck to see if temperature influences emission of nitrous oxide. Emission measurement were taken at different times, with varying experimental conditions. The data are as follows: [8]

Temperature X	Nitrous oxideY
76.3	0.90
70.3	0.91
77.1	0.96
68.0	0.89
79.0	1.00
67.4	1.10
66.8	1.15
76.9	1.03
77.7	0.77
67.7	1.07
76.8	1.07
86.6	0.94
76.9	1.10
86.3	1.10
86.0	1.10
76.3	0.91
77.9	0.87
78.7	0.78
86.6	0.82
70.9	0.95

(i) Find the mean and variance of the given data.
(ii) Find the degree of relationship between them.
(iii) Calculate the coefficient of the determination and interpret the given data.

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division

2080 Baishakh

Exam.	Back		
Level	BE	Full Marks	80
Programme	BEL, BEX, BCT, BAG, BCH	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: - Probability and Statistics *(SH 602)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ ***Necessary tables are attached herewith.***
- ✓ *Assume suitable data if necessary.*

1. Compute the Five Number summary of the following information and prepare the Box and Whisker diagram: 34, 42, 66, 40, 59, 36, 41, 35, 36, 62, 43,30,43, 32, 44, 58, 53, 50, 48 and 38. Interpret the diagram. [6]
2. Define mutually exclusive and independent events. In a bolt factory, machines A, B and C manufacture respectively 25%, 35% and 40% of the total production, Among their total output, 95%, 94% and 92% are found to be of good quality bolts. A bolt is draws from the total product and is found to be good quality. What is the probability that (i) it was manufactured by A? (ii) it was manufactured by B? [6]
3. What are the difference and similarities between Binomial and Hyper-geometric probability distribution? [5]
4. During a laboratory experiment , the average number of radio active particles passing through a counter in milliseconds is 4. What is the probability that [5]

   a) 6 particles enter the counter.

   b) What is the probability that more than 2 particles enter the counter in given milliseconds.
5. A continuous random variable X has probability density function defined as follows. [5]

$$f(x) = \begin{cases} k\sqrt{x} & \text{for } 0 < x < 1 \\ 0, & \text{Otherwise} \end{cases}$$

   a) Find the value of constant k.
   b) Mean and the distribution function of X.
6. The breakdown voltage X of a randomly chosen diode of a particular type is known to be normally distributed with mean 40 volts and standard deviation of 1.5 volts. [5]

   a) What is the probability that the break down voltage will be between 40 and 42 volts?

   b) What is the probability that the break down voltage will be less than 43 volts?
7. Write the difference between statistic and parameter. Define central limit theorem and discuss its importance in engineering field. [5]
8. Define parameter and sample statistics. From the population of size 5 as: 22,23,24,25 and 26.

   a) List out all the samples of size three without replacement.

   b) Find the average of each sample.

   c) Prove that the average of sample mean is equal to the population mean.

   d) Also find the standard error of sample mean. [5]

9. The following were obtained in experiment designed to check whether there is a systematic difference in the weights obtained with two different scales. Test at the 5% level of significance whether the difference of the means of the weights obtained with the two scales is significant. [5]

Rock specimen		I	II	III	IV	V	VI	VII	VIII	IX	X
wt.(gram)	Scale-I	11.23	14.36	8.33	10.50	23.42	9.15	13.47	6.47	12.40	19.38
	Scale-II	11.27	14.41	8.35	10.52	23.41	9.17	13.52	6.46	12.45	19.35

10. The following table shows the lives in hours of four batches of electric lamps. [5]

Batches	Lives of electric lamps				
1	1600	1610	1650	1680	1700
2	1580	1640	1640	1700	1750
3	1460	1550	1600	1620	1640

Perform the suitable inferential statistics to test whether the different batches of light bulbs have same mean or not at 5% level of significant.

11. Bricks made in four kilns have been graded as high quality, average quality and poor quality. The production of bricks (000 unit) in a particular period was as follows. Test whether Kiln and quality of bricks are independent or not at 1% level of significance. [5]

Kiln	Quality of brick		
	High	average	poor
A	24	43	13
B	47	123	34
C	58	98	64

12. Describing the types of errors in hypothesis testing. Write down the steps for testing hypothesis of population proportion for a large sample size. [5]

13. A family income (Rs'0000) and expenditure (RS'000) survey result the following data.

Expenditure on food	5	7	8	9	11
Annul income	25	40	30	50	25
Family Size	3	2	4	5	1

a) Develop a regression model to estimate the expenditure on food based on the annual income of family and the family size.

b) Estimate the expenditure on food of a family with annual income Rs 50,000 and having 4 family members. [5]

14. The level of pollution because of vehicular emissions in Pokhara City is not regulated. Measurements by the local government of the change in flow of vehicles and the change in the level of air pollution (both in percentages) on 12 days yielded the following results:

Change in flow of vehicles (x)	28	36	15	19	24	18	25	40	63	12	16	21
Change in level of air pollution (y)	22	26	15	18	21	17	21	31	52	8	17	20

a) Make a scatter plot for the given result.

b) Fit a straight line by the method of least squares.

c) Find the change in the level of air pollution when the change in the flow of vehicles is 30%. [5]

15. As part of a study monitoring acid rain, measurements of sulfate deposits(kg/hectare) are recorded for different locations on the Eastern Terai of Nepal. The results are listed in the following table for 12 recent and consecutive years. [8]

Acid Rain: Sulfate Deposited (kg/Hectare)

Year	Location I (P)	Location II (Q)	Location III (R)
1	11.94	13.09	7.96
2	11.28	10.88	12.84
3	10.38	12.19	7.38
4	8.00	10.75	7.26
5	12.12	17.21	10.12
6	13.52	11.61	9.02
7	10.55	10.53	7.78
8	9.81	12.50	8.70
9	11.27	9.94	10.50
10	11.68	9.71	15.59
11	11.77	9.37	10.54
12	17.29	13.87	13.64

Find sample mean, sample standard deviation and coefficient of variation for sulfate deposits of each location. Give your conclusion about variability and uniformity from the analysis.

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division

2079 Bhadra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BEL, BEX, BCT, BAG, BCH	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: - Probability and Statistics *(SH 602)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ ***Necessary tables are attached herewith.***
- ✓ *Assume suitable data if necessary.*

1. Define five number summaries of data. Prepare the box-plot for the following data of daily registration of workers in the construction site. 34, 42, 66, 40, 59, 36, 41, 35, 36, 62, 43, 30, 43, 32, 44, 58, 53, 50, 48 and 38. [6]

2. State Bayes' Theorem. In a bolt factory, machines A, B and C manufacture respectively 25%, 35% and 40% of the total population. Among their total output, 5%, 4% and 2% are found to be defective bolts. If a bolt drawn from the total product is found to be defective,
   a) What is the probability that it was manufactured by A?
   b) What is the probability that it was manufactured by B?
   c) What is the probability that it was manufactured by C?
   d) Which machine seems most likely to produce the defective bolts? [6]

3. Discuss the poisson distribution as limit care of binomial distribution. In a certain factory turning out razor blades there is a small chance 1/500 for any blade to be defective. The blades are supplied in packets of 50. Use suitable probability distribution to calculate the approximate number of packets containing in of 10,000 packets. [5]
   a) no defective b) One defective and c) Two defective

4. What are the parameters used in Poisson distribution? A manufacturer of pins knows that on the average 3 on 100 of its production is defective. He sells pins in boxes of 100 and guarantees that not more than 2 pins will be defective. What is the probability that a box selected at random (i) will meet the guaranteed quality? (ii) will not meet the guaranteed quality? [5]

5. Define the normal distribution and standard normal distribution. Under what condition binomial distribution follows normal distribution. [5]

6. Describe the conditions for the probability density function. The length of time (in minutes) that a certain lady speaks on the telephone is found to be random phenomenon, with a probability function specified by the probability density function f(x) as

$$f(x)=\begin{cases} Ae^{-x/5} & \text{for } x \geq 0 \\ 0 & \text{elsewhere} \end{cases}$$

   Find value of A. What is the probability that the number of minutes that she will take over the phone is
   a) more than 10 minutes b) less than 5 minutes and
   c) between 5 and 10 minutes. [5]

7. A population of the four numbers 5, 6, 9, 12.
   a) Write down all possible sample size of two without replacement.
   b) Verify population mean is equal to the mean of sample mean.
   c) Calculate the standard error of the sample distribution of sample mean. [5]

8. State Central Limit Theorem and write any two applications of it. The lifetime of a certain brand of an electric bulb may be considered a random variable with mean 1200 hours and standard deviation 250 hours. find the probability that average lifetime of 60 bulbs
   a) exceed 1400 hours b) is between 1100 hours and 1300 hours
   c) is less than 1100 hours [5]

9. The following are the average weekly losses of worker-hours due to accidents in 10 industrial plants before and after a certain safety program was put into operation:

Before	45	73	46	124	33	57	83	34	26	17
After	36	60	44	119	35	51	77	29	24	11

Use $\alpha = 0.05$ to test whether the safety program is effective. [5]

10. From a random sample of 60 buses, Montreal's mass-transit office has calculated the mean number of passengers per km to be 4.1. From previous studies, the population standard deviation is known to be 1.2 passengers per km.
    a) Find the standard error of the mean. (Assume that the bus fleet is very large.) [5]
    b) Construct a 95 percent confidence interval for the mean number of passengers per Km for the population.

11. The information obtained during rapid assessment after earthquake about damage grade with respect to structure of building. Test whether there exist any association between damage grade with structure of building at 10% level of significant. [χ^2 value of 6 d.f = 12.592]

Damage Grade	Structure of Building		
	Frame	Masonry	Mixed
D1	303	345	11
D2	37	389	22
D3	14	875	310
D4	5	1083	13

Write down the steps involved in the hypothesis testing of difference of mean when both the sample are small. [5]

12. Rick Douglas, the new manager of food Barn, is interested in the percentage of customers who are totally satisfied with the store. The previous manager had 86 percent of the customers totally satisfied and Rick claims the same is true today. Rick sampled 187 customers and found 157 were totally satisfied. At the 5 percent significance level, is there evidence that Rick's claim is valid? [5]

13. The study was done to study the ambient temperature on the electric power consumed by a chemical plant. Following table represent the data which are collected from an experimental pilot plant.

Temperature (F)	27	45	72	58	31	60	34	74
Electric power (BTU)	250	285	320	295	265	298	267	321

Fit a simple regression line, assuming that the relationship between them is linear. Also, predict the power consumption for an ambient temperature of 65°F. [5]

14. Define Karl Pearson Correlation coefficient and its coefficient of determination and write down the basic properties of it. [5]

15. Following data revels the 27 sample of paired data (X, Y) measured in the suitable units. Use scientific calculator to compute the required sums. Also compute following measures by using the suitable statistical formulae. [8]

X	75	96	80	72	93	71	86	72	79
	98	77	84	70	96	85	84	94	71
	89	92	76	88	78	83	96	87	71
Y	166	197	176	164	177	189	173	175	185
	182	181	185	190	187	159	193	167	164
	194	177	166	162	192	156	158	182	175

a) Sample Average of both variables X and Y.
b) Sample standard deviation of both the variables X and Y
c) Which series is more uniformity as regard to the variability of the data?

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2079 Baishakh

Exam.	Back		
Level	BE	Full Marks	80
Programme	BEL, BEX, BCT, BAG	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: - Probability and Statistics (*SH 602*)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ ***Necessary tables are attached herewith.***
- ✓ *Assume suitable data if necessary.*

1. What is disparsion? Explain what do you understand by absolute and relative measures of dipersion. The marks distribution of 100 students of a college is as follows: [6]

Marks	10-20	20-40	40-70	70-90	90-100
No of students	15	20	30	20	15

Find the mean, median and standard deviation on of given distribution.

2. By examining the chest x-ray, the probability that T.B is detected when a person is actually suffering from it is 0.99. The probability that the doctor diagnoses incorrectly that a person has TB, on the basis of the x-ray is 0.001. In a certain city, 1 in 10000 persons suffer from TB. A person selected at random is diagnosed to have TB. What is the probability that person has actually TB? [6]

3. Define hypergeometric distribution with an example. Describe the conditions for the binomial approximation to hypergeometric distribution. [2+3]

4. An instructor of a statistics class is planning to interview a sample of n = 10 students who are randomly selected from the class. The class has a total 30 students, consisting of 20 male and female students. [5]
   i) Determine the probability mass function of the number of female students in the sample.
   ii) Find the probability that at least students is in sample.
   iii) Find mean and variance for female students.

5. Define standard normal distribution. Give the condition for normal approximation to binomial distribution. [2+3]

6. Time taken to boot a computer is a continuous random variable x having pdf: [5]

$$f(x) = \begin{cases} = k\,x(1-x), & 0 < x 1 \\ = 0, & \text{otherwise} \end{cases}$$

   Find i) E(x)
   ii) $P(0.25 < x < 0.5)$

7. Define parameter and statistic with examples. Explain the central limit theorem. [5]

8. A population consists of the four numbers 5, 6, 9, 12. [5]
   i) Write down all possible sample size of two without replacement.
   ii) Verify that the population mean is equal to the mean of the sample mean.
   iii) Calculate the standard error of the sampling distribution of the sample mean.

9. What assumptions are of paired t-test? Write the process of paired t-test. [5]

10. Four brands of flashlight batteries are to be compared by testing each brand in five flashlights. Twenty flashlights are randomly selected and divided randomly into four groups of five flashlights each. Then each group of flashlights uses a different brand of battery. The lifetimes of the batteries, to the nearest hour, are as follows; [5]

Brand A	Brand B	Brand C
42	36	28
28	36	38
24	32	28
20	39	32
30	31	28

At the 5% significance level, does there appear to be a significance difference in mean lifetime among the four brands of batteries.

11. Define type I and II error. A manufacturer claimed that at least 95% of the pumps supplied to the ABC Company confirmed to specifications. However, the production manager at ABC Company wasn't satisfied with the claim of the manufacturer. Hence, to test the claim, the manager examined a sample of 250 pumps supplied last month and found that 228 pumps as per the specifications. Can you conclude that the production manager is right to doubt on the claim of the manufacturer? ($\alpha = 0.01$) [5]

12. Describe the hypothesis testing procedure of Chi-square test of independent for 2×2 table. [5]

13. A computer operator is interested to know data rate of internet users dependents upon the band width, the following result were gathered by the operator: [5]

Band Width	17	35	41	19	25	20	10	15
Data rate	47	64	68	50	60	55	30	33

i) Is there any association between band width and data rate?
ii) Fit the regression model to describe the given data and also interpret the estimated regression coefficient.
iii) Compute the band width when data rate is 62.

14. Define correlation and regression with examples. Write down the properties of correlation coefficient. [5]

15. Randomly sampled 60 TU graduated BEs, half of whom majored in civil Engineering and half in Computer Engineering. From each, the highest salary offer (including benefits) is stated in following table:

Salary of Civil Engineering		Salary of Computer Engineering Graduates	
61,228	86,792	68,421	73,361
51,836	75,155	56,276	36,956
20,620	65,948	47,510	63,627
73,356	29,392	58,925	71,069
84,186	96,382	78,704	40,203
79,782	80,644	62,553	97,097
29,523	51,389	81,931	49,442
80,645	61,955	30,867	75,188
76,125	63,573	49,091	59,854
62,531	56,276	48,843	79,816
77,073	47,510	79,782	51,943
86,705	58,925	29,523	35,272
70,286	78,704	80,645	60,631
63,196	62,553	76,125	63,567
64,358	36,956	62,531	69,423

i) Which of these groups shows consistency on the basis of salary offer?
ii) Find standard deviation of difference of average salaries of two groups. [8]

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2078 Kartik

Exam.	Back		
Level	BE	Full Marks	80
Programme	BEL, BEX, BCT, BAG	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: - Probability and Statistics *(SH 602)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ ***Necessary tables are attached herewith.***
- ✓ *Assume suitable data if necessary.*

1. An investor buys Rs. 12000 worth of shares in a company each month. During the 1st five months he bought the shares at a price of Rs.100, 120, 150, 200, 240 per share. After five months, what is average price paid for the shares by him? [6]
2. Define conditional probability. Two sets of candidates are competing for the positions on the Board of Directors of a company. The probability that the first and second sets will win are 0.6 and 0.4 respectively. If the first set wins the probability of introducing a new product is 0.8 and the corresponding probability if the second set win is 0.3. What is the probability that the product will be introduced? [6]
3. What is the difference between Binomial distribution and Poisson distribution? Explain under what condition Poisson distribution approximate to binomial distribution. [5]
4. An office switchboard receives telephone calls at a rate of 3 calls per minute on an average. Find the probability of receiving (a) no calls in one minute interval;
   (b) at least 3 calls in a one minute interval;
   (c) at most 2 calls in a five minute interval [5]
5. A continuous random variable X has following probability density function

$$f(x) = \begin{cases} \frac{3}{4}(1+x^2), & 0 \le x \le 1 \\ 0, & \text{otherwise} \end{cases}$$

   a) Find mean and standard deviation of X
   b) Find $P(-\sigma < X < \sigma)$ [5]
6. Define Normal distribution. Highlight the important properties of Normal Distribution. [5]
7. A population consists of five numbers: 2, 4, 6, 8 and 10. [5]
   a) Write down all possible samples of size two with SWOR.
   b) Calculate mean and the variance of population.
   c) Prove that sample mean is unbiased estimator of population mean.
8. The heights of hilly people of Nepal are normally distributed with a mean of 64 inches and a standard deviation of 2 inches, what is the probability that the mean height of a random sample of 100 hilly people is greater than 66 inches? [5]
9. The mean of a 200 samples of observations from a normal population with a standard deviation 5 cm is 25 cm.
   a) Estimate the population mean with 95% confidence
   b) Estimate the population mean with 95% confidence, changing the population standard deviation to 2.5 cm. [5]

10. Shyam and Co. produces three varieties of products: Deluxe, Fine and Ordinary. A recent market survey is conducted for preference of products. The preference was found as follow:

Product	Preference			
Deluxe	15	14	19	18
Fine	17	12	20	16
Ordinary	16	18	16	17

Is there a significant difference in the preference of products? Use ANOVA test, and $\alpha = 5\%$. [5]

11. Define chi-square distribution. From the following data can you conclude that there is association between the purchase of brand and geographical region? (Use 5% level of significance) [5]

	Region		
	Central	Eastern	Western
Purchase brand	40	55	45
Do not purchase brand	60	45	55

12. Define confidence level. The developer has claimed that at least 98% of the software which he supplied to a company conformed to specifications an examination of samples of 500 software revealed that 30 were defective. Test the claim at a significance level of 0.01. [5]

13. Describe about the correlation coefficients and their properties. Define coefficient of determination and state its use in analysis of data. [5]

14. The following data gives the experience of machine operators in years and their performance as given by the number of good parts turned out per 100 pieces.

Experience (X)	16	12	18	4	3	10	5	12
Performance (Y)	87	88	89	68	78	80	75	83

a) Fit the regression equation of performance ratings on experience and estimate the probable performance if an operator has 8 years experience.
b) Calculate the coefficient of determination and interpret it. [5]

15. As part of a study monitoring acid rain, measurements of sulfate deposits (kg/hectare) are recorded for different locations on the Eastern Terai of Nepal. The results are listed in the following table for 15 recent and consecutive years: [8]

Acid Rain: Sulfate Deposited (kg/hectare)

Year	Location 1 (x)	Location 2 (y)	Location 3 (z)
1	11.94	13.09	7.96
2	11.28	10.88	12.84
3	10.38	12.19	7.38
4	8.00	10.75	7.26
5	12.12	17.21	10.12
6	10.27	10.26	8.89
7	14.80	15.49	11.60
8	13.52	11.61	9.02
9	10.55	10.53	7.78
10	9.81	12.50	8.70
11	11.27	9.94	10.50
12	12.12	11.21	9.95
13	11.68	9.71	15.59
14	11.77	9.37	10.54
15	17.29	13.87	13.64

a) Find sample mean, sample standard deviation and coefficient of variation for Sulfate deposits of each location.
b) Give your conclusion about variability and uniformity from the analysis.

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division

2078 Bhadra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BEL, BEX, BCT, BAG	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

2078/06/22

Subject: - Probability and Statistics *(SH 602)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ ***Necessary tables are attached herewith.***
- ✓ *Assume suitable data if necessary.*

1. The number of minutes that a person had to wait for the bus to work on 13 working days are: 1, 10, 13, 12, 8, 2, 6, 9, 17, 30, 5, 4 and 15
   a) Find the values constituting the 5 – number summary.
   b) Construct a box plot. [6]
2. Worldlink, an internet service provider of Nepal buys, signal routers from three countries. It buys 22% of routers from America, 38% from India and 40% from China. It is found that 3% of routers from America, 4% of routers from India and 5% of routers from China are defective. If a customer buys one of these routers, what is the probability that
   a) It is defective
   b) If the router is defective, it is from China. [6]
3. Compare Binomial and Negative Binomial Distributions. [5]
4. In a busy road of Kathmandu there were 500 vehicles passing from 8 AM to 6 PM. It was found that 2 in 1000 vehicle wrongly entered in a one way. Find the probability that at a particular day from 8 AM to 6 PM, there will be [5]
   a) No vehicle enter in one way
   b) One vehicle enter in one way
   c) At least one vehicle enter in one way
   d) At most 2 vehicle enter in one way
5. Define continuous random variable. Write the importance of Normal distribution with its area property. [5]
6. A random variable X has the probability density function f(x) as

$$f(x)=\begin{cases} kx\, e^{-\frac{x^2}{12}}, x\geq 0 \\ 0, \text{ otherwise} \end{cases}$$

   a) Find the value of k if f(x) is a probability density function.
   b) Find the mean and variance of random variable X. [5]
7. Explain the following terms with suitable example
   a) Parameters
   b) Statistics
   c) Standard error of statistics [5]
8. To illustrate that the mean of a random sample is an unbiased estimate of the mean of the population, consider five slips of paper numbered 3, 6, 9, 12, 15.
   a) List all possible samples of size 3 that can be taken without replacement from this finite population.
   b) Calculate the mean of each of the samples listed in
   c) Verify that the sample mean is an unbiased estimate of the population mean [5]

9. The response time in milliseconds was determined for three different types of circuits in an electronic calculator. The results are shown in the following table.

Circuit Type	Response				
A	19	22	20	18	25
B	20	21	33	27	40
C	16	15	18	26	17

Using $\alpha = 0.01$, test the hypothesis that the three circuit types have the same response time. ($F_{0.01, 2, 12} = 6.93$ $F_{0.01, 3, 12} = 6.70$) [5]

10. Define Hypothesis and Write down the steps involve in the test of significance of difference of mean of large population. [5]

11. Four hundred employees of Nepal Telecom are classified according to their level and decisions. Do you agree with the statement that decisions vary according to level of employee? Test at 5% level of significance. [5]

Decisions	Sr. Officer	Officer	Jr. Officer	Total
Quick	60	80	70	210
Slow	40	60	90	190
Total	100	140	160	400

12. Consider the case of Pharmaceutical Manufacturing Company testing two new compounds intended to reduce blood-pressure level. The compounds are administered two different sets of laboratory animals. In groups A, 71 out of 100 animal tested response to drug first with lower blood-pressure levels. In group B, 58 out of 90 animals tested respond to drug second with lower blood pressure level. The company wants to test at 0.05 levels whether there is a difference between the efficiencies of these two drugs. [5]

13. A sample of 10 values of the variables X1, X2 and X3 were obtained as

$\sum X_1 = 10$	$\sum X_2 = 20$	$\sum X_3 = 30$
$\sum X_1^2 = 20$	$\sum X_2^2 = 68$	$\sum X_3^2 = 170$
$\sum X_1 X_2 = 10$	$\sum X_1 X_3 = 15$	$\sum X_2 X_3 = 64$

Find Partial correlation between X2 and X3 eliminating the effect of X1 also interpret coefficient of partial determination. [5]

14. Fires and Acres Burned. Find the best predicted value of number of acres burned given that there were 80 fires [5]

Fires	73	69	58	48	84	62	57	45
Acres burned	6.2	7.2	1.9	2.7	5.0	1.6	3.0	1.6

15. A semiconductor manufacturer produces devices used as central processing units in personal computers. The speed of the device (in megahertz) is important because it determines the price that the manufacturer can charge for the devices. The following table contains measurements on 48 devices. [8]

717	727	653	637	660	693	679	682	724	642	704	695
704	652	664	702	661	720	695	670	656	718	660	648
683	723	710	680	684	705	681	748	697	703	660	722
662	709	683	705	678	674	656	667	683	691	750	685

Find the

a) Sample mean of the distribution.
b) Sample standard deviation and coefficient of variation.
c) Standard error of sample mean.
d) What percentage of the devices has a speed exceeding 700 megahertz?

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division

2076 Chaitra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BEL, BEX, BCT, BAG	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: - Probability and Statistics *(SH602)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt All questions.*
- ✓ *The figures in the margin indicate Full Marks.*
- ✓ *Necessary tables are attached herewith.*
- ✓ *Assume suitable data if necessary.*

1. A professor of statistics, in his class with 20 students, had conducted a survey about time spent by students on social media, during college hours, and found average time of 20 minutes and standard deviation of 5 minutes. In subsequent verification, it was found that observation 30 was entered as 13. Then find corrected mean and standard deviation of time spent by the students on social media during college hours. [6]
2. Define mutually exclusive and independent events. An insurance company insured 2000 Civil engineers, 4000 Electrical engineers and 6000 Mechanical engineers. The probability of an accident involving Civil engineer, Electrical engineer and Mechanical engineer during their jobs is 0.01, 0.03 and 0.15 respectively. One of the insured engineers meets with an accident. What is the probability that he is civil Engineer? [6]
3. What are the characteristics of Binomial Distribution and how does it differ from Hypergeometric Distribution? [5]
4. If the probability that an individual suffers a bad reaction from a certain injection is 0.001, determine the probability that out of 2000 individuals
   a) Exactly 3, individuals will suffer bad reaction
   b) More than 2, individuals will suffer bad reaction [5]
5. If inner diameter of a rod follow Normal Distribution. If 7% of the rod has inner diameter less than 35 mm and 89% of rod has inner diameter fewer than 63 mm. Find the mean and the standard deviation of diameter of rods. [5]
6. Find the mean and variance of the probability density function given by

$$f(x)=\begin{cases}12x^2(1-x); & 0\le x\le 1\\ 0\ ; & \text{otherwise}\end{cases}$$ [5]

7. Define Standard error and explain its importance in inferential statistics and write down the formula of standard error of sample mean and sample proportion. [5]
8. A population consists of live numbers 4, 8, 12, 16 and 20. If a random sample of size 2 is drawn without replacement. [5]
   a) Find the population mean and population standard deviation.
   b) List the all possible sample and find their sample mean.
   c) Show the mean of sample mean is equal to the population mean.
   d) Find the standard error of sample mean.
9. Write the process of test of significance of difference of two means for large samples. [5]
10. The sales figure of an item in six shops before and after and advertisement is given as:

Before	53	28	31	48	50	52
After	58	29	30	55	56	45

Test whether the advertisement was effective at 5% level of significance? [5]
(t-value for 5 degree of freedom = 2.571)

11. Dyson Company in Berlin plans to produce a new hair product known as Dyson Supersonic. The suppliers for the company are company A and Company B found that 1% and 2% defective of 200 and 300 items respectively. Arrange appropriate hypothesis testing to investigate whether Company B is better by using a 0.05 level of significance. [5]

12. In a recent survey 1650 Engineers were classified according to their intelligence (GPA in Bachelor) and economic conditions after graduation. Test whether there is any association between intelligence and economic condition. [χ^2 value for 9 degree of freedom=16.919] [5]

Economic Condition after graduation	Intelligence in BE			
	Excellent	Good	Mediocre	Dull
Good	48	199	181	82
Average	80	73	65	89
Below average	86	51	51	84
Not good	81	185	190	105

13. What are the two regression coefficients and what do they present? Write the properties of regression coefficients. [5]

14. Listed below are circumference (in feet) and height (in feet) of trees in Marshall. Minnesota (base on data from "Tree Measurement" by Stenley Rice, American Biology Teacher Vol 61. No 9) [5]

X(circ)	1.8	1.9	1.8	2.4	5.1	3.1	5.5	5.1	8.3
Y (ht)	21.0	33.5	24.6	40.7	73.2	24.4	40.4	45.3	53.5

a) Is there a correlation exist?
b) Explain this correlation.

15. The scores of randomly selected 32 students of two groups on Probability and Statistics are;

Group 'A'				Group 'B'			
50	37	13	37	56	74	50	43
45	9	11	34	39	24	55	35
24	6	13	24	72	32	45	59
32	32	24	40	47	36	34	32
33	45	37	38	40	53	55	18
33	32	46	32	32	42	49	32
46	21	32	4	41	33	14	60
45	16	43	32	60	34	38	48

a) Which group is best?
b) Which group is more consistent?
c) Find standard error of difference of their means. [3+3+2]

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division

2076 Ashwin

Exam.	Back		
Level	BE	Full Marks	80
Programme	BEL, BEX, BCT, BAG	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: - Probability and Statistics *(SH 602)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt All questions.*
- ✓ *The figures in the margin indicate Full Marks.*
- ✓ *Necessary tables are attached herewith.*
- ✓ *Assume suitable data if necessary.*

1. Describe the strong and weak points of various measures of Central tendency. From the following frequency distribution find the range of income of middle 70% of the employees and the median income. Also find mean deviation from mean. [6]

Income in Rs.	500-600	600-700	700-800	800-900	900-1000
No. of employees	150	300	500	200	50

2. Distinguish between absolute and relative measures of dispersion. The running capacity of two horses is given below, state which is more consistent and why? [5]

Horse A	250	255	280	290	295	300
Horse B	280	282	290	295	298	295

3. If we the following probability density function.

$$f(x) = \begin{cases} k(5+2x), 2 \le x \le 4 \\ 0, \quad \text{otherwise} \end{cases}$$

Find the value of K and mean and variance of random variable X. [5]

4. A random variable X has following probability function.

X	-2	-1	0	1	2	3
P(X)	K	0.1	0.2	2k	3k	0.1

i) Find the value of K. [6]
ii) Find Mean and Variance.

5. During one stage in the manufacture of integrated circuit chips, a coating must be applied. If 70% of chips receive a thick enough coating, find the probability that among 15 chips (i) at least 12 will have thick enough coatings; (ii) at most 3 will have thick enough coatings; (iii) exactly 10 will have thick enough coatings. [5]

6. In a normal distribution 31% of the items are under 45 and 8% are over 64. Find the mean and standard deviation of distribution. (Given, $Z_{0.42}=1.4$, $Z_{0.19}=0.5$) [5]

7. Describe the advantages of sample surveys over complete enumeration? [6]

Nepal Electricity Authority wishes to estimate the average electric bills for the month of October for single family homes in Kathmandu. Based on similar studies in other cities the standard deviation is assumed to be Rs. 150. The NEA wants to estimate the average bill for October such that error will not deviate by Rs. 15 with 90% confidence. What sample size is needed?

8. What are the assumptions for the t-test? Describe the procedure of test of significance between two means for small sample. [5]

9. A research company has designed three different systems to clean up oil spills. The following table contains the results, measured by how much surface area in square meters is cleared in one hour. The data were found by testing each method in several trials. Are the three systems equally effective? Use the 0.05 level of significance. [5]

System A	55	60	63	56	59	55
System B	57	53	64	49	62	-
System C	66	52	61	57	-	-

10. Test of the fidelity and selectivity of 190 digital radio receivers produced the results shown in the following table.

		Fidelity		
		Low	Average	High
Selectivity	Low	6	12	32
	Average	33	61	18
	High	13	15	0

Use α=0.05and $x^2 = 5.991$ to test whether there is relationship between fidelity and selectivity. [6]

11. Define Hypothesis, and write down the steps involve in the test of significance of difference of proportion. [5]

12. In 1990, 5.8% job applicants who were tested for drugs failed the test. At the 0.05 significant level, the test claim that the failure rate is now lower if a simple random sample of 1520 current job applicants results in 58 failure. Does the result suggest that fewer job applicants now use drugs? [5]

13. Fit the regression line of yield of crop ('000 tones) on amount of rainfall (mm) and amount of fertilizers used (kg). Also estimate the yield of crop for the year in which rainfall is 13 mm and fertilizer used is 9 kg. [5]

Yield	4	6	7	9	13	15
Rainfall	3	4	6	8	12	15
Fertilizer	4	10	14	20	24	30

14. The following data gives the experience of machine operators in years and their performance as given by the number of good parts turned out per 100 pieces.

Experience (X)	16	12	18	4	3	10	5	12
Performance (Y)	87	88	89	68	78	80	75	83

a) Fit the regression equation of performance rating on experience and estimate the probable performance of an operator had 8 years experience.
b) Determine coefficient of determination and interpret it. [5]

15. List Five Number summary and prepare the box plot for numbers of guest registered each of 60 randomly selected days. [6]

108	94	188	116	165	181	106	133	176	110
169	134	129	109	85	124	119	165	153	135
105	180	105	91	117	148	83	96	101	123
128	143	136	99	169	133	89	90	174	144
151	168	103	116	106	107	179	113	172	120
179	183	99	94	87	120	154	159	103	139

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2075 Chaitra

Exam.	Regular / Back		
Level	BE	Full Marks	80
Programme	BEL, BEX, BCT, BAG	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: - Probability and Statistics *(SH 602)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ ***Necessary tables are attached herewith.***
- ✓ *Assume suitable data if necessary.*

1. Write down the significance of statistics in engineering. An experiment shows the height of 51 plants given below. If average heights of all the 51 plants are 40 cm find the missing frequencies corresponding to the height 30 and 50cm. [6]

Height (cm)	10	20	30	40	50	60
No. of plant	2	3	-	21	-	5

2. What do you mean by mutually exclusive, exhaustive and complementary events? Explain with examples. In a particular city, airport A handles 50% of all airlines traffic, airport B handles 30% and airport C handles 20%. The detection rates for weapons at the three airports are 0.9, 0.5 and 0.4 respectively. A passenger is randomly selected at one of the airports. Then (i) what is the probability that he/she carrying a weapon? (ii) If he/she is found to be carrying a weapon, what is the probability that airport A is being used? [5]

3. Define probability density function? A continuous probability distribution of a variable x is defined as $f(x)=KX(1-X)$ for all $0 \le X \le 1$. Compute (i) $P(X \ge 0.4)$ (ii) $P(¼ \le X \le ¾)$ [5]

   Or,

   A fair dice was rolled until one gets a Six; find the expected number of toss required?

4. Define Negative Binomial distribution and explain characteristics. How does it differ from binomial distribution? [6]

5. A typist made 2.6 mistakes per page on average, find the probability that in the page typed by him, i) there is no mistake ii) at least two mistakes iii) at most 3 mistakes. [5]

6. Define Gamma distribution, chief characteristics and write its applications. [5]

   Or,

   The breakdown voltage X of randomly chosen diode of a particular type is known to be normally distributed with mean 40 and s.d. 1.5 volts. What is the probability that the breakdown voltage will be (a) between 39 and 42 volts; (b) at most 43 volts; (c) at least 39 volts.

7. Define estimation? Write characteristics of a good estimator? A sample of 400 students taking Entrance for BE revealed an average score of 56. Construct a 95% as well as 99% confidence interval for population mean score if standard deviation of score of all students in known to be10. [6]

8. A whole sale dealer wanted to buy a large quantity of light bulbs from two brands label A and B. He bought 100 bulbs from each bulbs brand and found by testing that brand A had mean life time 1120 hours and standard deviation 75 hours and brand B had mean life

time 1062 hours and standard deviation 82 hours. Find the 95% and 99% confidence limits for the difference in the average life of bulbs from the two brands. [5]

9. The following are the breaking strength of three different brands of cables.

Brand	Breaking Strength					
A	40	30	50	60	30	-
B	60	40	55	65	-	-
C	60	50	70	65	75	40

Construct ANOVA table and test for the equality of the average breaking strength of cables at α=5%. [5]

10. In a recent survey 1,072 Engineers were classified according to their intelligence (GPA in Bachelor) and economic conditions after graduation. Test whether there is any association between intelligence and economic condition. [6]

Economic Condition after graduation	Intelligence in BE			
	Excellent	Good	Mediocre	Dull
Good	48	199	181	82
Not good	81	185	190	106

x^2 value for 2 d.f.=5.991

11. What is testing of hypothesis? Explain the procedure followed in testing of Significance difference between two population proportion large sample? [5]

12. A simple random sample of Household with TV set in use. Show that 1024 of them were tuned to 60 minute while 3836 were tuned to some other show. Use 0.05 significant level to test the claim of CBS executive that "60 minute get more than a 20 shave", which mean that more than 20% of set in use are tuned to 60 minute. [5]

13. A sample of 10 values of three variables X1, X2 and X3 were obtained as

$\Sigma X_1=10$	$\Sigma X_2=20$	$\Sigma X_3=30$
$\Sigma X_1^2=20$	$\Sigma X_2^2=68$	$\Sigma X_3^2=170$
$\Sigma X_1X_2=10$	$\Sigma X_1X_3=15$	$\Sigma X_2X_3=64$

Find (i) Partial correlation between X_1 and X_2 eliminating the effect of X_3 (ii) Multiple correlation between X_1, X_2 and X_3 assuming X_1 as dependent variable. [5]

14. Differentiate between correlation and regression? From following data find the Karl Pearsons coefficient correlation and interpret the result? [5]

Marks in Statistics	39	65	62	90	82	75	25	98	36	78
Marks in Mathematics	47	53	58	86	62	68	60	91	51	84

15. Following data reveals the sample of 22 pairs of observation (X,Y) drawn from large population.

X	46	61	56	68	58	45	50	59	45	66	57
Y	49	46	43	32	26	27	29	47	37	30	43
X	59	66	62	57	57	45	50	61	55	47	51
Y	32	27	37	24	43	49	48	29	37	32	26

i) Find the sample mean for each variable X and Y.
ii) Which series is more consistent and why?
iii) Find the standard error of the difference of mean.
iv) Find the coefficient of Karl Pearson correlation. [6]

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12 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division

2074 Chaitra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BEL, BEX, BCT, B.Agri.	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: - Probability and Statistics *(SH602)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ ***Necessary tables are attached herewith.***
- ✓ *Assume suitable data if necessary.*

1. What are measures of central tendencies? Write favorable points of each of them. Calculate approximate measures of central tendency from following data; [1+2+3]

Wages in Rs/ week	Less than 35	35-37	38-40	41-43	Over 43
No. of wage earned	14	82	99	18	7

2. From a group of 4 Engineers, 3 Doctors and 2 Statistician a sub-group of 3 has to be made, what is the probability that sub-group consists of

   a) One from each profession
   b) Atleast one engineer [4]

3. Define discrete probability distribution with suitable example. Compare Negative Binomial and Binomial probability distributions. [3+3]

4. A quality control engineers inspects a random sample of 3 batteries from each lot of 24 car batteries that is ready to shipment. If such a lot contain six batteries with slight defects, what is the probabilities that the inspector's sample will contain

   a) None of the batteries with defect
   b) Only one of the batteries with defect
   c) At least two of the batteries with defect [6]

5. Write major characteristics of normal distribution. Discuss relation between Normal distribution and Standard Normal distribution. [2+3]

OR

What are Gamma and Chi-squared distributions? Specify relationship between them.

6. The life of an electric light bulbs follows Normal distribution with mean 800 hours and a standard deviation of 50 hours. Find the probability that a bulb burns

   a) Between 750 and 825 hours
   b) More than 900 hours [5]

OR

Define exponential distribution. Suppose that the service life of a semiconductor is exponentially distributed with an average of 60 hours. Find the probability that a semi-conductor will a) still working after 90 hours
b) fail within 120 hours

7. A population consists of five numbers 2, 4, 6 and 8

   a) Enumerate all possible sample of size two without replacement
   b) Show that the mean of the sampling distribution of sample mean is equal to population mean [4]

8. State central limit theorem. A random sample of size 100 is taken from an infinite population with mean 75 and variance 256. Assert the chances of sample mean between 67 and 83. [6]

9. What is type Ist error? Describe the procedure of the for difference of two Mean for large sample. [6]

10. Define chi-square distribution. A book containing 500 pages, was thoroughly checked. The distribution of number of error page was given below as

Number of errors:	0	1	2	3	4	5
Number of pages:	275	138	75	7	4	1

Using chi-square test of goodness of fit, verify whether the arrivals follow a poison distribution at 5% level of significance. [6]

11. Define hypothesis. Describe the procedure of testing of hypothesis of significant difference between two population means for large samples.

OR

Describe the types of error in Hypothesis Testing. Write the procedure testing of Hypothesis of single proportion. [6]

12. Write the Decision criteria in test of Hypothesis with diagram. [4]

13. In trying to evaluate the effectiveness of antibiotics in killing bacteria, a research institute compiled the following information

Antibiotics (mg)	12	15	14	16	17	10
Bacteria	5	7	5.6	7.2	8.6	6.2

Find strength and direction of relationship between them. [4]

14. Differentiate between Correlation and regression analysis. [4]

15. Following data revels the scores of sixty candidates of IOE entrance examination

51.43	40	78.57	46.43	51.43	50.71
42.14	50.71	42.86	55	71.43	64.29
52.86	42.14	57.14	45.71	43.57	40
44.29	55.71	40	48.57	48.57	49.29
51.43	47.14	54.29	45	53.57	50
49.29	60	48.57	50.71	50	49.29
47.14	53.57	58.57	43.57	47.14	53.57
47.86	47.14	40	43.57	52.86	47.86
49.29	49.29	42.86	47.14	48.57	50
47.14	50.71	52.86	47.86	47.14	70

a) Estimate average score of candidates
b) Find unbiased estimator of true standard deviation and standard error of average score
c) Also test for consistency of score [8]

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12 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2075 Ashwin

Exam.	Back		
Level	BE	Full Marks	80
Programme	BEL, BEX, BCT, B.Agri.	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: - Probability and Statistics *(SH602)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt All questions.*
- ✓ *The figures in the margin indicate Full Marks.*
- ✓ *Necessary tables are attached herewith.*
- ✓ *Assume suitable data if necessary.*

1. Define measures of central tendency and measures of variance. Following data gives the distribution of marks of 50 students in statistics.

Marks more than	10	20	30	40	50	60	70
No. of students	50	45	35	20	10	4	1

Compute median marks. Also compute minimum marks obtained by a pass candidate if 60% student pass in the test. [6]

2. A problem in statistics is given to three students A, B and C whose chances of solving are ½, ¾ and ¼ respectively. If all of them try independently, what is the probability that
   a) at least one of them will solve it
   b) none of them can solve it
   c) exactly two of them can solve it [6]
3. Define binomial distribution and explain the condition for Binomial distribution. [2+2]
4. If the probability that an individual suffers a bad reaction from a certain injection is 0.001, among 2000 individual
   a) obtain probability distribution function for suffering bad reaction
   b) determine the probability that
   (i) exactly 3 individuals will suffer bad reaction
   (ii) more than 2, individuals will suffer bad reaction [6]
5. The breakdown voltage x of randomly chosen diode of a particular type is known to be normally distributed with mean 40 and standard deviation 1.5 volts. What is the probability that the breakdown voltage. Will be
   a) Between 39 and 42 Volts
   b) At most 43 Volts
   c) At least 39 Volts [6]

OR

The distribution function for a random variable x is

$$f(x) = 1 - e^{-2x} \text{ for } x \geq 0$$
$$= 0 \text{ for } x < 0$$

a) Find $p(x > 2)$
b) Find mean and variance of the variable x.

6. Define discrete and continuous random variable. Also describe the procedure to compute mean and variance for both variables. [4]

7. Define standard normal distribution. Write down its properties and importance of this distribution. [4]

8. A population consists of four number 2, 8, 14, 20,

   a) Write down all possible sample size of two without replacement.
   b) Verify that the population mean is equal to the mean of the sample mean. [6]

9. What are difference between point estimation and Interval estimation? Also discuss differences between estimation and Hypothesis testing. [3+3]

10. Define critical value. A manufacturer claimed that at least 95% of the water pumps supplied to the ABC Company confirmed to specification. However, the product manager at ABC Company wasn't satisfied with the claim of the manufacturer hence to test the claim, the manager examined a sample of 250 water pumps supplied last month and found that 228 water pumps 45 per the specification. Can you conclude that the production manager is right to doubt on the claim of the manufactures ($\alpha = 0.01$) [6]

11. Three varieties of coal were analyzed by four chemists and the ash-content in the varieties were found as follows:

Varieties	Chemists			
	1	2	3	4
A	8	5	5	7
B	7	6	4	4
C	3	6	5	4

Test whether the varieties differ significantly in their ash-content? Test at 5% level of significance.
[$F_{(2,9)} = 19.4$, $F_{(3,9)} = 8.81$]. [6]

12. Write the procedure of testing of Hypothesis for single proportion. [4]

13. The following data gives the number of twists required to break a certain kind of forged alloy bar and percentage of alloying element A present in the metal

Number of twists	41	49	69	65	40	50	58	57	31	36
Percentage of elements A	10	12	14	15	13	12	13	14	13	12

   a) Fit the regression equation of number of twists on percentage of element A. Determine the predicted number of twists required break an alloy when percentage of element is 20

   b) Find 99% confidence interval for the regression coefficient. [4]

14. The simple correlation coefficient between fertilizer (x_1) seeds (x_2) and productivity (x_3) are $r_{12} = 0.59$, $r_{13} = 0.46$ are $r_{23} = 0.77$ calculate the partial correlation coefficient $r_{12.3}$ and multiple correlation $R_{1.23}$ [4]

15. The samples of length of life of bulbs from two companies are given below. [8]

Length of life (hours)	Company	
	A	B
500-600	10	3
600-700	21	8
700-800	6	15
800-900	8	12
900-1000	21	4
1000-1100	10	5
1100-1200	2	15
1200-1300	12	13
1300-1400	19	7
1400-1500	9	7
1500-1600	3	4
1600-1700	7	6
1700-1800	5	3
1800-1900	4	2
1900-2000	1	3

a) Calculate mean length of life of bulbs fro company A and company B
b) Calculate sample standard deviation and sample variance for given data
c) Which company is bulbs are more uniform?

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22 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division

2073 Chaitra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BEL, BEX, BCT, B. Agri	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: - Probability and Statistics *(SH602)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ ***Necessary tables are attached herewith.***
- ✓ *Assume suitable data if necessary.*

1. Describe the various measures of central tendency and its application. The following table represents the marks of 100 students. [6]

Marks	0-20	20-40	40-60	60-80	80-100
No. of students	14	18	27	26	15

Find the mean, median and standard deviation of all 100 students.

2. Explain Baye's theorem. A chain of video stores sells three different brands of DVD players; Of its DVD players sales, 50% are brand 1 (the least expensive), 30% are brand 2, and 20% are brand 3. Each manufacturer offers a 1-year warranty on parts and labor. It is known that 25% of brand 1's DVD players require warranty repair work, where as the corresponding percentages for brands 2 and 3 are 20% and 10%, respectively. [2+4]
   a) What is the probability that a randomly selected purchaser has bought a brand 1 DVD players that will need repair while under warranty?
   b) What is the probability that a randomly selected purchaser has a DVD player that will need repair while under warranty?
3. Define negative binomial distribution with its important characteristics. [5]
4. If a publisher of nontechnical books takes great pains to ensure that its books are free of typographical errors, so that the probability of any given page containing at least one such error is 0.005 and errors are independent from page to page, what is the probability that one of its 400-page novels will contain. [5]
   a) Exactly one page with errors?
   b) At most three pages with errors?
5. In a certain examination test 2000 students appeared in Statistics. The average marks obtained were 50% and the standard deviation was 5%. How many students do you expect to obtain more than 60% marks? What are the minimum marks of the top 100 students? Assume that the marks are normally distributed. [5]

OR

The daily consumption of water in a certain place follow a gamma distribution with parameters $\alpha = 2$ and $\beta = 3$. If the daily capacity of this city is 9 million gallon of water, what is the probability that on any given day the water supply is inadequate? [5]

6. The distribution function of a random variable x is

$$F(x) = 1 - e^{-2x} \quad \text{for } x \geq 0$$
$$= 0 \quad \text{for } x < 0$$

   a) Find $P(x > 2)$
   b) Find mean and variance of the variable x.

7. What do you mean by central limit-theorem and discuss its applications. [4]

8. An electrical firm manufactures light bulbs that have a length of life that is approximately normally distributed with mean equal to 800 hours and standard deviation of 40 hours. Find the probability that a random sample of 16 bulbs will have an average life of (a) less than 850 hours (b) between 750 to 900. [6]

9. Define partial and multiple correlation with suitable examples. Write down the properties of partial and multiple correlation. [5]

10. Raw material used in the production of a synthetic fiber is stored in a place which has no humidity control. Measurements of the relative humidity in the storage place and moisture content of sample of the raw material (both in percentage) on 12 days yielded the following results: [5]

Humidity, X	42	35	50	43	48	62	31	36	44	39	55	48
Moisture content, Y	12	8	14	9	11	16	7	9	12	10	13	11

Verify that it is reasonable to fit a straight line. Fit the straight by the method of least squares.

11. Describe the procedure of the test of significance for difference of two properties for large sample. [5]

12. Six sample of each of four types of cereal grain grown in a certain region were analyzed to determine thiamin content, resulting in the following data (mg/g): [5]

Wheat	5.2	4.5	6.0	6.1	6.7	5.8
Barley	6.5	8.0	6.1	7.5	5.9	5.6
Maize	5.8	4.7	6.4	4.9	6.0	5.2
Oats	8.3	6.1	7.8	7.0	5.5	7.2

Does this data suggest that at least one of the grains differ with respect to true average thiamin content? Use 0.05 level of significance.

OR

A liquid dietary product implies in its advertising that use of the product for one month results in an average weight loss of at least 3 pounds. Eight subjects use the product for one month, and the resulting weight loss data are reported below. Do the data support the claim of the producer of the dietary product with the probability of a type I error set to 0.05?

Subjects	1	2	3	4	5	6	7	8
Weight (lb)	165	201	195	198	155	143	150	187
Weight (lb)	161	195	192	193	150	141	146	183

13. From the following data can you conclude that there is association between the purchase of brand and geographical region? [5]

	Region		
	Central	Eastern	Western
Purchase brand	40	55	45
Do not purchase brand	60	45	55

Use 5% level of significance.

14. Two different areas of a city are being considered as sites for day-care centers. Of 200 households surveys in one section, the proportion in which the mother worked full-time was 0.52. In another section, 40% of 150 households surveyed had mothers at full time jobs. At 0.05 level of significance, is there a significant difference in the proportion of working mothers in the two areas of the city? [5]

P.T.O.

[8]

15. The entrance score of three engineering institutes are as follows:

Institutes	Entrance scores								
A	740	800	830	840	860	890	830	930	1070
B	655	775	825	978	989	1025	950	980	1100
C	850	825	749	870	565	978	925	950	1000

a) Calculate mean and standard deviation for institute A, B and C
b) Which institute is good?
c) Which institute is consistent?

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22 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2074 Ashwin

Exam.	Back		
Level	BE	Full Marks	80
Programme	BEL, BEX, BCT, B. Agri.	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: - Probability and Statistics *(SH602)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ ***Necessary tables are attached herewith.***
- ✓ *Assume suitable data if necessary.*

1. What is Box plot and what does it measure? Explain the meaning of its different parts with diagram.

   A civil engineering monitors water quality by measuring the amount of suspended solids in a sample of river water. Over 11 weekdays, he observed 14, 12, 21, 28, 30, 63, 29, 65, 55, 19, 20 suspended solids (parts per million).

   Find the third quartile and interpret its meaning. [3+3]

2. Write sown the difference between the sample space and sample points, dependent and independent events. Urn A contains 2 white 1 black and 3 red balls. Urn B contain 3 white 2 black and 4 red balls. Urn C contain 4 white 3 black and 2 red balls. One Urn is choosen at random and 2 balls are drawn. They happen to be red and black. What is the probability that both come from Urn B. [6]

3. What are the characteristics of Binomial Distribution and how does it differ from Negative Binominal Distribution? [4]

4. A quality control engineer inspects a random sample of 4 batteries from each lot of 24 car batteries that is ready to shipment. If such a lot contain six batteries with slight defects. What are the probabilities that the inspector's sample will contain. [5]

   i) None of the batteries with defect?
   ii) At least two of the batteries with defects?
   iii) At most three of the batteries with defects?

5. The breakdown voltage X of a randomly chosen diode of a particular type is known to be normally distributed with mean 40 volts and variance 2.25 volts. What is the probability that the breakdown voltage will be [5]

   i) Between 39 and 42 volts
   ii) Less than 44 volts
   iii) More than 43 volts

OR

The daily consumption of electric power in a certain city follow a gamma distribution with $\alpha = 2$ and $\beta = 3$. If the power plant of this city has daily capacity of 12 million kilowatt hours, what is the probability that this power supply will be inadequate on any given day?

6. A college professor never finishes his lecture before the bell rings to end the period and always finishes his lectures within one minute after the bell rings. Let X = the time which elapses between the bell and the end of the lecture. Suppose that the p.d.f of X is [5]

$$f(x) = kx^2, 0 \le x \le 1$$
$$= 0, \text{otherise}$$

i) Find the value of k
ii) What is the probability that the lecture ends with ½ minute of the bell ringing?
iii) What is the probability that the lecture continues beyond the bell for between 15 and 30 seconds?

7. Define Central Limit Theorem. The amount of impurity in a batch of a certain chemical product is a random variable with mean value 4.0 gm and standard deviation 1.5 gm. If 50batches are independently prepared, what is the probability that the sample average amount of impurity is between 3.5 and 3.8 gm? [5]

8. Define population. Sample parameter and statistic with suitable examples. A population consists of 3,7,11,15. Consider all possible samples of size two which can be drawn without replacement from this population. Find population mean and Standard error of mean. [6]

9. What are the two regression coefficients and what do they represent when these two will be same? Write any three properties of regression coefficient. [5]

10. A sample of 8 values of three variables X_1, X_2 and X_3 were obtained as [5]

$\Sigma X_1 = 360$	$\Sigma X_2 = 64$	$\Sigma X_3 = 48$
$\Sigma X_1^2 = 17172$	$\Sigma X_2^2 = 546$	$\Sigma X_3^2 = 320$
$\Sigma X_1 X_2 = 2845$	$\Sigma X_1 X_3 = 2269$	$\Sigma X_2 X_3 = 396$

Find:

i) Partial correlation between X_1 and X_3 eliminating the effect of X_2
ii) Multiple correlation between X_1, X_2 and X_3 assuming X_3 as dependent

11. Discuss difference between estimation and hypothesis test of significance of population [5]

66.3	63.5	64.9	61.9	64.3	64.7	65.1	64.5	68.4	63.2

Find 99% confidence interval for true hardness of magnesium alloy.

12. An examination was given to 50 students at college A and 60 students at college B. At a mean grade was 75 with standard deviation of 9. At B mean grade was 79 with a standard deviation of 7. Is these significant difference between the performance of students at A and those at B, given that $\alpha = 0.05$? [6]

OR

Three randomly selected groups of chickens are fed on three different diets. Each group consists of five chickens. Their weight gains during a specified period of time are as follows:

Diet I	4	4	7	7	8
Diet II	3	4	5	6	7
Diet III	6	7	7	7	8

Test the hypothesis that mean gains of weight due to the three diets are equal.

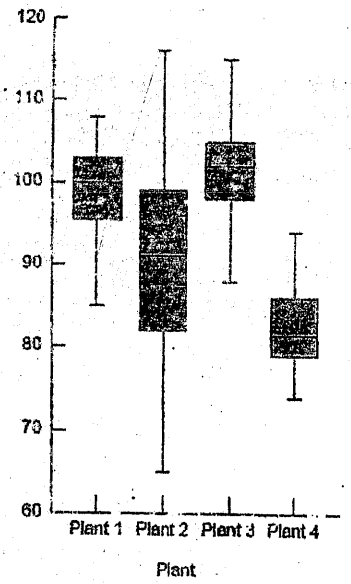
13. A random sample of smokers was obtained and each individual was classified both with respect to gender and with respect to the age at which he/she first started smoking. [5]

Age	Gender	
	Male	Female
<16	25	10
16-17	24	32
18-20	28	17
>20	19	34

Carry out a test of hypotheses to decide whether there might be an association between gender and the age at which an individual first smokes?

14. Explain the concept of (i) point estimation and (ii) Internal estimation of population properties. In a random sample of 400 industrial accidents, it was found that 231 were due to at least partially to unsafe working condition. 95% confidence intervals for the corresponding true proportion. [5]

15. Following multiple box plots shows the quality index at 4 manufacturing plants. Comment on the relationships between quality at different plants and the variability present those 4 plants. [7]



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22 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division

2072 Chaitra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BEL, BEX, BCT, B. Agri.	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: - Probability and Statistics *(SH602)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ ***Necessary tables are attached herewith.***
- ✓ *Assume suitable data if necessary.*

1. What are the differences between measures of central tendency and measures of dispersion? The mean and standard deviation of 20 items is found to be 10 and 2 respectively. At the time of checking it was found that one item 8 was incorrect. Calculate the mean and standard deviation if: (i) the wrong item is omitted (ii) it is replaced by 12. [6]

2. Define conditional probability. An assembly plant receives its voltage regulators from these three different suppliers, 60% from supplier A, 30% from supplier B, and 10% form supplier C. It is also known that 95% of voltage regulators from A, 80% of these from B, and 65% these from C perform according to specifications. What is the probability that [6]
   i) Anyone voltage regulator received by the plant will perform according to specifications
   ii) A voltage regulator that perform according to specification came from B

3. Write the differences and similarities between Binomial and Negative Binomial Distribution. [2+3]

4. In certain factory turning out optical lenses, there is a small change, 1/500 for any lens to be defective. The lenses are supplied in packets of 10 each. What is the probability that a packet will contain [5]
   i) No defective lens
   ii) At least one defective lenses
   iii) At most two defective lenses

   OR

   Define mathematical expectation of a discrete random vasriable. A probability distribution is given.

X = x	0	1	2	3	4	5
p(X=x)	0.26	0.25	0.11	0.02	0.25	0.11

   Find (a) $P(X \geq 4)$; (b) $p(0 < X < 4)$; (c) mean and variance of X

5. Define standard normal distribution. Give the condition for normal approximation of Poisson distribution. [5]

6. The mean inside diameter of a sample of 200 washers produced by a machine is 0.502 cm and the standard deviation as 0.005 cm. The purpose for these washers are interned allows a maximum tolerance in the diameter of 0.496 to 0.508 cm, otherwise the washers are considered defective. Determine the percentage of defective washers produced by the machine. Assume the diameter is normally distributed. [5]

7. What do you mean by sampling distribution of a sample mean and its Standard Error? Explains with example. What would be the variance of sampling distribution of mean, if sample is taken from finite population? [5]

8. Define the Central Limit Theorem. A sample of 100 mobile battery cells tested to find the length of life produced the following results as mean 13 months and standard deviation of 3 months. Assuming the data to be normally distributed by using Central Limit Theorem what percentage of battery cells expected to have Average life? [5]

   i) More than 15 months (ii) Less than 9 months

9. Define partial and multiple correlations with examples. Write down the properties of partial and multiple correlation. [5]

10. An article in wear (Vol.152, 1992, pp. 171-181) presents data on the fretting wear of mild steel and oil viscosity. Representative data follow, with x = oil viscosity and y = wear volume (10^{-4} cubic millimeters). [5]

y	240	181	193	155	172	110	113	75	94
x	1.6	9.4	15.5	20.0	22.0	35.5	43.0	40.5	33.0

   i) Fit the sample linear regression model using least
   ii) Predict fretting wear when viscosity x = 30

11. Describe the procedure of the test of significance for difference of two population mean for large sample. [5]

12. Ten objects were chosen at random from the large population and their weights were found to be in grams 63, 63, 64, 65, 66, 69, 65, 66.1, 64.5. In the light of above data, discuss the suggestion that the mean weight in the population is 65 gm. Use $\alpha = 0.05$. [5]

13. Define chi-square distribution. From the following data can you conclude that there is association between the purchase of brand and geographical region? (Use 5% level of significance). [5]

	Region		
	Central	Eastern	Western
Purchase brand	40	55	45
Do not purchase brand	60	45	55

14. In a postal survey of 500 households, 330 said that they thought they were being overcharged for the public services within their area. [5]

   i) Calculate an approximate 99% confidence interval for the population proportion, p, of households who thought they were being overcharged for public services within their area.
   ii) Estimate the size of sample required to estimate the value of p to be within 99% confidence limits of ±0.025.

15. Following data gives the sample records of number of passenger take ticket at the counter of Bus during one hour period. [8]

22	58	32	36	62	57	25	45	23	37
64	56	46	60	29	49	63	36	26	58
60	26	58	58	29	43	53	36	45	22
52	43	45	31	45	39	35	38	30	60
58	42	54	62	52	42	65	58	51	60
53	45	31	53	22	53	51	52	47	59

   Find the
   i. Sample mean of Number of passenger
   ii. Sample Standard deviation and Coefficient of variation.
   iii. Standard error of the sample mean.
   iv. Find the 95% and 99% confidence limit of sample mean

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23 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2073 Shrawan

Exam.	New Back (2066 & Later Batch)		
Level	BE	Full Marks	80
Programme	BEL, BEX, BCT, B. Agri.	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: - Probability and Statistics *(SH602)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ ***Necessary tables are attached herewith.***
- ✓ *Assume suitable data if necessary.*

1. In two companies A and B engaged in similar type of industry, the average weekly wage and standard deviation are given below: [6]

	Company A	Company B
Average weekly wage (Rs)	460	490
Standard deviation	50	40
No. of wage earners	100	80

   i) Which company pays larger amount as weekly wags?
   ii) Which company show greater variability in the distribution weekly wages?
   iii) What is the mean and standard deviation of all the workers in two companies taken together?

2. State the law multiplication of probability. An Electronics company has an engineering position open. The Probability that an applicant is capable is 0.7. Each applicant is given written test and oral examination. A capable applicant passes with Probability 0.9 while an incapable applicant passes with Probability of 0.4. Find (a) the probability that an applicant passes the test (b) the probability that the applicant is capable given he/she passes the test. [6]

3. Define negative Binominal Distribution. If a boy is throwing stone at a target what is the probability that his 10^{th} throw is his 5^{th} hit, if the probability of hitting the target at any trial is 0.6. Also find the mean and variance of random variable. [5]

4. Define hypergeometric probability distribution with an example. Describe the conditions for the binomial approximation to hypergeometric distribution? [5]

5. Let X denote the amount of time for which a book on two hour reserve at a college library is checked out by a randomly selected student and suppose that X has density function, [5]

$$f(x) = 1/2x, \quad 0 \le x \le 2$$
$$= 0 \quad \text{otherwise}$$

   Calculate $P(X \le 1)$ and $P(0.5 \le X \le 1.5)$

6. Define continuous random variable with suitable example. Describe the properties of probability density function and distribution function. [5]

7. State Central limit theorem with an example. Explain why it is important in engineering field? [5]

8. A population consists of the four number 2,8,14,20 [5]
   i) Write down all possible sample size of two without replacement
   ii) Verify that the population mean is equal to the mean of the sample mean
   iii) Calculate the standard error of the sampling distribution of the sample mean

9. Define Karl Person coefficient of Correlation and coefficient of determination. What it is input in analysis. [5]

10. A house survey on monthly expenditure on food yield following data: [5]

Monthly expenditure (100 Rs.)	10	15	20	25	30	35	40
Monthly income (1000 Rs.)	2	4	5	7	6	6	5
Size of the family	4	5	7	10	8	11	4

Obtain the multiple correlation coefficient.

11. There was a research on voltage supply by Ba Hries supplied by two companies. Both company claims that same. But researcher suspects that there is significance difference between mean voltages between two companies. To test this, she selected independent samples from both company and in lab test the result were as follows: [5]

		Mean	Sample Standard deviation
Company A	13	3.59V	0.3V
Company B	10	3.15V	0.4V

Test the researcher suspect was correct at 5% level of significance.

12. Shyam and Co. produces three varieties of certain product: deluxe, find and ordinary. A recent market survey is conducted for preference of products. The preference was found as follow: [5]

Product	Production			
Deluxe	15	14	19	18
Fine	17	12	20	16
Ordinary	16	18	16	17

Is there a significant difference in the preference of products test it using ANOVA test. Use $\alpha = 5\%$

OR

The following are the average weekly losses of worker hours due to accidents in 10 industrial plan before and after a certain safety program was put into operation:

Before	45	73	46	124	33	57	83	34	26	17
After	36	60	44	119	35	51	77	29	24	11

Use the 0.05 level of significance to test whether the safety program is effective.

13. Define critical value. A manufacturer claimed that at least 95% of the water pumps supplied to the ABC Company confirmed to specification. However, the product manager at ABC Company wasn't satisfied with the claim of the manufacturer. Hence, to test the claim, the manager examined a sample of 250 water pumps supplied last month and found that 228 water pumps as per the specification. Can you conclude that the production manager is right to doubt on the claim of the manufactures? (α=0.01) [5]

14. Describe the Hypothesis testing procedure of Chi-square test of independence for 2×2 table. [5]

15. The following table shows the number of hours 45 hospital patients slept following the administration of a certain anesthetic. [8]

7	10	12	4	8	7	3	8	5
12	11	3	8	1	1	13	10	4
4	5	5	8	7	7	3	2	3
8	13	1	7	17	3	4	5	5
3	1	17	10	4	7	7	11	8

a) Find sample mean, sample variance and sample standard deviation
b) Compare a value that measures the amount of variability relative to the value of mean

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22 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2071 Chaitra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BEL, BEX, BCT, B.Agri	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: - Probability and Statistic *(SH602)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ ***Necessary tables are attached herewith.***
- ✓ *Assume suitable data if necessary.*

1. Two different sections of a statistics class take the same quiz and the scores are recorded below: [6]

   a) Find the range and standard deviation for each section
   b) What do the range values lead you to conclude about the variation in the two sections?
   c) Why is the range misleading in this case?
   d) What do the standard deviation values lead you to conclude about the variation in two sections?

Section 1	1	20	20	20	20	20	20	20	20	20	20
Section 2	2	3	4	5	6	14	15	16	17	18	19

2. Define dependent and independent events with suitable examples. The independent probabilities that the three sections of a costing department will encounter a computer error are 0.2, 0.3 and 0.1 per week respectively. What is the probability that there would be: [6]

   i) At least one computer error per week
   ii) One and only one computer error per week

3. Write the differences and similarities between Binominal and Negative Binominal Distribution. [2+3]

4. A quality control engineer inspects a random sample of 4 batteries from each lot of 24 car batteries that is ready to shipment. If such a lot contain six batteries with slight defects. What are the probabilities that the inspector's sample will contain: [5]

   i) None of the batteries with defect?
   ii) At least two of the batteries with defects?
   iii) At most three of the batteries with defect?

5. A random variable X has the following probability density function as: [5]

$$f(x)=\begin{cases} kx^3(4-x)^2, 0<x<1 \\ 0, \text{otherwise} \end{cases}$$

   Find the value of k, using this value of k find mean and variance of distribution.

6. The breakdown voltage X of a randomly chosen diode of a particular type is known to be normally distributed with mean 40 volts and variance 2.25 volts. What is the probability that the breakdown voltage will be: [5]

   i) Between 39 and 42 volts
   ii) Less than 44 volts
   iii) More than 43 volts

OR

The daily consumption of electric power in a certain city follow a gamma distribution with $\alpha = 2$ and $\beta = 3$. If the power plant of this city has daily capacity of 12 million kilowatt hours, what is the probability that this power supply will be inadequate on any given day?

7. State central limit theorem. An electrical firm manufactures light bulbs that have a length of life that is approximately normally distributed with mean equal to 800 hours and standard deviation of 4 hours. Find the probability that a random sample of 16 bulbs will have an average life of less than 12775 hours. [5]

8. What do you mean by sampling distribution of a sample mean and its standard Error? What would be the variance of sampling distribution of mean if sample is taken from finite population? [3+1]

9. Define partial and multiple correlation with suitable examples. Write down the properties of partial and multiple correlation. [5]

10. The following data gives the number of twists required to break a certain kind of forged alloy bar and percentage of alloying element A present in the metal. [5]

Number of twists	41	49	69	65	40	50	58	57	31	36
Percentage of element A	10	12	14	15	13	12	13	14	13	12

i) Fit the regression equation of number of twists on percentage of element A. Determine the predicted number of twists required to break an alloy when percentage of element is 20.

ii) Find 99% confidence interval for the regression coefficient (i.e.slope)

11. In a certain factory, there are two independent processes manufacturing the same item. The average weight in a sample of 250 items produced from one process is found to be 120 gram with a standard deviation of 12 gram, while the corresponding figures in a sample of 400 items from the other process are 124 and 14 respectively. Test whether the two mean weights differ significantly or not at 5 percent level of significance. [5]

12. Three trained operators work on production of new product. The productivity of the operators are recorded as below: [5]

Operators	Production			
1	10	12	14	16
2	12	11	13	16
3	14	15	12	11

Using ANOVA test whether the difference in average productivity due to the difference in operators are significant. Use $\alpha = 5\%$

OR

Define confidence level and significance level. A company claims that its light bulbs are superior to those of its main competitor. If a study showed that a sample of 40 of its bulbs has mean lifetime of 647 hours of continuous use with standard deviation of 27 hour. While a sample of 40 bulbs made by its main competitor had mean lifetime of 638 hours of continuous use with standard deviation of 31 hours. Does this substantiate claim at 1% level of significance?

13. Write down the steps for testing hypothesis on difference between two population proportions for the large sample size. [5]

14. 1072 students were classified according to their intelligence and economic conditions. Test whether there is any association between intelligence and economic condition. [6]

Economic Condition	Intelligence			
	Excellent	Good	Mediocre	Dull
Good	48	199	181	82
Not good	81	185	190	106

10. Define standard error of sample mean. A population consist of the four numbers 12, 19, 13, 16. [5]

i) Write down all possible sample size of two without replacement.
ii) Find standard error of the sample mean.

11. Describe the procedure of the test of significance for difference of two population mean for large sample. [5]

12. In the investigation of a citizens' committee complaint about the availability of fire protection within the country, the distance in miles to the nearest fire station was measured for each of five randomly selected residences in each of four areas. [5]

Area 1	7	5	5	6	8
Area 2	1	4	3	4	5
Area 3	7	9	8	7	8
Area 4	4	6	3	7	5

Do these data provide sufficient evidence to indicate a difference in mean distance for the four areas at the = 0.05 level of significance?

OR

The diameter of steel rods manufactured on two different extrusion machines is being investigated. Two random samples of sizes $n_1 = 15$ and $n_2 = 17$ are selected, and the sample means and sample variances are $\bar{x}_1 = 8.73, s_1^2 = 0.35, \bar{x}_2 = 8.68$, and $s_2^2 = 0.40$, respectively. Assume that $\sigma_1^2 = \sigma_2^2$ and that the data are drawn from a normal distribution. Is there evidence to support the claim that the two machines produce rods with different mean diameters? Use $\alpha = 0.05$ in arriving at this conclusion.

13. A random sample of 500 adult residents of Maricopa County found that 385 were in favor of increasing the highway speed limit to 75 mph, while another sample of 400 adult residents of Pima County found that 267 were in favor of the increased speed limit. Construct 95% confidence interval on the difference in the two proportions. [5]

14. Define chi-square distribution. From the following data can you conclude that there is association between the purchase of brand and geographical region? [5]

	Region		
	Central	Eastern	Western
Purchase brand	40	55	45
Do not purchase brand	60	45	55

Use 5% level of significance.

15. The following table shows the number of hours 45 hospital patients slept following the administration of a certain anesthetic. [8]

7	10	12	4	8	7	3	8	5
12	11	3	8	1	1	13	10	4
4	5	5	8	7	7	3	2	3
8	13	1	7	17	3	4	5	5
3	1	17	10	4	7	7	11	8

i) Find sample mean, sample variance and sample standard deviation.
ii) Compute a value that measures the amount of variability relative to the value of mean.

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22 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2072 Kartik

Exam.	New Back (2066 & Later Batch)		
Level	BE	Full Marks	80
Programme	BEL, BEX, BCT, B.Agri.	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: - Probability and Statistic *(SH602)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ ***Necessary tables are attached herewith.***
- ✓ *Assume suitable data if necessary.*

1. What is absolute and relative Measure of Dispersion? Construct a Box plot from the following data of marks of students as: [1+5]

Marks	10-20	20-30	30-40	40-50	50-60
No. of students	2	6	22	13	7

2. State the law of addition of probability. In a training, the 70% of persons achieved a rating of Satisfactory. Of those as rated as Satisfactory, 80% had Acceptable Scores on the personality test. Of those rated as Unsatisfactory, 35% had Acceptable Scores. Find the probability that an applicant would be a Satisfactory trainee given the Acceptable scores on personality test. [2+4]
3. Define Negative binomial distribution with its important characteristics. [5]
4. A particularly long traffic light on your morning commute is green 20% of the time that you approach it. Assume that each morning represents as independent trial. [5]
   i) Over five mornings, what is the probability that the light is green on exactly one day?
   ii) Over 20 mornings, what is the probability that the light is green on exactly four days?
5. The distribution function for a random variable X is [5]

   $F(x) = 1 - e^{-2x}$ for $x \geq 0$
   $= 0$ for $x < 0$

   i) Find $P(X > 2)$
   ii) Find mean and variance of the variable X.
6. Define Standard Normal Distribution with their respective probability density function and describe its properties. [5]
7. An article in Wear (Vol.152, 1992, pp.171-181) presents data on the fretting wear of mild steel and oil viscosity. Representative data follow, with x = oil viscosity and y = wear volume (10^{-4} cubic millimeters). [5]

y	240	181	193	155	172	110	113	75	94
x	1.6	9.4	15.5	20.0	22.0	35.5	43.0	40.5	33.0

   i) Fit the simple linear regression model using least
   ii) Predict fretting wear when viscosity x = 30
8. What are the two regression coefficients and what do they represent? Write the properties of regression coefficient. [5]
9. Define Central Limit Theorem. An electronics company manufactures resistors that have a mean resistance of 100 ohms and a standard deviation of 10 ohms. The distribution of resistance is normal. Find the probability that a random sample of 25 resistors will have an average resistance less than 95 ohms. [5]

TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2080 Bhadra

Exam.		Regular	
Level	BE	Full Marks	80
Programme	BEL, BEX, BCT	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: - Instrumentation *(EX 602)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. Define instrumentation. Imagine you are designing an automated greenhouse system. Explain how a closed loop microprocessor-based system can control the temperature and humidity in the greenhouse efficiently. [4]
2. Design an interfacing circuit to set up bidirectional data communication in the master-slave format between two 8085A microcomputers. Use the 8255A as the interfacing device between the master and the slave microcomputers. Write necessary program to transfer a block of data from master to slave. Also, make flowchart of the master and slave program. [10]
3. a) What are the advantages of serial data transmission over parallel data transmission? Differentiate between asynchronous and synchronous data transmission. [2+2]
   b) Explain null modem connection. [4]
4. Show the interfacing circuit diagram of an 8-bit ADC using status check I/O method. Generate the addresses/words for START, DR (Data Ready) and Reading data from ADC. Write subroutine to accept data from ADC and store in memory. [3+3+2]
5. a) Suppose you have designed a data logger system for your agricultural farm which are located at 3 different cities Pokhara, Biratnagar and Mustang. You need to log rainfall information, win speed, humidity of soil and temperature from these 3 farms and transmit to your office in Kathmandu. Draw a complete block diagram for this system listing out the hardware needed, and suitable transmission technique. [4]
   b) List advantages of digital communication system over analog communication system. [2]
6. a) Explain the general rules for a circuit design in terms of grounding and shielding. [4+4]
   b) An op-amp. circuit is receiving noise interference from a nearby digital switching circuit. The digital circuit switches logic levels between 4.5 V and 1.0V within 10 ns. Its current changes from 0 to 10 mA within 100ns. What type of noise coupling has occurred in this scenario?
7. a) What are the different measures of making a fault tolerant electrical circuit? Explain in brief. [5]
   b) Why we need impedance matching in circuit design? Explain. [3]
8. Describe the different terminologies used in routing signal traces for designing a commercial circuit layout. [8]
9. a) Compare prototyping and spiral model. [4]
   b) Define embedded and real-time software. What is white box testing and black box testing? [4]
10. Draw the complete block diagram of the industrial process control involved in your case study. Explain what were the shortcomings/flaws in the existing design. What changes did you recommend for making it more cost effective and more automated? Explain the benefits that the management would achieve after implementing your design. Mention the probable problems you might face after system implementation. [12]

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2081 Baishakh

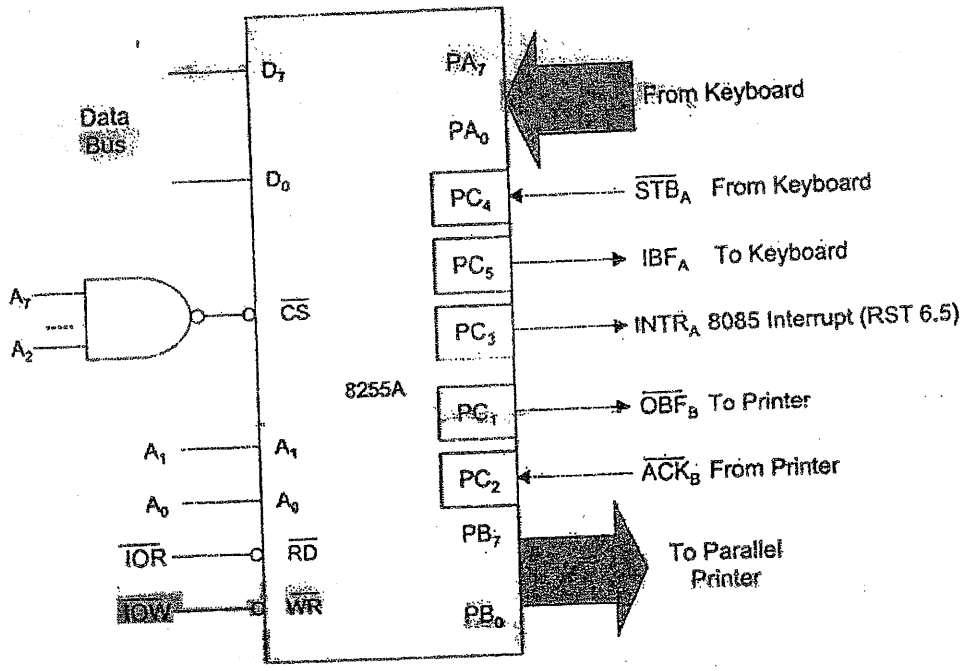
Exam.	Back		
Level	BE	Full Marks	80
Programme	BEL,BCT, BEX	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: - Instrumentation II *(EX 602)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. One thing that is common on embedded real time systems is they include some type of processor. They range anywhere from serial program input devices to a full-fledged PC on a chip or board. At some point you need to decide on the type of processor to use. As an engineer, how can you choose it? Are there any rational reasons for picking one over another, Or all the selection is based on personal bias? What are the situational factors imposing the selection of a micro-processor or micro-controller for a design? Discuss in brief. [4]

2. Figure shows an interfacing circuit using 82555A in Mode 1. Port A is designated as the input port for a keyboard with interrupt I/O and Port B is designated as the output port for a printer with status check I/O.
   a) Find the port addresses by analyzing the decode logic. [2]
   b) Determine the control word to set up Port A as input and Port B as output in Mode 1. [2]
   c) Determine the BSR control word to enable $INTE_A$. [1]
   d) Determine the masking byte to verify the OBF' line in status check I/O. [1]
   e) Write subroutine to accept character from keyboard and send character to printer. [4]



3. a) Describe the various error detection techniques used in serial data transmission. [3]

b) What are the problems that might occur when you attempt to connect together two RS 231 device which are both configured as DTE. How can you solve this problem? Explain in brief with a suitable diagram. [5]

4. Provide examples of A/D and D/A interfacing applications in real-world scenarios. Design an interfacing circuit diagram for an 8 bit ADC using interrupt. Explain it with the suitable program. [2+6]

5. a) Discuss in brief why digital communication system is preferred over analog communication. [4]

   b) What is a data logger? Explain its application. [2]

6. a) What is ESD? Mention some ideas how we can reduce the chance of ESD in our workplace. [4]

   b) Explain the term energy coupling in an electrical circuit. Describe about inductive coupling with remedies. [4]

7. a) What do you mean by reliability in a circuit design? Discuss how the reliability can be achieved by incorporating fault tolerance methods. [5]

   b) Discuss about FPGA (Field Programmable Gate Array). [3]

8. a) How are the components placed in a circuit layout? [4]

   b) List any four methods of preventing crosstalk with necessary diagrams. [4]

9. Good design and programming practices can make programs more readable and understandable. How can this be achieved? Explain in detail. [8]

10. Explain the control mechanism of the industrial process control system involved in your case study with the help of block diagram. What was your recommendation for further improvement of the current system? Explain why the management should implement your recommendation. Do you foresee any problems after implementing this control system? [12]

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2080 Baishakh

Exam.	Back		
Level	BE	Full Marks	80
Programme	BEL, BEX, BCT	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: - Instrumentation II *(EX 602)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. a) Describe the various PC interfacing techniques while interfacing an I/O devices. [3]
   b) Draw circuit diagram of an interfacing circuit controlling one 4KB RAM and one 4KB ROM assuming base address 4000H. [5]
2. A microprocessor kit has an onboard 8255. Interface to the 8255 eight single-pole-double-throw (SPDT) switches numbered S_0 to S_7 and a seven segment common anode LED display. Draw the complete circuit setup. Define clearly the functions of all ports. Write a program to initialize 8255. Detect a switch closure and display the value of the switch number on the LED display. [9]
3. a) Illustrate digital data transmission using modem and standard phone lines. [5]
   b) Explain Check Sum error detection technique with suitable example. [4]
4. Why do we need digital to analog conversion? Design an interfacing circuit diagram for an 8 bit ADC using status check. Explain it with the suitable flowchart and program. [2+6]
5. a) What are the components used in Data Acquisition system? Explain with necessary block diagram. [4]
   b) Explain Bluetooth protocol architecture with suitable block diagram. [4]
6. a) Talk about inductive coupling in short. [2]
   b) Explain Ground Loop mechanism and also discuss the elimination of the ground loop issues with suitable diagram. [4]
7. Any circuit design must be capable to provide the high speed and low power performance. Discuss various terminologies in detail to achieve the above witnesses in fair design. [6]
8. What are the general rules for placement of components in a circuit? Describe grounding in terms of circuit layout. [4+2]
9. What do you mean by software reliability? Explain prototyping model for software development. [2+6]
10. What have you learned from case study? Draw the complete block diagram of the industrial process control involved in your case study. What are the critical factors effecting the production you have noticed in the visited industry and what measure you can suggest for the same? What problems you might face after implementing your suggested process control system? [12]

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2079 Bhadra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BEL, BEX, BCT	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: - Instrumentation II *(EX 602)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. a) Define a microprocessor based instrumentation system. Differentiate between open loop and closed loop microprocessor based instrumentation. [1+4]
   b) Describe direct memory access. [3]
2. Design an interfacing circuit to set up bidirectional data communication in the master-slave format between two 8085A microcomputers. Use the 8255A as the interfacing between the master and the slave microcomputers. What will be the port addresses and control word. Write necessary program to transfer a block data from the master to the slave along with its flowchart diagram. [10]
3. a) Explain how communication takes place between PC (DB9 port) and printer (DB 25 port) using Null modern connection. [4]
   b) What are common USB packet field? Explain different USB packets. [3+3]
4. Interface a suitable DAC using 8255 PPI to an 8085 microprocessor to generate a square wave oscillating between 0V and 5V having a frequency of 1 KHz. Describe the interfacing circuit along with the necessary program. [8]
5. List the characteristics of Bluetooth. Explain the components of data logger with the help of block diagram. [2+6]
6. Describe any three mechanisms of noise coupling. Explain briefly on prevention of noise coupling. [3+3]
7. Write an importance of decoupling, ground bounce, cross talk and impendence matching in designing circuit. [6]
8. What are the different types of boards for electronics prototyping? List out each circuit boards characteristics. [2+4]
9. Explain about Embedded and Real Time Software used to run and control various modern instruments. As an instrumentation engineer, discuss the different approaches of coupling and cohesion technique to define tasks and design an integrated module. [6]
10. Case study is related to the basic measurement requirements, accuracy and specific hardware employed environmental conditions under which the instruments must operate, signal processing, transmission and output devices. Regarding your case study visit; draw a block diagram of the existing control system and mention the problems found in the existing system. You should also draw an interfacing diagram for solving the problem with discussing merits and demerits of your recommended system in terms of cost, manpower and plant automation. [12]

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2079 Baishakh

Exam.	Back		
Level	BE	Full Marks	80
Programme	BEL, BEX, BCT	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: - Instrumentation II (*EX 602*)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. What are the basic features of MBI system? Compare open loop and closed loop microprocessor based system with suitable examples. [2+6]
2. 8255 is to be operated in mode O. Port A and port C upper are designed as output for LEDs and port B and port C lower as input ports for DIP switches. Address line A15 is connected with $\overline{cs}$ of 8255 through an inverter.
   a) Draw the complete mapping diagram. [2]
   b) Determine the port addresses. [2]
   c) Determine the control word. [1]
   d) Write a program to read the DIP switches and display the reading from port B at port A and C lower at port C upper. [3]
3. a) Show the interfacing circuit of TTL logic with RS 232, appropriate line drivers and line receivers. [3]
   b) Describe the enumeration process in USB 2.0 appropriate flow diagrams. Compare and contrast between USB device and host interface chips and list three examples of each type. [4+3]
4. Consider yourself as a fluid dynamic engineer, who has been assigned the task of designing a hardware circuit that keeps a gas chamber under standard temperature and pressure (STP) conditions. The circuit should be an MBI system, an 8255 PPI, two 10-bit ADCs and appropriate temperature and pressure sensors that constantly monitor the pressure and temperature inside the gas chamber. An alarm LED should be lighted to notify the operator when either the temperature exceeds zero degree Celsius or the pressure exceeds hundred Kilopascals. Calibrate your temperature and pressure sensors accordingly. Sketch your design, show the necessary control words, and draw an appropriate flowchart to show the logic of your software algorithm. [8]
5. Describe the Bluetooth network topologies. Explain the characteristics and application of data logger. [4+4]
6. Define grounding and shielding. Explain inductive and capacitive shielding mechanisms. [2+4]
7. Explain the different types of transmission line issues that should be considered while designing the high speed circuit. [6]
8. a) Discuss the general process of creating a PCB with appropriate figures. [3]
   b) Why is routing signal traces important during circuit layout? Explain the factors that need to be considered while creating a signal trace. [1+2]
9. a) What do you mean by embedded and real time software? Discuss the software model suitable for your academic project. [4]
   b) What are good programming practices? Discuss the nature of bugs and preventive steps to minimize it. [4]

10. Suppose, the CEO of the company where you performed your case study is impressed with your case study report, and decides to hire you as a consulting engineer to oversee their existing MBI system. You are assigned the task of revamping their existing MBI system with the blueprint that you have designed. Show a well labeled, clear and detailed sketch of your design that you will be presenting to the board of directors to convince them to implement your idea. Your block diagram and supporting documents should include a minimum of the following items: the hardware solution, the software requirements, the advantages and disadvantages of your own strategy, the gain in efficiency of the plant after employing your plan, and a cost breakdown of realizing your project. [12]

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2078 Kartik

Exam.	Back		
Level	BE	Full Marks	80
Programme	BEL, BEX, BCT	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: - Instrumentation II *(EX 602)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. a) What is the rationale behind using a microprocessor in instrumentation systems? Describe two situations where an open-loop MBI system performs better than a closed-loop MBI system, illustrating your answer with block diagrams. [1+3]

   b) Describe the DMA active and idle cycles with appropriate figures. Provide at least five disadvantages of using DMA controllers. [2+2]

2. Draw the circuit diagram to interface 8255A PPI with 8085 microprocessor at base address B0H. Write an assembly program that determines the addition of contents of port A and port B and display the result in port C. Use appropriate control word to initialize the 8255A. [3+5]

3. a) Define bit rate and baud rate. Determine a character transmission rate using asynchronous serial data transfer method at baud rate 9600. Suppose a character has 7 bits data, one bit start bit, two bits stop bit and none parity. Calculate the time required to send a word: Engineer. [5]

   b) Describe the problems occur when you try to connect RS-232 devices that both are configured as DTE. How this problem can be resolved? [5]

4. What are the parameters to characterize ADCs? Design a circuit to interface ADC0808 with 8085 microprocessor using 8255A PPI. [2+6]

5. a) Draw the block diagram of a digital transmission system that can be used to transmit analog as well as digital data. Compare and contrast analog and digital transmission techniques with at least five distinguishing characteristics. [2+2]

   b) Design a data logging and storage system that is capable of receiving and storing signals from optical fibers, satellites and Bluetooth devices. Provide the block diagram of the overall system, which should show how messages get transmitted over the three transmission schemes and how the logger receives them. [4]

6. How ground loop can be prevented? Explain the Electromagnetic coupling. [6]

7. Explain ground bounce, decoupling and crosstalk in the context of circuit design. [6]

8. What are the factors that need to be considered while routing the signal traces in circuit layout. How do you avoid crosstalk while making layout of the circuit? [2+4]

9. What are the different phases of bugs in software development? Explain the different types of techniques used for software testing. [3+5]

10. Draw the complete block diagram of industrial process control system involved in your case study. Explain why you want to implement your control system over existing one in terms of cost, manpower and plant automation? What problems you might face after implementing this control system? What are the benefits of new system over old one? [12]

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2078 Bhadra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BEL, BEX, BCT	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: - Instrumentation II *(EX 602)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. Define instrumentation system. Compare status check I/O, Interrupt driven I/O and DMA. [2+6]
2. Design an interfacing circuit to set up bidirectional data communication in the master-slave format between two 8085A microcomputers. Use the 8255A as the interfacing between the master and the slave microcomputers. What will be the port addresses and control word. Write necessary program to transfer a block of data from the master to the slave along with its flowchart diagram. [9]
3. a) Explain simplex, half duplex and full duplex operation of RS-232 serial standard. [4]
   b) Describe different types of USB protocols along with the common USB packet fields. [6]
4. Explain the principle involved while interfacing an 8-bit ADC using interrupt; including suitable block diagram, process flow diagram and necessary ALP subroutine. [8]
5. List the major characteristics of Bluetooth. Draw the block diagram of data acquisition system and explain each block. [3+5]
6. Explain the principle of energy coupling. Describe about capacitive coupling with remedies. [6]
7. Discuss and differentiate between different types of fault tolerance schemes used in the purpose of circuit design. [6]
8. Explain ground, returns and shields in the context of circuit layout. [6]
9. a) Draw the complete block diagram for prototype model in software development process and explain its component in brief. [4]
   b) Write about White box testing and Black box testing. [3]
10. Draw the complete block diagram of industrial process control system involved in your case study. Explain why you want to implement this control system over existing one in terms of cost, manpower and plant automation. What problems you might face after implementing this control system. [12]

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2076 Chaitra

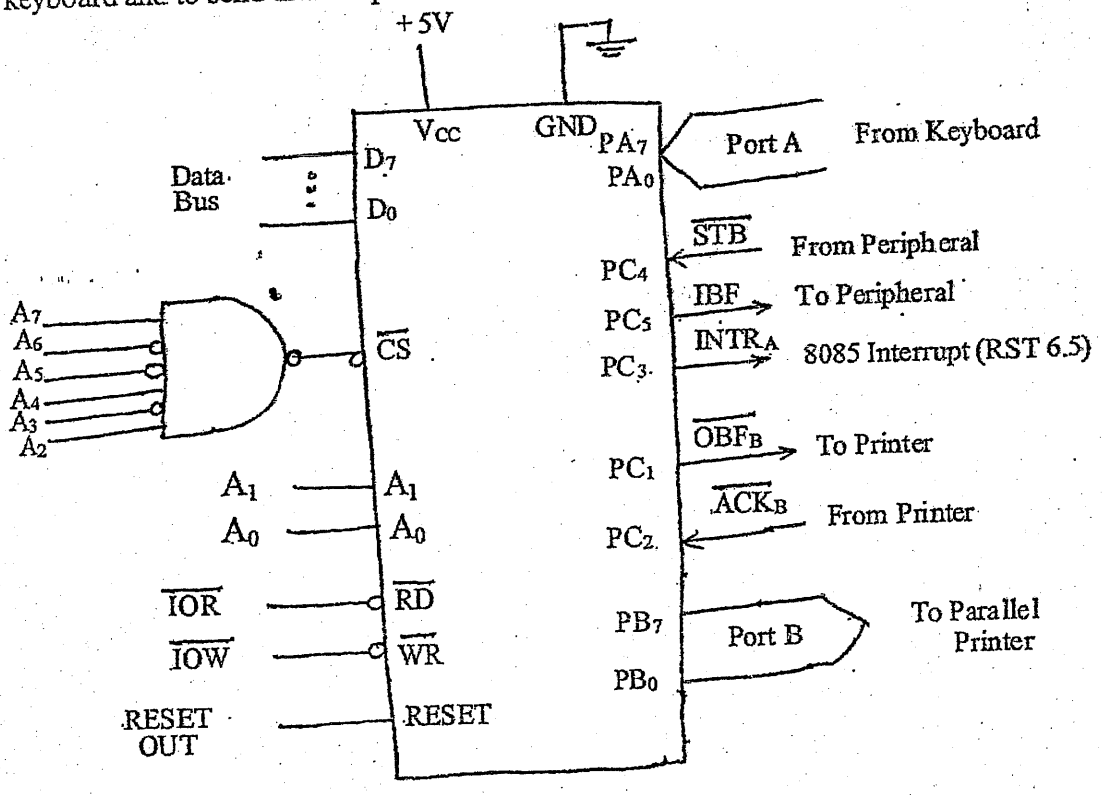
Exam.	Regular		
Level	BE	Full Marks	80
Programme	BEL, BEX, BCT	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: - Instrumentation II *(EX 602)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt <u>All</u> questions.*
- ✓ *The figures in the margin indicate <u>Full Marks</u>.*
- ✓ *Assume suitable data if necessary.*

1. a) Explain the basic modes of data transfer techniques available between microprocessor and peripheral devices. [5]
   b) Mention the features of Microprocessor Based Instrumentation system. [3]

2. Port A is to design as the input for a keyboard in interrupt driven I/O and Port B as the output for a printer in status check I/O using mode 1 of 8255 with 8085 microprocessor as shown below: [9]
   a) Find port addresses by analyzing decoding logic.
   b) Determine the control word to set up port A as input and port B as output.
   c) Determine the BSR word to enable $INTE_A$.
   d) Determine the masking byte to verify the OBF_B line.
   e) Write main program and a read and write subroutines to accept characters from keyboard and to send them to print.



3. a) Explain the Null modem with and without handshaking mechanism. [5]
   b) Explain Cyclic Redundancy Code with suitable example. [4]

4. Design the interfacing of 1408 DAC with an output port of address AF H for 0v to 10v range. Note that take appropriate values for resistors and capacitors. [8]

5. a) How can you design the communication system with satellite as an unguided transmission scheme? [4]
   b) Explain the Data Acquisition system with the help of compact data logger. [4]

6. Explain different types of filtering mechanisms used to reduce conductive noise coupling on the basis of frequency, mode and amplitude. [6]

7. Define ground bounce and crosstalk in circuit design. List their reduction ways. [6]

8. Describe the different terminologies used in routing signal traces for designing a commercial circuit layout. [6]

9. Explain spiral software development model with its advantages and disadvantages. Describe cohesion and coupling. [5+3]

10. Answer the following questions with regard to your case study. [12]
    a) Describe the existing work flow mechanism of the industrial instrumentation system.
    b) What are the critical factors affecting the production of existing system and what measures you can recommend for mitigating those factors?
    c) Design a proposed system using microprocessor/ microcontroller, input/ output devices, interfacing process, communication protocols, data converters and handshake signals with neatly labeled block diagram.
    d) List out the different advantages of the proposed plan in terms of technology, production rate, quality assurance, cost-benefit and return on investment (ROI).

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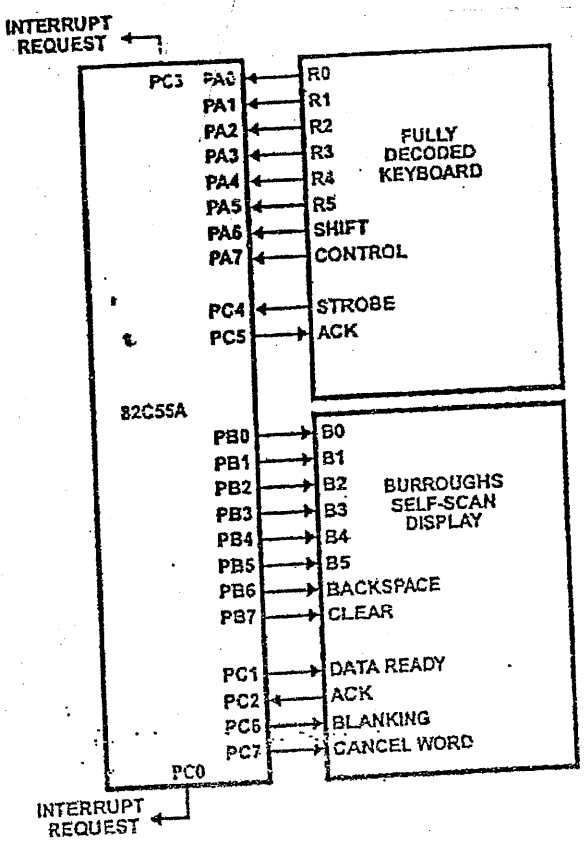
TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2076 Ashwin

Exam.	Back		
Level	BE	Full Marks	80
Programme	BEL, BEX, BCT	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: - Instrumentation II *(EX 602)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt All questions.*
- ✓ *The figures in the margin indicate Full Marks.*
- ✓ *Assume suitable data if necessary.*

1. a) Explain microprocessor based instrumentation system with its block diagram. [5]
   b) List out the factors to be consider while selecting a processor. [3]
2. An 8255A PPI card is connected to 8085 microprocessor has system as shown in figure below in which control word is stored in address of F3H. [1+3+2+2+2]
   a) What are the addresses captured by 8255A PPI card?
   b) Draw the minimum interfacing circuit.
   c) Write down the control word to initialize the 8255A PPI card.
   d) Write down the status word format for 8255A PPI card for the system.
   e) Write down BSR control word to initialize port A interrupt request.



3. a) What is the importance of RS 232-C in serial communication? Explain the RS 232-C working principle with its different types of signals. [1+4]

b) What is USB? Explain its common packet fields. [1+3]

4. a) Describe INL and DNL error of data converter with necessary illustrations. [4]

   b) With necessary diagram, Explain interfacing of 8 channel 8 bit ADC with 8085 microprocessor along with timing diagram. [5]

5. a) Discuss analog communication system and digital communication system with an appropriate block diagram. [4]

   b) Mention the characteristics of Bluetooth. Differentiate between piconet and scatternet network topology used in Bluetooth environment. [4]

6. a) What will happen to the electronic circuit connected in single point ground system when operated in frequency greater than 1 MHz? Explain with necessary illustration. [3]

   b) Explain how decoupling capacitor can be used to suppress the transient current. What effects do you observe when very large decoupling capacitor is connected in your circuit? [3+2]

7. a) What is reliability? List out the factor affecting reliability. [1+2]

   b) What are the factors that need to be considered while designing high speed circuit. [3]

8. How do you reduce crosstalk when routing signal traces on a PCB? [4]

9. Explain different types of software bugs that might exist in software. How these bugs can be identified while implementing different types of software testing. [6]

10. Explain existing industrial process control system involved in your case study with necessary block diagram. Recommend the changes that you deem necessary for the improvement of overall system performance. Explain why management should implement these changes. What are the probable problems you might face after implementation of your recommended system? [12]

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2075 Chaitra

Exam.	Regular / Back		
Level	BE	Full Marks	80
Programme	BEL, BEX, BCT	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: - Instrumentation II *(EX 602)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. a) Define closed loop MBI system with suitable example. [2]
   b) Among full or partial address decoding, which method of address decoding do you choose while interfacing memory device? Give reasons with suitable example. [4]
2. Interface a parallel bus centronics printer with 8085 microprocessor using 8255A in mode 1 output configuration.
   a) Draw the necessary interfacing circuit required for this purpose using 8255 PPI in handshake mode. [3]
   b) Determine port address as per your chip select logic. [2]
   c) Determine the control word required for printing operation. [2]
   d) Draw the timing waveform for transferring data to the printer. [2]
   e) Write an ALP to print characters whose ASCII code is available in memory location from 9000H. [3]
3. a) Explain the transferring of serial data using asynchronous transfer. One character is formed with 7-bit ASCII code, 1-bit start, 2-bit stop and 1-bit parity. [4]
   b) Describe up to date USB standards. Differentiate different USB data transfer mechanisms with suitable example of each. [6]
4. a) Explain the interfacing technique of 12-bit DAC to 8-bit Data bus. [6]
   b) Explain different types of errors in ADC & DAC. [4]
5. Explain Bluetooth network topology in detail. Why optical fiber has high demand in the field of communication. [4+2]
6. Explain different types of Energy coupling mechanisms with suitable example of each. How can a circuit be protected from ESD? [6]
7. What do you mean by reliability in a circuit design? Discuss how the reliablity can be achieved by incorporating fault tolerance. [6]
8. a) What is PCB? Write down the advantages of PCB. [1+2]
   b) How do you reduce cross talk when routing signal traces on a PCB? [3]
9. Define roll back recovery with suitable example. Explain the spiral model software development cycle. [2+4]
10. Explain your industrial visit carried out on your case study in terms of existing system circumstances, problem identification and analysis, recommendation plan, requirement and feasibility analysis of the recommended plan and rollback plan if necessary. Also list out the different advantages of the proposed plan in terms of technology, production rate, quality assurance, cost-benefit and return on investment (ROI) for the particular industry. [12]

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13 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2075 Ashwin

Exam.	Back		
Level	BE	Full Marks	80
Programme	BEL, BEX, BCT	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: - Instrumentation II *(EX602)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. a) What do you mean by interfacing? A RAM chip of 512 bytes is given for interfacing with 8085 microprocessor system. Design an address decoding hardware for the same. [1+3]
   b) What is an interrupt driven data transfer? Explain the operation of interrupt driven data transfer with flowchart of interrupt subroutine and main programme sequence. [1+5]
2. A/D converter requires signal to start the conversion and indicates with the end of conversion signal. 8255A PPI is interfaced with 8085 microprocessors at 80H. Microprocessor reads 8-bits O/P data of the ADC at port A and display the same data to eight LED's connected at port B of 8255A. State any assumptions made.
   a) Identify the address captured by the card [1]
   b) Determine the necessary control words [2]
   c) Draw the schematic interfacing circuit [2]
   d) Write a program to perform the operation [3]
3. a) What is the importance of RS232-C in serial communication? Determine the time required to transmit a string: "Life is beautiful." using asynchronous serial data transfer method in baud rate of 4800 Baud. Suppose a character has 7 bits data, one bit start bit, one bit stop bit and one bit even parity bit. [2+4]
   b) Differentiate between USB 1.0 and USB 2.0. [1]
4. Interface a 10-bit DAC with 8255 PPI and 8085 CPU running at 2 MHz. Write an ALP to generate a triangular wave of frequency 500 Hz using the same interfacing circuit. The amplitude of the triangular wave should be +5V. [8]
5. a) 'In satellite communication the uplink frequency and downlink frequency are different.' Why? Explain the Bluetooth network topology. [1+3]
   b) Compare data archiving and data storage. With the block diagram describe the characteristics of data logger. [1+4]
6. Explain different types of filtering based on frequency, mode (common and differential) and amplitude (surge suppression). [6]
7. While selecting a processor for an embedded system product, you have to specify the performance, number of peripherals functions, memory and tool support to determine the appropriate processor for the product. As a system designer, provide a technical explanation for each of these factors required to achieve the proper functional design. [6]
8. What are general guidelines to avoid the crosstalk while routing signal traces on Printed Circuit Board? What are the problems due to impedance mismatch? [4+2]
9. What is software reliability? Compare waterfall and prototyping model. Describe Embedded and Real Time Software. [2+3+3]
10. Answer the following questions with regard to your case study.
    a) Design a proposed system using microprocessor/microcontroller input/output devices, interfacing process, communication protocols, data converters and handshake signals with neatly labeled block diagram. [6]
    b) Mention different types of problems that might occur after implementing the recommended setup and probable mitigating factors to overcome these problems. [6]

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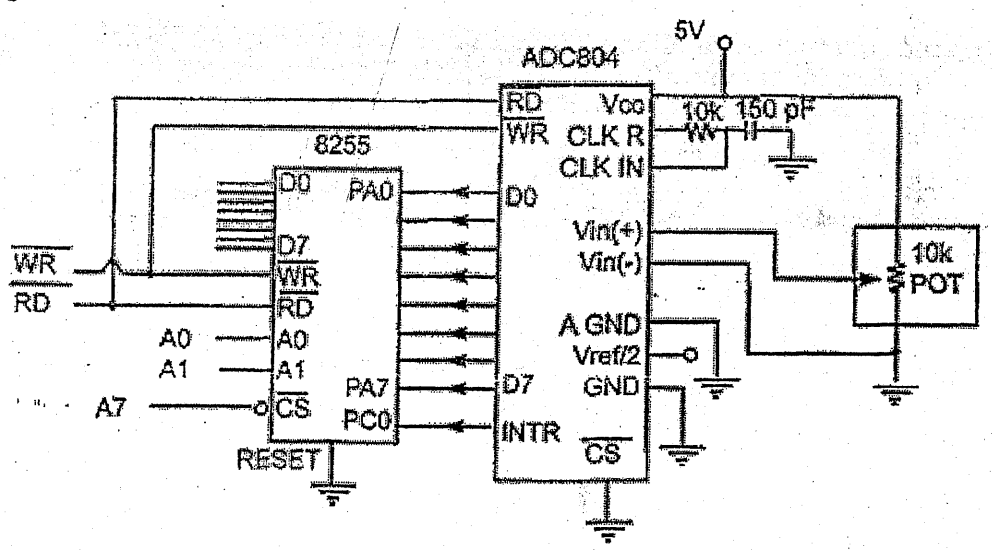
13 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2074 Chaitra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BEL,BEX, BCT	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: - Instrumentation II *(EX602)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. a) Describe various well-known techniques while interfacing an I/O device with a personnel computer system. [3]
   b) Differentiate I/O mapped I/O and memory mapped I/O with suitable examples. How can you generate I/O mapped and memory mapped signals using IO/M, RD and WR signals? [5]
2. Explain the different schemes of parallel data transfer with suitable timing diagram. Explain the functional block diagram of 8255A PPI with neat diagram. [4+4]
3. a) Describe the various error detection techniques used in serial data transmission. [3]
   b) Explain the functions of USB Host, USB Hub and USB Device. Discuss different packets used in USB protocol. [5]
4. What are the different types dynamic errors in ADC and DAC? What will be the control word for interfacing as shown figure below? Also write the subroutine program to read the digital data from ADC. [4+6]



5. Explain the advantages of optical fiber over copper wire? Explain each block of data logger. [2+6]
6. a) What are the different noise coupling mechanism? [3]
   b) How can you reduce the conductive noise coupling? Explain in detail. [3]
7. What are general approaches of establishing requirements for circuit design? What are the two factors that drive reliability of a product? [4+2]
8. Poor circuit layout and signal propagating principle may cause many problems in the circuit operation, manufacturing ease and probability of design errors. What factors will you consider while routing the signal traces on PCB. [6]
9. Explain Prototyping Model for software development in brief. Explain different phases of introduction of bugs in software. [3+5]
10. Describe the different processing plants that you have studied in case study. With neat and clean block diagram explain how the further improvement of these plants can improve the performance of the overall system. [12]

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22 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2074 Ashwin

Exam.		Back	
Level	BE	Full Marks	80
Programme	BEL, BEX, BCT	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: - Instrumentation II *(EX602)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

(1) If the speeds of I/O devices do not match the speed of the microprocessor, what types of data transfer techniques are used? Describe them with necessary block diagrams and control signals. [6]

(2) A microprocessor kit has an onboard 8255. Interface to the 8255 eight single-pole-double-throw (SPDT) switches numbered S0 to S7 and a seven segment common anode LED display. Draw the complete circuit setup. Define clearly the functions of all ports, write a program to initialize 8255, detect a switch closure, and display the value of the switch number on the LED display. [8]

(3) (a) Explain the design of a USB to RS-232 adapter with the aid of a neat circuit diagram, appropriate voltage translation chips, and necessary handshake/control signals. [6]

(b) What is the time required for transmission of a character with one start bit, seven data bits, one parity bit, and one stop bit with 1200 baud? [2]

(4) The data converter that is being used in your project is suffering from differential nonlinearity and harmonic distortion. Instead of purchasing a new converter, you are required to use the defective converter. Discuss technical measures that can be implemented to mitigate the aforementioned errors. [6]

(5) Signals from three different transducers need to be recorded in a data logger. The analog signals supplied by the three transducers are dual polarity (– 50 mV to 50 mV) having frequencies of 5 KHz, 10 KHz and 15 KHz. Explain the design of the following stages of the data logger:

(a) Input scanner stage of the data logger such that it can appropriately sample the incoming signals [3]

(b) Signal conditioner stage if the 8-bit ADC used inside the data logger accepts only positive polarity signals ranging from 0 volts to 5 volts. [3]

(6) Explain the mechanism of filtering line noise with the aid of chokes. How does a choke differentiate between the signal that it needs to pass and the noise that it needs to suppress? Describe the circumstances where chokes are preferred over other noise filtering approaches. [8]

(7) During circuit design process, what are some general technical dilemmas faced by engineers? Explain how an engineer can arrive at an optimal solution given the requirements of a customer? [8]

(8) (a) In a multi-layer PCB, describe how grounding is performed and how coupling amongst the layers is minimized. [4]

(b) A faulty computer motherboard has severe clock jitter. The crystal producing the clock pulses is functioning properly, but clock signals arriving at various motherboard chips suffer from jitter. Discuss the source of the problem and provide some remedies. [4]

(9) (a) Discuss the shortcomings of existing software development models, and suggest measures to overcome them. [5]

(b) The testing time for software cannot be too long, yet software needs to be thoroughly tested before it can be commercialized. Explain how this paradox is overcome in a real-world software development environment. [5]

(10) Answer the following questions with regard to your case study:

(a) Discuss the main architectural differences between the existing system and the proposed system. [2]

(b) Does your proposed system use a microcontroller or a microprocessor? Justify your choice, and make a neatly labeled block diagram of your proposed system. [3]

(c) In your proposed system, explain in detail the interfacing process of peripheral devices with the microcontroller or microprocessor in terms of data format, data rate, data converters, communication protocols, timing diagrams, and handshaking signals. [5]

(d) List the technical drawbacks present in your proposed design. [2]

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23 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2073 Chaitra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BEL, BEX, BCT	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: - Instrumentation II *(EX602)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. a) Define Microprocessor Based Instrumentation System. Explain, with suitable example, why microcomputer is an important consideration in instrumentation design. What are the basic features of microprocessor based instrumentation system? [1+2+2]
   b) Explain the interrupt driven data transfer scheme. [3]
2. a) List out the technical benefit of using 8255 PPI in MBI system. Explain PCI bus in brief. [2+2]
   b) Explain how the base address of 8255A is changed with change in address lines of 8085 connection with 8255A? [3]
3. a) Describe the functions of RS-232C signals used in handshaking. Why RS-422A can transfer data in longer distance and at higher rate than RS-232C? [1+3+1]
   b) Explain USB-OTG in brief. Discuss the types of data packets in USB protocol. [2+3]
4. a) Why analog signals need to be transferred to digital? What are the errors associated with ADC and DAC? [1+3]
   b) Explain the way you can interface a 10-bit DAC with 8085. [4]
5. a) Explain the characteristics of data logger. [4]
   b) Explain the Bluetooth network topology. [4]
6. a) How can you protect a circuit from electrostatic discharge? [2]
   b) A new model sports car had a disconcerning problem: occasionally the dashboard lights would all illuminate simultaneously. Two service calls later, replacement of a wire harness for the spark plugs solved the problem. Explain what the coupling mechanism was and how it can be reduced? [6]
7. Kathmandu Milk Supply Scheme has planned to automatize the milk refilling process. As an engineer, what would be your design considerations to reduce the probability of failure of the system? [5]
8. What is crosstalk? Explain the guidelines for low power design. [1+5]
9. Explain the approach for good programming practice. What are the basic criteria for selecting a company for purchasing reliable software? [4+4]
10. Discuss the current control mechanism of the industrial process control system involved in your case study with the help of block diagram. What was your recommendation for further improvement of this system? Explain why the management should implement your recommendation. Do you foresee any problems after implementing this control system? [12]

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24 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2073 Shrawan

Exam.	New Back (2066 & Later Batch)	Full Marks	80
Level	BE	Pass Marks	32
Programme	BEL, BEX, BCT	Time	3 hrs.
Year / Part	III / I		

Subject: - Instrumentation II *(EX602)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. a) Explain the features of microprocessor based instrumentation system. [3]
   b) Differentiate between open loop and closed loop instrumentation system along with block diagrams. [5]
2. Assume that your group has decided to make microprocessor based instrumentation system for an Ice Cream Factory using an 8255 PPI card at base address 5000H in memory mapped I/O mode for controlling purpose. You need to measure pressure and temperature of a manufacturing plant. [1+1+2+2+4]
   i) List out the collected documents and components.
   ii) List out different signals you need to derive and or can be directly connected to your interfacing circuit.
   iii) Draw minimum mapping circuit for above system
   iv) What are the addresses captured by your card? Generate the control word for the system
   v) Write a program module for measuring temperature and control if the temperature is not in the range. Assume suitable data if necessary.
3. a) Explain why system that uses the RS 422A can transmit data over longer distance and at higher baud rate than Rs 232C and RS 423A. [4]
   b) The fundamental elements of communication on the USB data Bus is a packet. Discuss various types of packets used in USB protocol. [4]
4. a) Why analog signal needs to be converted to digital? What are the selection criteria for selecting ADC? [2+2]
   b) What are the characteristics of ADC and DAC? [4]
5. a) What is spread spectrum frequency hopping in Bluetooth? Write the application of Bluetooth. [1+2]
   b) What is data logger? Explain the operation of data logger along with its block diagram. [5]
6. How inductive noise is introduced in electronic system? Discuss the shielding mechanism for capacitive coupling. [3+3]
7. Establishing requirements is the most difficult part of circuit design. What could be the basic tips and thoughts for setting requirements towards selecting the appropriate technology which help you to achieve a new circuit design? [6]

8. Write about the factors we should consider while doing component placement. Explain the role of grounding and shielding to reduce noise in PCB. [3+3]

9. The essential components of software development interact in different ways in different process models which helps to plan the development of a project and estimate the effort for it. Describe different types of software models used in Software Development platform. Also mention the merits and demerits of each model. [8]

10. What changes do you recommend in the visited industry during your case study? Why do you think that the management should implement these changes? Assume that you have a senior reporting engineer closely looking at work from the system development level, apart from convincing the management team at the visited industry to implement new system, you also need to convince the senior engineer technically so that your recommendations will be implemented. How do you want to achieve this technically? Debate on your technical design to replace the current system and also relate probable problems you might face after system implementation. [12]

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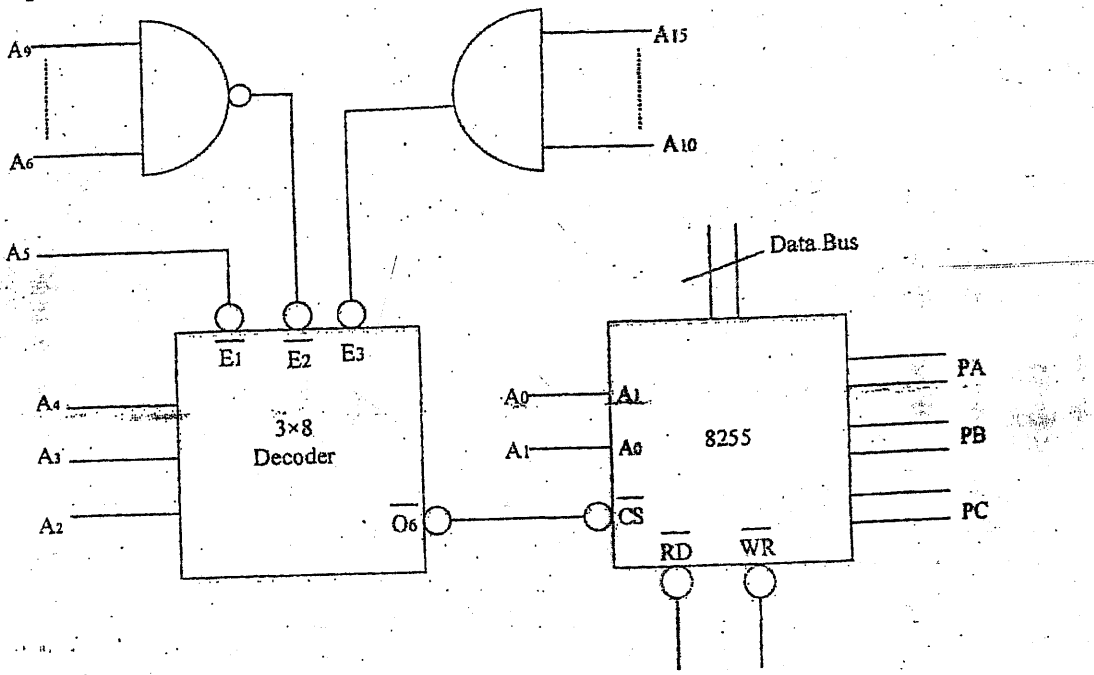
23 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2072 Chaitra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BEL, BEX, BCT	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: - Instrumentation II *(EX602)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. a) What do you understand by a closed loop MBI system? [1]
   b) Differentiate unique vs non unique address decoding. [4]
   c) Specify the addresses for the ports of 8255PPI shown in figure below. [3]



2. a) List out the technical benefits of using 8255 PPI in a MBI system. [2]
   b) With a neat timing diagram and an appropriate example, explain the operation of 8255 PPI in mode 2. You should clearly show the necessary control signals and an interfacing circuit to connect 8255PPI to 8085 microprocessor. Also write the necessary control words to configure the 8255 in this fashion. [3+3+2]

3. a) What are the errors associated with serial data transfer and their error checking mechanism? [4]
   b) What is USB on the Go? Write short note on USB packet types. [1+3]

4. a) With necessary illustrations, explain the cause behind the DNL and INL errors in A/D and D/A conversion. [2]
   b) Interface a suitable DAC using 8255 PPI to a 8085 microprocessor to generate a square wave oscillating between 0V and -5V having a frequency of 1 KHz. Show the interfacing circuit and the necessary program. [3+3]

5. A datalogger receives signals from Bluetooth Scatternet which consists of different Bluetooth devices. The data retrieved needs to be transmitted via option fiber links.

   a) What is frequency hopping? Relate it with the Bluetooth technology. [2]
   b) Write in brief about the typical characteristics of a datalogger. [3]
   c) Draw a neat and labelled block diagram of the complete system. [2]
   d) Compare and contrast the terms data archiving and data storage. [1]

6. a) Explain the remedial strategies for various energy coupling mechanisms. [4]

   b) An electronic circuit receives noise from a switching element. If voltage on the switching device swings from 4V to 6V within 100μs, during which current makes a transition from 10 μA to 25 μA in 10 ns, what might be the noise coupling mechanism? Identify it using suitable calculations. [2]

7. DOECE is looking for an expert engineer to work in the research projects of high frequency, high speed applications. What guidelines would you suggest as an engineer to design high speed and high frequency circuits? Explain in detail. [6]

8. Circuit boards combine electronic components and connectors in to a functional system through electrical connections and mechanical support. Explain the factors that need to be considered while creating traces to connect the electronic components. [6]

9. A software company is planning to make new software. Suggest good procedure to develop software. Explain different types of software models. [3+5]

10. Draw the complete block diagram of the industrial process control involved in your case study. What are the critical factors affecting the production you have noticed in the visited industry and what are the measures can you suggest for the same? Also mention advantages and disadvantages of suggested system. [12]

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23 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2072 Kartik

Exam.	New Back (2066 & Later Batch)		
Level	BE	Full Marks	80
Programme	BEL, BEX, BCT	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: - Instrumentation II *(EX602)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. a) "Microprocessors are indispensible tools in modern industrial instrumentation systems". As an engineer, provide a technical explanation including block diagrams to this statement by relying on observations from your case-study. [4]

   b) What benefit are obtained from a memory-mapped I/O design? Design an interface arrangement for 8085 microprocessor to map output ports in address space 1000H to 2000H and input ports in address space 3000H to 4000H. [4]

2. a) Consider a double handshake scheme that allows data transfer from an input peripheral device to an 8085-microprocessor through an 8255-PPI. [5]
      i) List all control signals that get exchanged between the devices.
      ii) Draw a detailed timing diagram showing the exchange of control and data signals. Include the cause and effect arrows in your timing diagram.
      iii) With a neat sketch how the overall system diagram between the modules mentioned above
      iv) Generate an appropriate control word based upon your drawing and derive the address of the control register of the 8255-PPI used in your design.

   b) List the control signals used by the ISA bus. Provide convincing arguments to justify the replacement of the ISA bus by the PCI bus. Calculate the brandwidth of a 64 bit PCI bus operating at 66-MHz. [3]

3. a) What are the criteria should be involved during the design of RS-232A in Simplex, Half Duplex and Full Duplex modes. [4]

   b) Explain the USB signals and associated bus states. Also mention the signal levels to achieve these bus states. [4]

4. a) Why do we need to digitize a signal? What are the errors associated with A/D or D/A converters? [6]

   b) What are the selection criteria for A/D or D/A converter? [2]

   c) To convert an analog signal into digital form, 8-bit ADC is used. The ADC has eight input channels, and channel four is used to capture the incoming analog signal. The address of the desired channel is sent through pins PB0, PB1 and PB2. After at least 50-nanoseconds, this address must be latched. The latching signal is sent using PB4. After another 2.5-microseconds, PB3 is used to initiate the conversion process. The completion of the process is signaled via PC5. The output latch of the ADC can be enabled through PB6, and digital data can be read through port A of 8255-PPI. [8]

i) Draw a circuit showing the interfacing of the ADC module, 8255-PPI and 8085 microprocessor on the basis of the connections described above.

ii) Draw the timing waveforms of all the control and data signals inyolved in the process.

iii) Provide a flowchart that depicts the ADC process

iv) Derive port addresses from your circuit diagram and provide the control word

5. a) In high-speed circuits, "ground" is a meaningless concept, the important question is, "what path does return current follow?" Justify the above statement with proper reasons and examples. [4]

b) Discuss the importance of an interface unit. What factors need to be accounted for while designing input and output interface units? [4]

6. a) Define impedance matching. What is the impact of impedance discontinuities? [2]

b) How do you reduce crosstalk when routing signal traces on a PCB? [4]

7. What are the basic principles of signal propagation and circuit layout for Routing Signal Traces which are predominant of effective circuit layout? [6]

8. Programs are to be read by humans. For programs to be useful, reliable and maintainable, you must make them readable and understandable. Good design and programming practices can make programs more readable. Explain in brief how you can make programs more readable. [8]

9. Answer the following questions with respect to your case study: [12]

i) What is techno-commercial feasibility of a system? Provide examples from your case-study experience.

ii) List the major technical drawbacks present in the existing MBI system that you witnessed at the industrial site.

iii) Give at least three feasible technical solutions to overcome the drawbacks that you witnessed. Show how your solution will offer higher reliability and incorporate fault-tolerant design practices. Include block diagrams.

iv) If you had to present your design to the company's management team, what sort of question would you anticipate? Provide a list of at least five questions that would be asked from a management point of view. How would you cope with the questions, and how would you convince the team to accept your design?

v) Repeat part (d), but now you are trying to convince senior engineers. How will the question and answer session change compared to part (d)?

vi) Compare and contrast your design with the existing design in terms of the following metrics: cost/performance ratio, technical specifications (hardware and software) and design complexity (provide diagrams)

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2080 Bhadra

Exam.	Regular		
Level	BE	Full Marks	40
Programme	BEL	Pass Marks	16
Year / Part	III / I	Time	1½hrs.

Subject: - Electric Machines II *(EE 601)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. a) Is it possible that the terminal voltage of synchronous generator (alternator) be greater than internal generated emf ? Explain with proper phasor and diagrams. Also describe the effect of armature reaction in resistive and inductive loading with proper diagrams. [3+5]

   b) A 3-phase star connected alternator is rated at 1500 kVA, 12000 V. The armature effective resistance and synchronous reactance are 2Ω and 25Ω respectively per phase. Calculate the emf generated and percentage voltage regulation for a load of 1250 kW at power factors of : (i) 0.75 leading (ii) 0.75 lagging. [6]

2. a) Derive the power angle characteristics of salient pole synchronous machine and also derive condition for maximum power. [5+2]

   b) A 3-phase, 5 kVA, 208 V, 4 –pole, 50 Hz star connected synchronous motor has negligible armature winding resistance and synchronous reactance of 8 ohm per phase. It is operated from the 3-phase, 208 V, 50 Hz power supply and field excitation is adjusted to that the power factor is unity and the motor, draw a power a 3 kW from the supply.

   (i) Find the back emf (or excitation) voltage and power angle.

   (ii) Keeping the excitation voltage constant, the power angle is increased by 20% due to increase in load on the shaft. Calculate the new armature current and power factor. [8]

3. a) Explain the working principle of single phase induction motor and draw its torque-slip characteristics. Explain one of the starting method. [3+2+2]

   b) Write short notes on DC servo motor. [4]

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2081 Baishakh

Exam.	Back		
Level	BE	Full Marks	40
Programme	BEL	Pass Marks	16
Year / Part	III / I	Time	1½ hrs.

Subject: - Electric machines II *(EE 601)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. a) Define voltage regulation of an alternator. Why voltage regulation at capacitive load is negative? Explain with the help of armature reaction and proper phasor diagram. [8]

   b) A 3-phase, 1500 KVA, 2300V, 50Hz star connected alternator has a per phase resistance of 0.12Ω. A field current of 70A produces a short circuit current equal to full load current of 376 A in each line. The same field produces an emf of 700V on open circuit. Determine the synchronous reactance of the machine and its full regulation at 0.8 power factor lagging. [6]

2. a) Explain how a three phase synchronous motor can be operated at lagging, leading and unity power factor by varying excitation. [8]

   b) A 3 phase, 5 kVA, 208 V, 4 pole Y-connected synchronous motor has negligible armature winding resistance and synchronous reactance of 10 ohm per phase. It is operated from 3-phase, 208V, 50Hz power supply and field excitation is adjusted so that power factor is unity and motor draws power of 3 kW. Calculate: [6]

   (i) The back emf (or excitation voltage) and power angle.

   (iii) Keeping the excitation voltage constant, the power angle is increased by 25% due to increase in load on the shaft. Calculate the new armature current and power factor.

3. a) Explain with help of torque speed characteristics why single phase induction motor not self-starting. How these can be made self starting? Explain one of them. [6]

   b) Explain the working principle and application hysteresis motor. [6]

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2080 Baishakh

Exam.	Back		
Level	BE	Full Marks	40
Programme	BEL	Pass Marks	16
Year / Part	III / I	Time	1 ½ hrs.

Subject: - Electric Machines II *(EE 601)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. a) What is the necessity of parallel operation of alternators?State the necessary conditions for paralleling alternators and describe bright lamp method of synchronizing alternators. [2+3+3]

   b) A 3 phase, star - connected, 50 Hz salient-pole synchronous motor has reactance of Xd = 0.8 pu and Xq = 0.5 pu respectively. The effective resistance is 0.02 pu. Compute percentage regulation when the generator is delivering rated load at 0.8 power factor lagging and leading. Assume rated voltage and rated current as one per unit. [6]

2. a) In what manner does a synchronous motor adjust itself to an increasing shaft load? [6]

   b) A 5 kVA, 220 V, star connected 3 phase salient pole alternator with direct axis and quadrature axis reactance of 12 Ω and 7 Ω per phase respectively, delivers full load current at unity pf. Calculate the excitation voltage, neglecting armature resistance. [6]

3. a) Explain the double field revolving theory for single phase induction motor and also explain why single phase induction motor is not self-starting with the help of torque-slip characteristics. Explain one of the starting method. [8]

   b) The main and auxiliary winding impedances of a 50Hz capacitor start single phase induction motor are Main winding Z_m=(3+j3) ohm and auxiliary winding Za = (7.5+j3) ohm. Determine value of the capacitor to be connected in series with auxiliary winding for obtaining a phase displaced of 90° between the currents in two windings at start. [6]

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2079 Bhadra

Exam.	Regular		
Level	BE	Full Marks	40
Programme	BEL	Pass Marks	16
Year / Part	III / I	Time	1 ½ hrs.

Subject: - Electric Machines II *(EE 601)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. a) Explain armature reaction in an alternator along with its effects. [2+6]

   b) A 3-phase delta connected alternator is rated at 1600 kVA, 13.5 kV having per phase armature effective resistance and synchronous reactance of 1.5 Ω and 3 Ω per phase respectively. Calculate the voltage regulation for a load of 1.28 MW at (i) 0.8 pf lagging (ii) 0.8 pf leading. [6]

2. a) Explain the variation of armature current and power factor for different values of excitation current in a synchronous motor with suitable figures and phasor diagrams. [6]

   b) A 3-phase 9 kVA, 320 V, 4-pole, 50 Hz synchronous motor has negligible armature winding resistance and synchronous reactance of 7.2 ohm per phase is operated from a 3-phase 320 V, 50 Hz power supply and field supply is adjusted so that power factor is unity and motor draws power of 4.6 kW from the supply.

   (i) Find back emf and power angle.
   (ii) Keeping excitation voltage constant, load on the shaft of motor increased so that load angle increases by 25%. Calculate new value of current drawn by the motor and power factor. [6]

3. a) Describe the construction and working principle of

   (i) Reluctance Motor (ii) Hysteresis Motor [7]

   b) A 250 W, 230 V, 50 Hz single phase capacitor start induction motor has the following constants for the main and starting windings.

   Main Winding: $Z_m = (4.5 + j3.7)\ \Omega$
   Starting Winding: $Z_s = (9.5 + j3.5)\ \Omega$

   Determine the value of capacitor to be connected in series with starting winding that will make the main and starting windings current in quadrature at starting. [7]

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2079 Baishakh

Exam.	Back		
Level	BE	Full Marks	40
Programme	BEL	Pass Marks	16
Year / Part	III / I	Time	1½ hrs.

Subject: - Electric Machines II (*EE 601*)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. a) What do you understand by the term Synchronization? Explain the Synchronizing process of a Synchronous generator operating parallel with an infinite bus bar. Also write the advantages and disadvantages of disadvantages of three dark lamps method of Synchronizing. [7]

   b) Calculate Voltage regulation and load angle for a 3-∅, Y-connected alternator rated at 18 MVA, 11 kV with per phase armature resistance and Synchronous reactance 1.5 Ω and 30 Ω respectively and operating at load of 1.48 MVA at 0.85 pf lagging. Also find the operating power factor for zero voltage regulation condition. [7]

2. a) With suitable figures and phasor diagrams justify that "variation in excitation of a Synchronous motor running with a given load produce variation in load angle only. [7]

   b) A 400V, 6-pole, 50 Hz, Star connected Synchronous motor has a resistance and Synchronous impedance of 0.5 Ω and 5 Ω per phase respectively. With certain excitation, while operating at unity pf, it takes 16A current. If load is increased such that line current drawn increased to 60A, determine the gross torque developed and the new power factor. [8]

3. a) Explain construction and operating details of rereluctance motor. What are the advantages, limitations and its applications? [5]

   b) A capacitor start motor has following details: [6]
   Capacity Rating: 260W at 50 Hz
   Main winding impedance: (8+j6) Ω
   Auxiliary winding impedance: (12+j6) Ω
   Calculate the value of capacitor that should be connected in series with auxiliary winding to provide a phase displacement between the currents in two windings. Draw the circuit and phasor diagram for the motor.

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2078 Kartik

Exam.	Back		
Level	BE	Full Marks	40
Programme	BEL	Pass Marks	16
Year / Part	III / I	Time	1 ½ hrs.

Subject: - Electric Machines II *(EE 601)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. What is meant by armature reaction in synchronous generator? Discuss the effect of armature reaction on its emf when the load is resistive, capacitive and inductive. [7]
2. A three phase-star-connected synchronous generator has effective resistance and synchronous reactance of 1.6 ohm and 35 ohm respectively per phase. Determine the percentage regulation and power angle for a load of 1320 kW at power factor of (a) 0.8 lagging and (b) 0.8 leading when the rating of the machine is 1650 kVA and 13.8 K.V. [7]
3. Explain why synchronous motor does not have self-starting torque? Write starting methods and explain the damper winding starting method. [7]
4. A 3-phase, 11 kV, 50 Hz, 10 pole, 200 kW star connected salient pole synchronous motor has $X_d = 1.2$ p.u. and $X_q = 0.8$ p.u. It operates at 0.98 power factor leading. Determine the internal emf and load angle. [7]
5. Explain the double field revolving theory for single phase induction motor. Write starting methods and explain operating principle of the capacitor start and run motor. [6]
6. The equivalent impedances of the main and auxiliary windings in a single-phase capacitor start motor are $(15 + j22.5)\ \Omega$ and $(50 + j\ 120)\ \Omega$ respectively, while the capacitance of the capacitor is 12 μF. Determine the line current at starting on a 230 V, 50 Hz supply. [6]

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2078 Bhadra

Exam.	Regular		
Level	BE	Full Marks	40
Programme	BEL	Pass Marks	16
Year / Part	III / I	Time	1 ½ hrs.

Subject: - Electric Machines II *(EE 601)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. Define the pitch factor and distribution factor and their significance in synchronous machine. Derive the e.m.f equation of an alternator. [4+4]
2. A 3-phase, star-connected, round-rotor synchronous generator rated at 10 kVA, 230V has an armature resistance of 0.5 ohm per phase and a synchronous reactance of 1.2 ohm per phase. Calculate the percentage voltage regulation at full load at power factors of (a) 0.8 lagging, (b) 0.8 leading, (c) determine the power factor such that the voltage regulation is zero on full load. [2+2+2]
3. A synchronous motor can operate as both inductive and capacitive characteristics. Justify this statement with relevant phasor diagrams. [7]
4. Salient pole synchronous motor has reactance X_d = 0.8 pu, X_q = 0.4 pu. It is a 3-phase, 50 MVA, 11kV, 50 Hz. Motor draws rated current at a supply power factor of 0.8 lagging. Rotational losses are 0.15pu and armature resistance losses are neglected.
   a) Calculate the excitation voltage.
   b) Find the power due to field excitation and that due to the salience of the machine.
   c) If the field current is zero, will the machine stay in synchronism, explain why? [7]
5. Why is single-phase induction motor not self-starting? What are the various starting methods of the single-phase induction motors? Explain any two methods in detail. [2+1+3]
6. A 50 Hz split phase induction motor has a resistance 5Ω and an inductive reactance of 20 Ω in both main and auxiliary windings. Determine
   a) the value of resistance
   b) capacitance to be added in series with auxiliary windings to send the same current in each winding with a phase difference of 90°. [6]

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2076 Chaitra

Exam.	Regular		
Level	BE	Full Marks	40
Programme	BEL	Pass Marks	16
Year / Part	III / I	Time	1 ½ hrs.

Subject: - Electric Machines II *(EE 601)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. a) What are the different conditions to be satisfied for parallel operation of alternators? Describe in detail the full process of synchronization using dark lamp method. [8]

   b) The data obtained on 100 kVA, 1100V, Y-connected, 3-phase alternators are:
   DC resistance Test: Voltage between lines 6V DC, current in lines = 6A
   Open Circuit Test: Field Current = 12.5 A DC, line voltage = 420 V AC
   Short Circuit Test: Field Current = 12.5 A DC, line current = rated current
   Calculate the voltage regulation of alternator at 0.8 p.f. lagging. Take effective resistance to be 1.667 times of DC resistance. [6]

2. a) State the characteristic features and application of synchronous motor. Explain the effect of excitation on armature current and power factor on synchronous motor with diagram. [8]

   b) A 4KVA, 110V, 50Hz, 3 phase star connected synchronous motor has Xd = 3 ohm/phase and Xq = 2 ohm/phase, when the motor is delivering full load at 0.8 pf. lagging at rated voltage. Calculate the excitation emf, load angle and maximum power that motor can develop. [6]

3. a) A 250 KW, 230 V, 50 Hz, capacitor start motor has following impedance: Main Winding, Zm = (4.5 + j3.7) ohm and Auxiliary winding Za = (9.5 + j3.5) ohm. Determine the value of capacitor to be connected in series with auxiliary winding that will place main and auxiliary winding currents in quadrature at starting. [6]

   b) Write short notes on: [6]

   (i) AC Servomotor
   (ii) Hysteresis motor

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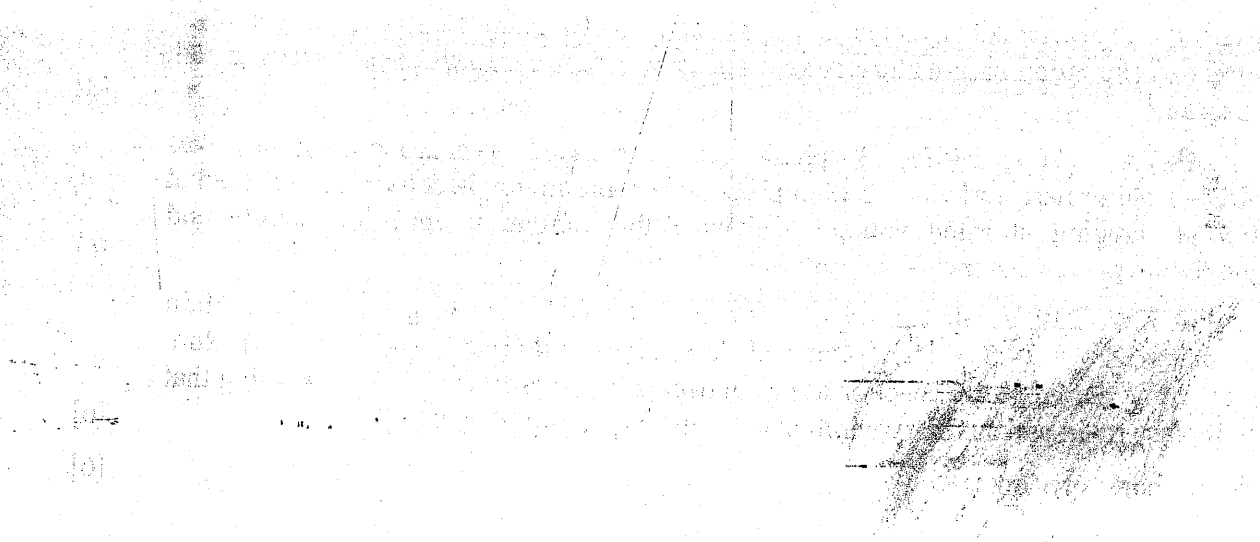

TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2076 Ashwin

Exam.	Back		
Level	BE	Full Marks	40
Programme	BEL	Pass Marks	16
Year / Part	III / I	Time	1½ hrs.

Subject: - Electric Machines II *(EE 601)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. a) Discuss the construction and principle of operation of a three phase synchronous generator. [7]

   b) 3 phase star connected, 50Hz synchronous generator has direct axis and quadrature axis reactance of 0.6 pu and 0.45 pu. Draw the phasor diagram at full load 0.8 lagging and hence calculate. (i) load angle (ii) Id and Iq (iii) open circuit voltage (iv) voltage regulation Resistance drop at full load is 0.015pu. [7]

2. a) Explain the principle of operation of shaded pole motor. [6]

   b) A three phase, star connected 1500 KVA, 13 KV, alternator has armature resistance of 0.9 ohm per phase and synchronous reactance of 8 ohm per phase. In each of the following cases if the alternator is supplying rated full load current at rated terminal voltage. Calculate emf generated and voltage regulation in each following cases:

   i) unity P.F.
   ii) 0.8 P.F. lagging [8]

3. a) Why are the single-phase induction motor not self-starting? How these can be made self starting. Explain one of them. [6]

   b) Explain how the damper winding on the rotor pole of a 3-phase synchronous motor can be used to make the motor self starting. [6]

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2075 Chaitra

Exam.	Regular / Back		
Level	BE	Full Marks	40
Programme	BEL	Pass Marks	16
Year / Part	III / I	Time	1½ hrs.

Subject: - Electric Machines II *(EE 601)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. a) In what circumstances, terminal voltage of a three-phase synchronous generator could be less than or more than the internal induced voltage? Explain with circuit diagram and phasor diagram. [6]

   b) A 3-phase, 10KVA, 400V, 50Hz star-connected synchronous alternator supplies the rated load at 0.8 power factor lagging. If the armature resistance is 0.5Ω and synchronous reactance is 10Ω, find the power angle and voltage regulation. [8]

2. a) State the characteristic features of synchronous motor and explain how a synchronous motor can be operate to draw lagging current as well as leading current. [7]

   b) A 6600V, 2MW, 3 phase star connected synchronous motor has Xd=5 ohm/phase and Xq=3.1 ohm/phase. Neglecting all losses. Calculate the excitation e.m.f. when the motor supplies rated load at 0.8 p.f. [7]

3. a) A 250 W, 230 W, 50 Hz, single-phase capacitor start Induction motor has the following constants for its main and starting windings: [6]

   Z_m=(4.5+j 3.5)Ω and Z_s=(9.5+j3.5)Ω. Determine the value of the starting capacitor that will place the main and starting winding currents in quadrature at starting.

   b) Explain the operating principle of split-phase capacitor start motor. [6]

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14 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2075 Ashwin

Exam.	Back		
Level	BE	Full Marks	40
Programme	BEL	Pass Marks	16
Year / Part	III / I	Time	1 ½ hrs.

Subject: - Electric Machines II *(EE601)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. a) Explain load characteristics of synchronous generator. Why terminal voltage of a synchronous generator is greater than internal generated emf (E) in case of capacitive load? Explain with the help of armature reaction and phasor diagram. [8]

   b) A 3-phase, star connected synchronous generator is rated at 1.5 MVA, 11kV. The armature effective resistance and synchronous reactance are 1.2 Ω and 25 Ω respectively per phase. Calculate the percentage voltage regulation for a load of 1.4375 MVA at i) 0.8 p.f. lagging and ii) 0.8 p.f. leading. Also find out the p.f. at which regulation is zero. [6]

2. a) A synchronous motor can operate as both inductive and capacitive characteristics. Justify this statement with relevant diagrams. [7]

   b) A 25 MVA, 3-phase star connected 11 kV, 12 poles, 50 Hz salient pole synchronous motor has direct axis reactance of 48 ohm and quadrature axis reactance of 3.5 ohm per phase. The armature resistance being negligible. At rated load, unity power factor and rated voltage, Determine,

   (i) Excitation Voltage
   (ii) Maximum value of power angle and corresponding power [7]

3. a) Explain the operating principle of stepper motor and list their application. [6]

   b) Explain the operating principle and Speed-Torque Characteristics of Single Phase Capacitor start Capacitor run-Induction Motor with suitable diagram. [6]

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14 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2074 Chaitra

Exam.	Regular		
Level	BE	Full Marks	40
Programme	BEL	Pass Marks	16
Year / Part	III / I	Time	1 ½ hrs.

Subject: - Electric Machines II *(EE601)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. a) State the required conditions for the parallel operation of alternators. Also explain synchronizing process by three lamp method with neat sketch. [7]

   b) A star connected 50 kVA, 440V, 50 Hz alternator has effective armature resistance of 0.25 Ω per phase, synchronous reactance is 3.2 Ω per phase and the leakage reactance is 0.5 Ω per phase. At rated load and unity power factor, Determine: [7]

   (i) Internal emf
   (ii) No-load emf
   (iii)Percentage voltage regulation at full load

2. a) In what manner does a synchronous motor adjust itself to an increasing shaft load? [6]

   b) A 3.3 kV, 50 Hz star connected synchronous motor has a synchronous impedance of (0.8 + j 55) Ω. It is synchronized to 3.3 kV main from which it is drawing 750 kW at an excitation emf of 4.27 kV (line). Determine the armature current, power factor and power angle. Also find the mechanical power developed. If the stay load loss is 30 kW, find the efficiency. [8]

3. a) A 230 V, 50Hz, 4pole, class A, Single phase induction motor has the following parameters $r_{1m} = 2.51\Omega$, $r'_2 = 7.81\ \Omega$, $x_m = 150.88\ \Omega$, $x_{1m} = 4.62\ \Omega$, $x_2' = 4.62\Omega$. Determine the main winding current and power factor when the motor is running at a slip of 0.05. [6]

   b) How does double revolving field theory, describe the operation of single phase induction motor? Explain with proper diagrams and expressions. [6]

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24 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2074 Ashwin

Exam.	Back		
Level	BE	Full Marks	40
Programme	BEL	Pass Marks	16
Year / Part	III / I	Time	1 ½ hrs.

Subject: - Electric Machine II *(EE601)*

- Candidates are required to give their answers in their own words as far as practicable.
- *Attempt **All** questions.*
- *The figures in the margin indicate **Full Marks**.*
- *Assume suitable data if necessary.*

1. a) Define the pitch factor and distribution factor and their significance in synchronous machine. Derive the e.m.f equation of an alternator. [8]

   b) Three lamps can be used for synchronization of two alternators. Explain it with proper justification. [6]

2. a) Explain power angle characteristics of cylindrical rotor machine. [6]

   b) A four pole, single phase, 120 V, 50 H_2 induction motor gave the following standstill impedances when tested at rated frequency. Main winding: Z_n = (1.5+j4) ohms. Auxiliary winding: Z_a = (3+j6) ohms. If an external capacitor of 1000μF is inserted in series with the auxiliary winding to obtain higher starting torque. Calculate the percentage increase in starting torque. [6]

3. a) State and explain the double field revolving theory of single phase induction motor with detailed diagram. [8]

   b) "synchronous motor is not self starting" Explain it with proper justification. [6]

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24 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2073 Chaitra

Exam.	Regular		
Level	BE	Full Marks	40
Programme	BEL	Pass Marks	16
Year / Part	III / I	Time	1 ½ hrs.

Subject: - Electric Machine II *(EE601)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. a) Why the terminal voltage (V) of a synchronous generator is greater than the internal generated emf (E) in case of capacitive load? Explain it with the help of armature reaction and phasor diagram. [8]
   b) Explain the various factors which will affect the regulation of an alternator. [6]
2. a) Explain the functions of damper winding provided on pole face of rotor of a Synchronous motor. [6]
   b) A 30 MVA, 3 phase star connected 11 KV, 12 pole 50Hz salient pole synchronous motor has a direct axis reactance of 55 ohm and quadrature axis reactance of 4 ohm per phase. The armature resistance being negligible. At rated load, unity power factor and rated voltage. Determine (i) Excitation voltage (ii) The maximum value of power angle and corresponding power. [6]
3. a) Explain why single phase induction motor is not self starting? Also explain working principle and application of permanently split phase capacitor motor. [3+5]
   b) Explain operating principle of single stack stepper motor. [6]

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25 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2073 Shrawan

Exam.	New Back (2066 & Later Batch)		
Level	BE	Full Marks	40
Programme	BEL	Pass Marks	16
Year / Part	III / I	Time	1 ½ hrs.

Subject: - Electric Machine II *(EE601)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. a) What are the conditions to be fulfilled for operating two 3-phase alternators in parallel? Explain the process of synchronizing two alternators by three lamp method. [7]

   b) A 3-phase, star-connected 3-phase synchronous generator is rated as 1500 kVA, 11kV. The armature winding resistance is 0.8 ohm per phase and synchronous reactance is 4 ohms per phase. If the generator is supplying power to a three phase balanced load of (80+j60) ohm per phase at rated terminal voltage, calculate emf generated and voltage regulation. Is the generator overloaded OR under-loaded? Calculate the percentage by which it is overloaded OR under-loaded. [7]

2. a) Explain the effect of varying excitation on armature current and power factor in a synchronous motor. Draw V curves and state their significance. [7]

   b) A 660 V, 3-phase, star-connected synchronous motor draws 50 kW at power factor of 0.8 lagging. Find the new current and power factor when the back e.m.f increases by 25%.The machine has synchronous reactance of 3 Ω and effective resistance is negligible. [7]

3. a) Explain the double revolving field theory for operation of single phase induction motor. [6]

   b) Explain the construction and working principle of stepper motors. Also give some of its applications. [6]

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24 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2072 Chaitra

Exam.	Regular		
Level	BE	Full Marks	40
Programme	BEL	Pass Marks	16
Year / Part	III / I	Time	1 ½ hrs.

Subject: - Electric Machine II *(EE601)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. a) Define armature reaction. Discuss the nature of armature reaction of an alternator for lagging, leading and unity power factor load. [6]

   b) A 3-phase star-connected alternator is rated at 1500 kVA, 12000 V. The armature effective resistance and synchronous reactance are 2 Ω and 25 Ω respectively per phase. Calculate the emf generated and percentage voltage regulation for a load of 1250 kW at power factors of: (i) 0.75 leading (ii) 0.75 lagging. [8]

2. a) Explain how a three-phase synchronous motor can be operated to draw lagging as well as leading current from the source. [6]

   b) A 3-phase, 5kVA, 208V, 4-pole, 50 Hz star connected synchronous motor has negligible armature winding resistance and synchronous reactance of 8 ohms per phase. It is operated from the 3-phase, 208V, 50Hz power supply and field excitation is adjusted to that the power factor is unity and the motor draw a power of 3 kW from the supply. [8]

      i) Find the back emf (or excitation) voltage and power angle.

      ii) Keeping the excitation voltage constant, the power angle is increased by 20% due to increase in load on the shaft. Calculate the new armature current and power factor.

3. a) The main winding and starting winding of a 50 Hz capacitor start single-phase induction motor have impedances as follow: [6]

   Main winding: (3+3j) ohm

   Starting winding: (7.5+j3) ohm

   Calculate the value of capacitor to be connected in series with the starting winding to produce a phase difference of 90° between main winding current and starting winding current at starting.

   b) Write short notes on: [2×3]

      i) AC servo motor

      ii) Stepper motor

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division

2080 Bhadra

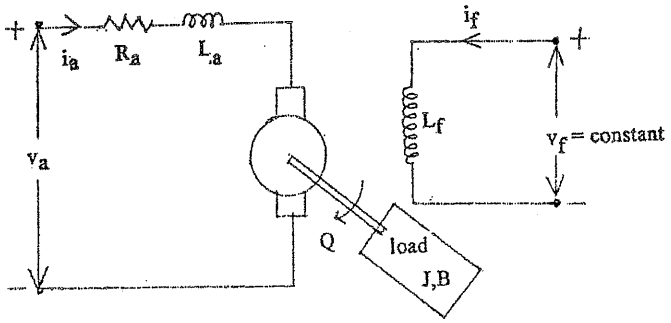
Exam.	Regular		
Level	BE	Full Marks	80
Programme	BEL,BEX,BME BAM, BIE	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: - Control System *(EE 602)*

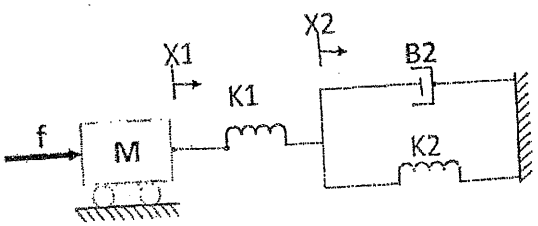
- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. a) Define control system. Why closed loop control system is more pronounced in modern complex system rather than open loop control systems. Justify. [2+4]

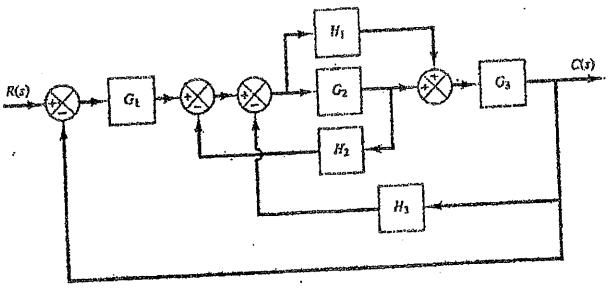
   b) Find the transfer function of armature controlled dc motor and also draw the block diagram of same. [6]



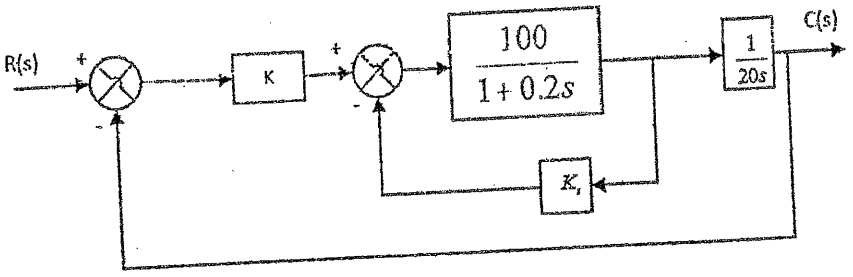
   c) Develop F-V and F-I analogy ckt of the mechanical system shown below. [4]



2. a) Obtain the overall transfer function of given system by signal flow graph technique. [8]



   b) Find the value of K and K_t so that the damping ratio of the system is 0.6 and the settling time is 0.1 sec. Assume unit step input. [8]



TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2081 Baishakh

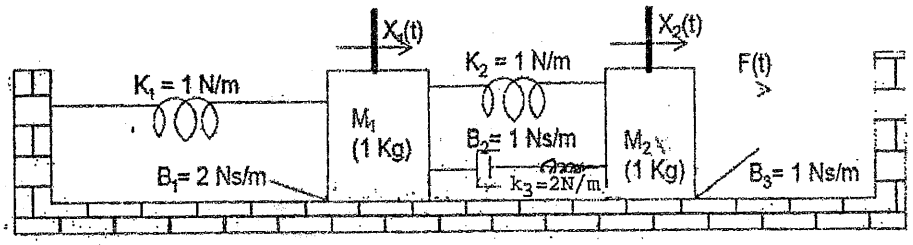
Exam.	Back		
Level	BE	Full Marks	80
Programme	BEL,BEX, BME,BAM, BIE	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: - Control System *(EE 602)*

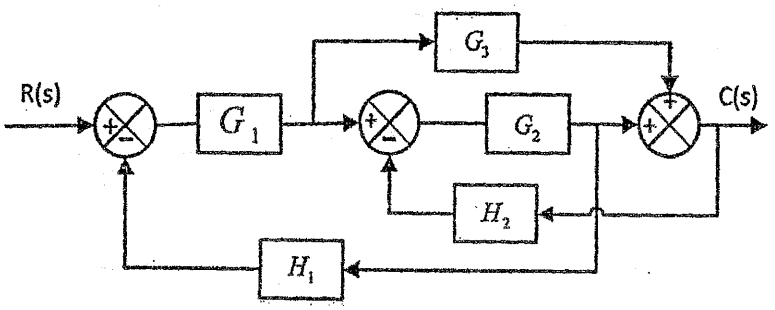
- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. a) What is control system? justify the significance of control system in Engineering with a suitable example. [6]

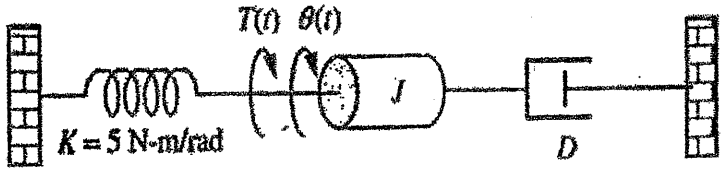
   b) The given mechanical has force, F(t) as input and X_1 and X_2 as displacement output. Draw the equivalent F-V analogous electrical circuit and determine the transfer function with X_1 as output. [2+8]



2. a) Find the overall transfer function C(s)/R(s) using the block diagram reduction technique. [8]



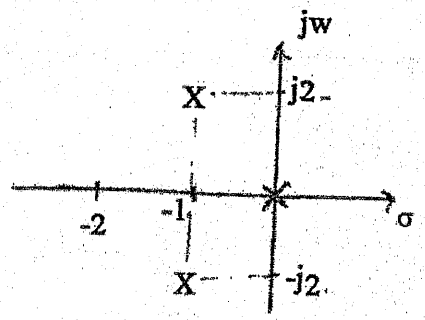
   b) For the given mechanical system, obtain the transfer function with angular displacement θ(t) as output and torque T(t) as input. Hence find J and D to give 20% overshoot and settling time of 2 second for step input of torque T(t). [8]



3. a) Using Routh-Hurwitz criterion determine the relation between "K" and "T" whose so that unity feedback control system whose open loop transfer function given below is stable. [6]

$$G(s) = \frac{K}{s[s(s+10)+T]}$$

b) Mention the criteria of Root locus plot. Write open loop transfer function and hence sketch the root locus of unity feedback system whose open loop poles and zeros are as shown in s plane below [2+8]



4. a) Draw the Nyquist plot for the open loop transfer function given below and comment on closed loop stability. [8]

$$G(s)=\frac{2.2}{s(s+1)(s^2+2s+2)}$$

b) Obtain characteristics equation for the system having given state model. [4]

$$\begin{bmatrix}x_1\\x_2\end{bmatrix}=\begin{bmatrix}-5 & -1\\3 & -1\end{bmatrix}\begin{bmatrix}x_1\\x_2\end{bmatrix}+\begin{bmatrix}2\\5\end{bmatrix}u \text{ and } Y=\begin{bmatrix}1 & 2\end{bmatrix}\begin{bmatrix}x_1\\x_2\end{bmatrix}$$

c) What is PI-controller? Also discuss its role in system response. [4]

5. Differentiate between lead and lag compensator. Design a suitable lead compensating network for $G(s)=\frac{K}{s^2(1+0.25s)}$ to meet the following specifications: $K_a = 10\text{sec}^{-2}$ and $P.M \geq 40°$. [2+14]

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2080 Baishakh

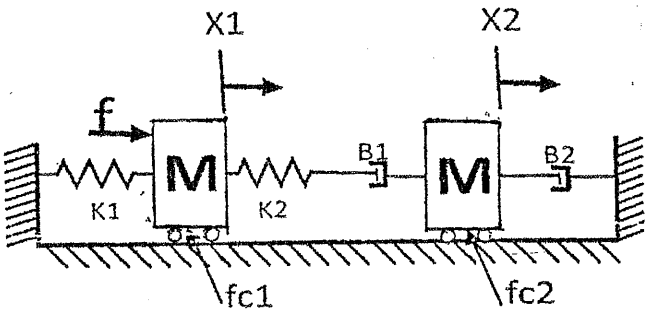
Exam.	Back		
Level	BE	Full Marks	80
Programme	BEL,BEX,BIE,BME,BAM	Pass Marks	32
Year / Part	III / I	Time	3 hrs

Subject: - Control System *(EE 602)*

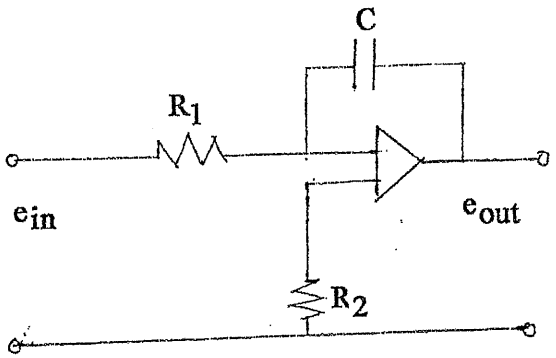
- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks***
- ✓ ***Semi-log graph paper will be provided.***
- ✓ *Assume suitable data if necessary.*

1. a) System response is faster in closed loop control system than in open loop control system. Justify. [4]

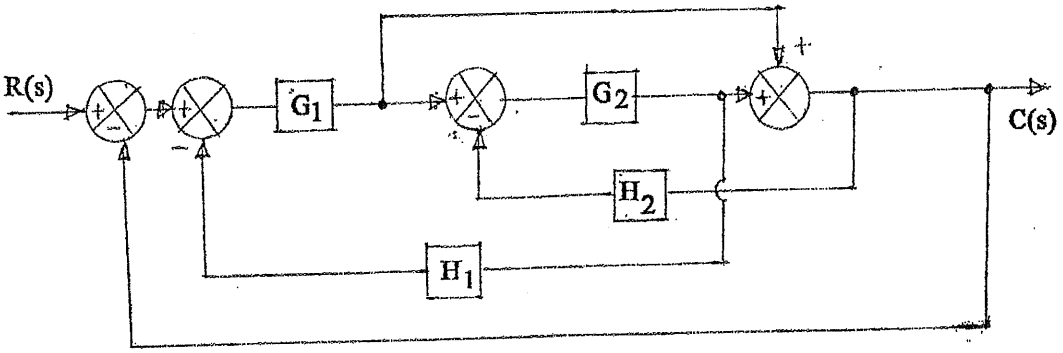
   b) Find the transfer $\frac{X_2(s)}{F(s)}$ for the given mechanical system. Also develop F-I analogy circuit. [8]



   c) Find transfer function, [4]

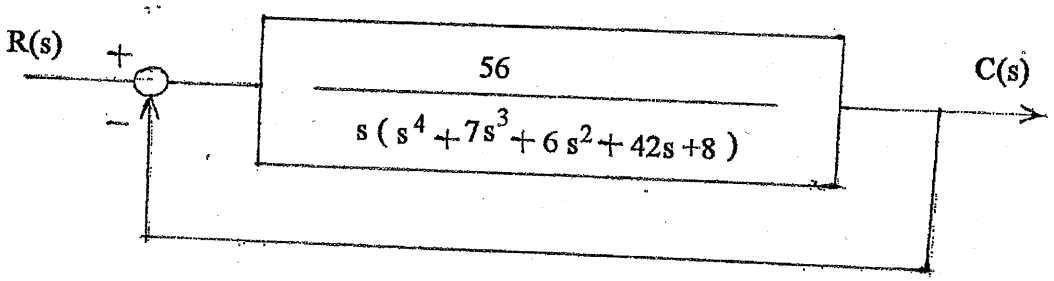


2. a) Obtain the overall transfer function of given system by block diagram reduction techniques. [8]



b) For a mechanical system with closed loop transfer function $\frac{\theta(s)}{T(s)} = \frac{1}{aS^2 + bS + c}$;
Where $\theta(s)$ is the output of step input $T(t) = 10Nm$. Determine values of a, b, and c ; if maximum overshoot is 6%, peak time$(t_p) = 1$ Sec, and $e_{ss} = 0.5$. [8]

3. a) Check stability of the system as given below in block diagram. [6]



b) Draw Bode plot for given open loop transfer function $G(s)H(s) = \frac{50(s+10)}{(s+1)(s+100)}$.
Also comment on stability from the plot. [10]

4. a) What is Nyquist Contour? Map the Nyquist contour of open loop transfer function $G(s) = \frac{200}{(S+3)(S+1)(S+2)}$ into G(s) plane and apply Nyquist criterion to check the stability of closed loop system. [8]

b) The system equation is given by $\dot{X}(t) = \begin{bmatrix} 0 & 1 \\ -5 & -6 \end{bmatrix} X(t) + \begin{bmatrix} 0 \\ 1 \end{bmatrix} U(t)$ and $y(t) = \begin{bmatrix} 1 & 0 \end{bmatrix} x(t)$. Find transfer function of the system and check stability. [8]

5. a) For a unity feedback system with open loop transfer function $G(s) = \frac{4}{s(s+2)}$
Design a Lead compensator such that settling time would become 2 seconds without change in maximum overshoot of the system. [12]

b) What is derivative feedback controller? Draw block diagram and find the transfer function and hence show its effect on transient performance of the system. [4]

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division

2079 Bhadra

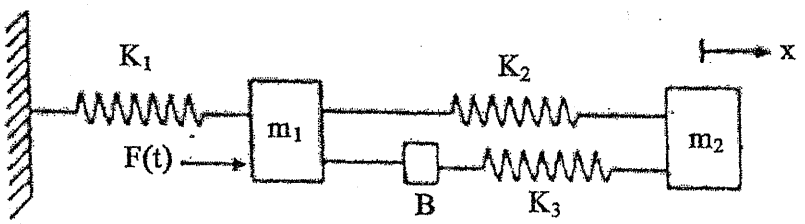
Exam.	Regular		
Level	BE	Full Marks	80
Programme	BEL, BEX, BME, BAM, BIE	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: - Control System *(EE 602)*

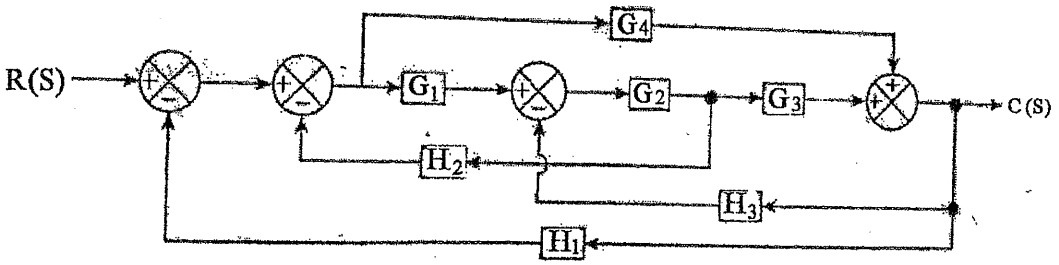
- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. a) Mention any two advantages of closed loop system in comparison to open loop system. You must justify them with any mathematical support. [6]

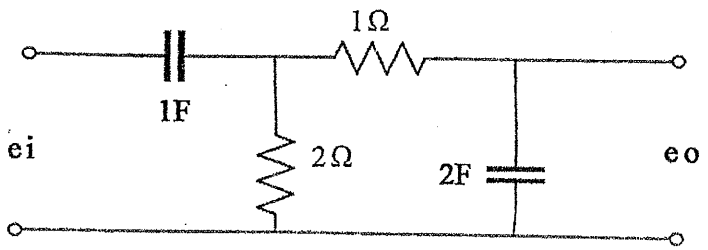
   b) Find the transfer function, $\frac{X(S)}{F(S)}$, for the mechanical system of figure below. Also draw F-V analogy circuit of the system. [8+2]



2. a) From the given block diagram, draw the signal flow graph and find the transfer ratio C(S)/R(S) using Mason gain's formula. [8]



   b) Find the impulse response of the given circuit. [8]



3. a) Using R-H criteria, tell how many roots of polynomial is in right half s-plane, in left half s-plane and on jw axis. Comment on stability. [8]

   $S^6 + 3S^5 + 4S^4 + 6S^3 + 5S^2 + 3S + 2 = 0$

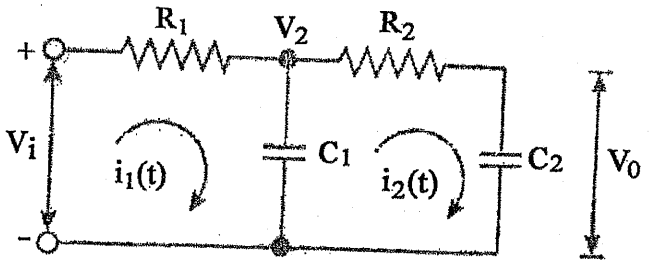
   b) Draw Bode plot for system with open loop transfer function.

$$G(S)\,H(S) = \frac{60}{s(s+2)(s+6)}$$

   Also find GM and comment on stability. [8]

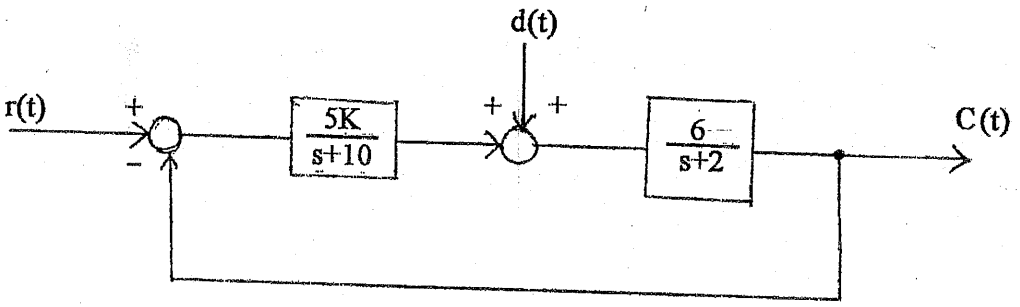
4. a) Examine the closed-loop stability of a system applying Nyquist criterion whose open-loop transfer function is given by $G(s)\,H(s) = \frac{50}{(s+1)(s+2)}$. Also find phase margin. [8+2]

b) Find state space model of given circuits. Consider V_0 as output. [6]



5. a) For a unity feedback system with open loop transfer function $G(s) = \frac{1.06}{s(s+1)(s+2)}$, design a log compensator such that steady state error for ramp input would be less than 0.2 without significant change in transients. [12]

b) The system below shows a potential tracking problems with the reference input r(t) and disturbance d(t). [4]



What value of K will limit the steady state component of c(t) due to d(t) to 2% of d(t)?

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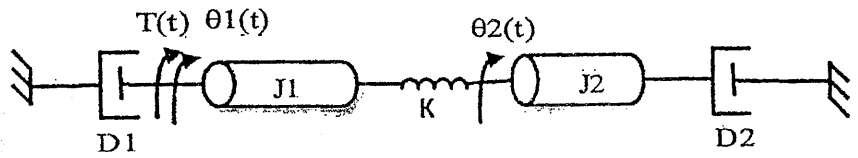
TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2079 Baishakh

Exam.	Back		
Level	BE	Full Marks	80
Programme	BEL, BEX, BME, BAM, BIE	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

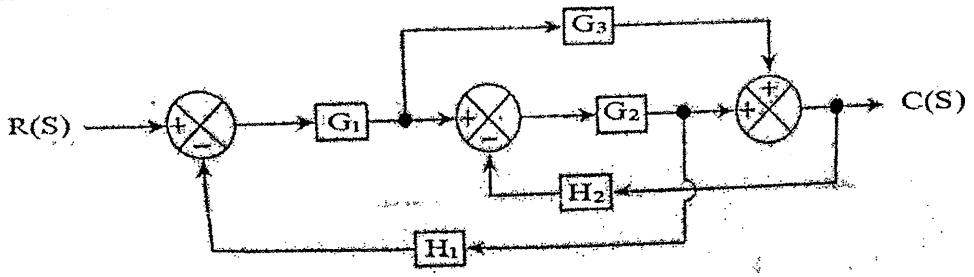
Subject: - Control System (*EE 602*)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

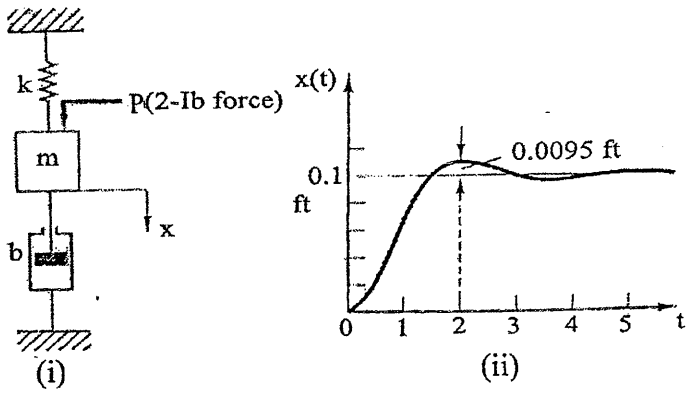
1. a) State whether the following statements are true or false and justify them.
   i) Negative feedback increases overall gain of the system. [4]
   ii) Derivative controllers are always used with other controllers. [4]
   b) Find transfer function. Take θ_2 as output. Also develop F-V analogous circuit. [8]



2. a) State the Mason's Gain formula to obtain the overall transfer function. Apply the same to obtain the transfer function of given system. [8]



   b) Figure (i) shows a mechanical vibratory system. When 2 1b of force (step input) is applied to the system, the mass oscillates, as shown in figure (ii). Determine m, b, and k of the system from this response curve. The displacement x is measured from the equilibrium position. [8]



3. a) What is the concept of relative stability? Using R-H criteria find the range of K for system having characteristics equation shown below, to be stable, critically stable and unstable.

$$S^4 + 2S^3 + (4+K)S^2 + 9S + 25 = 0$$

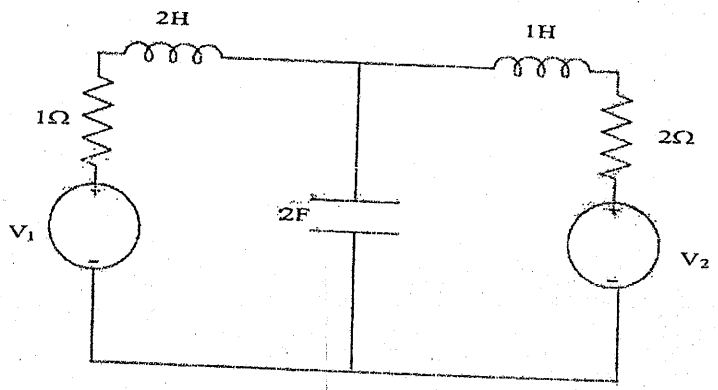
[2+6]

b) Sketch the root locus of unity feedback system with $G(s) = \frac{k(s+4)}{(s^2+2s+1)}$, hence find the range of parameter k for (i) underdamped response (ii) overdamped response (iii) critical damped response. [8]

4. a) State Nyquist Stability Criterion. Check the stability of a unity feedback system having forward transfer function given below using Nyquist Stability Criterion. [8]

$$G(s) = \frac{10}{s^2(1+2s)(1+3s)}$$

b) Write the state equation for the circuit shown below. Also check stability. [8]



5. a) Why compensation is necessary in control system? Briefly discuss need of lead and lag compensator networks. [4]

b) Design a suitable phase lag compensating network for $G(s) = \frac{k}{s(s+2)(s+20)}$ to meet the following specification. [12]

$K_v = 20\ Sec^{-1}$

$P.M \geq 35°$

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division

2078 Kartik

Exam.	Back		
Level	BE	Full Marks	80
Programme	BEL, BEX, BME, BAM, BIE	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

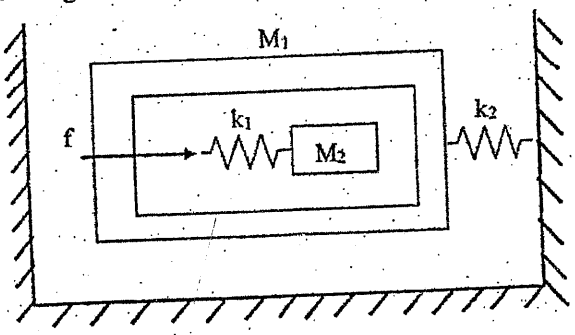
Subject: - Control System *(EE 602)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

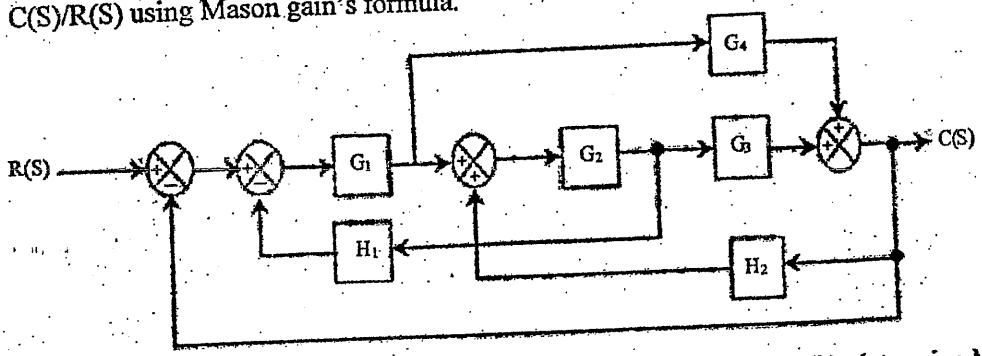
1. a) Why do you think traffic light system in Kathmandu is an open loop control system? [4]

   b) What is the affect of feedback on system gain and speed of response and how? [4]

   c) Consider displacement of mass M_2 as output and find transfer function of the mechanical system as in figure. Also find F – I analogous circuit. [6+2]



2. a) From the given block diagram, draw the signal flow graph and find the transfer ratio C(S)/R(S) using Mason gain's formula. [8]



   b) For the system as in figure (a), the unit step response is as in figure (b), determine M, B and K. [8]

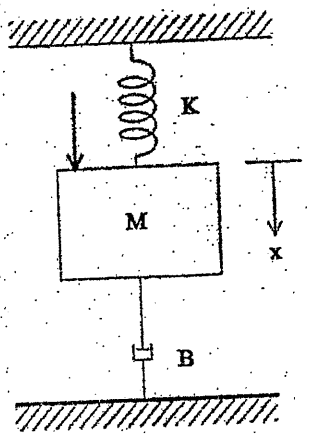


Fig (a)

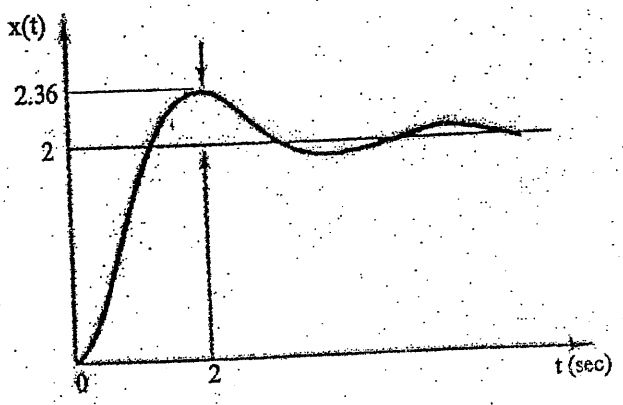
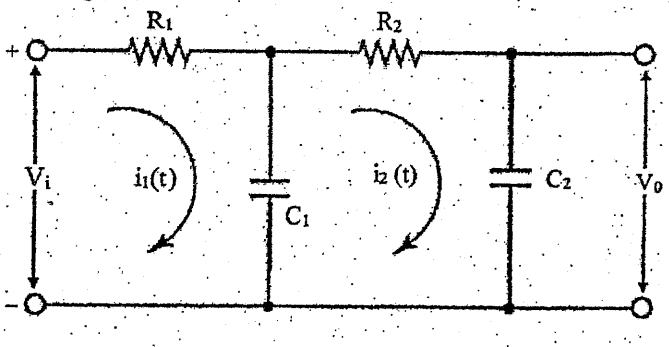


Fig (b)

3. a) Draw the block diagram of circuit shown below: [4]



b) The characteristic equation of a feedback control system is given by, [4]

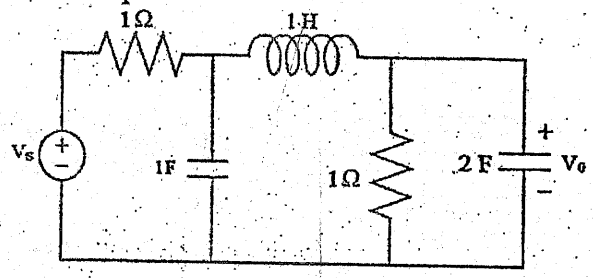
$s^4 + 20s^3 + 15s^2 + 2s + K = 0$

(i) Determine the range of K for the system to be stable.

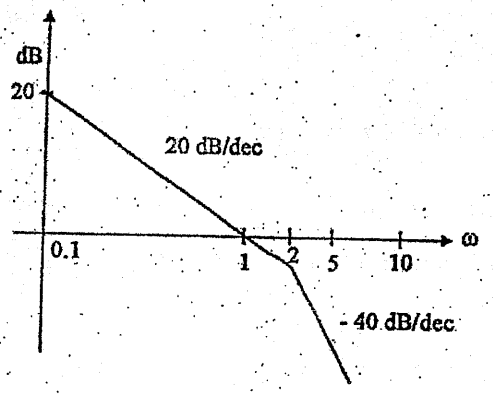
(ii) What value of K will make the system marginally stable? Also, find the frequency of sustained oscillation.

c) Draw the root locus for the system with open loop transfer function as $G(S)H(S) = \frac{K}{s(s^2+10s+24)}$ and hence from the root locus, find the gain(k) and corresponding natural frequency of oscillation when the damping ration is 0.7. [8]

4. a) Write the state space equation for the electrical network shown below. Take voltage across 2F capacitor as output. [5]



b) Find the open loop transfer function with the help of following Bode plot. [3]



c) For open loop transfer with unity feedback $G(S) = \frac{s+2}{(s+1)(s-1)}$. Sketch Nyquist plot, determine gain margin and comment on stability. [8]

5. a) What kind of controller would you recommend to bring changes in transient properties of a system and how? [4]

b) The open loop transfer function of a unity feedback control system is given by $G(s) = \frac{K}{S(1+0.2s)}$. Design a lead compensator such that the velocity error constant, $K_v = 10\ sec^{-1}$ and phase margin = 50°. Also draw the bode diagram for compensated system. [12]

TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2076 Chaitra

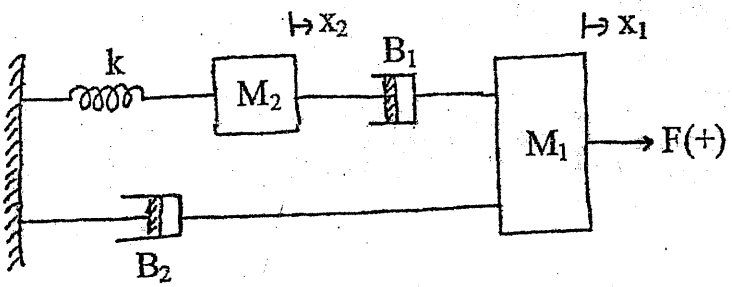
Exam.	Regular		
Level	BE	Full Marks	80
Programme	BEL, BEX, BME, BAM, BIE	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: - Control System *(EE 602)*

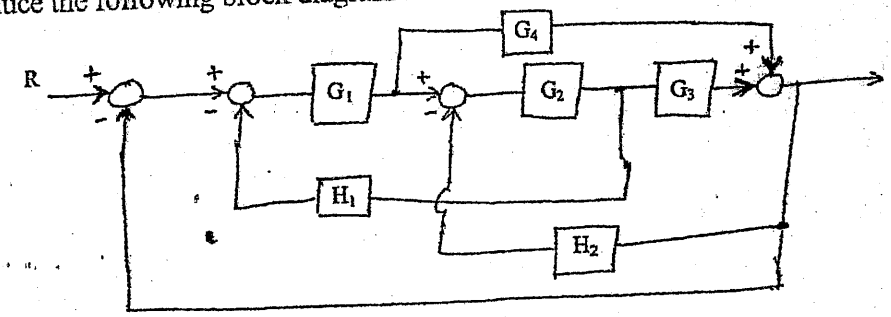
- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt <u>All</u> questions.*
- ✓ *The figures in the margin indicate <u>Full Marks</u>.*
- ✓ *Assume suitable data if necessary.*

1. a) Define control system. Why closed loop control system is more pronounced in modern complex systems rather than open loop control systems. Justify. [6]

   b) The given mechanical system has force, f(t) as input and x1 and x2 as displacement outputs. Draw equivalent f-v and f-I analogous electrical circuit and determine the transfer function with x_2 as output. [10]

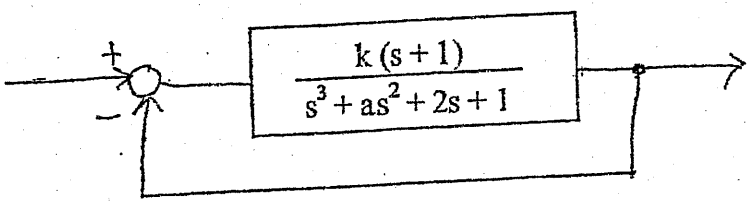


2. a) Reduce the following block diagram and find transfer function. [8]



   b) For a unity feedback system, the open loop transfer function is $G(S)=\frac{50}{s(s+2)}$. With unit step input find maximum overshoot and settling time. Also determine static error coefficients and steady state error if the input to the system is $r(t)=2+4t+6t^2, t\geq 0$. [8]

3. a) In the following system, determine K if the system just oscillates at a frequency 2 rad/sec. [6]



   b) Draw Bode plot for unity feedback system with open loop transfer function $G(S)=\frac{40(s+2)}{(2+s+25s^2)(1+2s)s}$. Find GM and comment on stability. [10]

4. a) Obtain the transfer function from the following system equations given by, [4]

$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \end{bmatrix} = \begin{bmatrix} 0 & 1 \\ -K/M & -B/M \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} + \begin{bmatrix} 0 \\ 1/M \end{bmatrix} u$$

$$y = [1 \quad 0] \begin{bmatrix} x_1 \\ x_2 \end{bmatrix}$$

b) Sketch the Nyquist contour and plot of unity feedback system having open loop transfer function: $G(S)H(S) = \frac{s+10}{(S-3)(S+3)}$

(i) Comment on stability.
(ii) Determine gain margin. [5+1+2]

c) Discuss briefly about PD controller. [4]

5. a) How does the location of poles affect the stability in control system? [2]

b) For a unity feedback system with feed forward transfer function $G(s) = \frac{10}{s(s+1)}$, design a lead compensator such that the settling time of the system will become 2sec and maximum percent overshoot 5%. [12]

c) Describe angle criteria for a point in s-plane such that the root locus would cross through the point. [2]

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division

2076 Ashwin

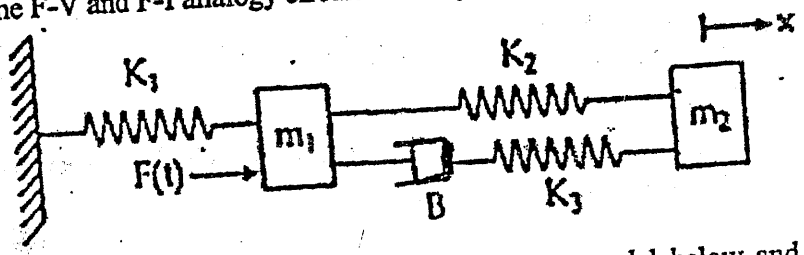
Exam.	Back		
Level	BE	Full Marks	80
Programme	BEL, BEX, BME, BAM, BIE	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: - Control System *(EE 602)*

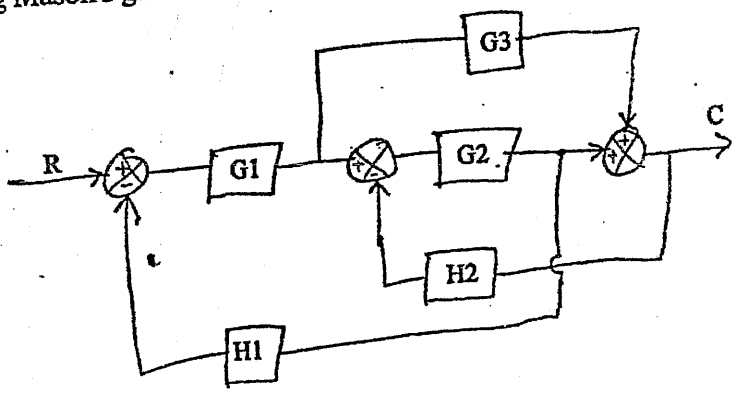
- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt All questions.*
- ✓ *The figures in the margin indicate Full Marks.*
- ✓ *Semilog graph paper will be provided.*
- ✓ *Assume suitable data if necessary.*

1. a) What is control system? Draw the block diagram of a closed loop control system and briefly explain the function of each block. [6]

   b) Find the transfer function. $\frac{X(S)}{F(S)}$, for the mechanical system of figure below. Also draw the F-V and F-I analogy circuit of the sy stem. [10]



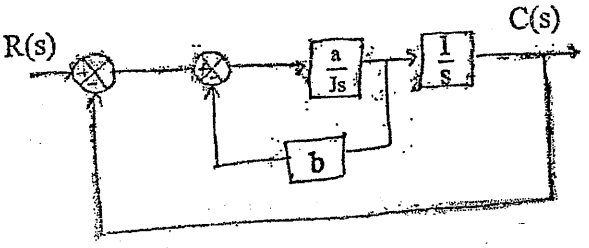
2. a) Develop Signal Flow graph for the block diagram model below and find transfer function using Mason's gain formula. [2+6]



   b) Check stability for the system with open loop transfer function $G(S)H(S)=\frac{2}{2s^5+3s^4+2s^3+s^2+2s}$ using R-H criterion. [4]

   c) What is derivative controller? How and why it can be useful? [4]

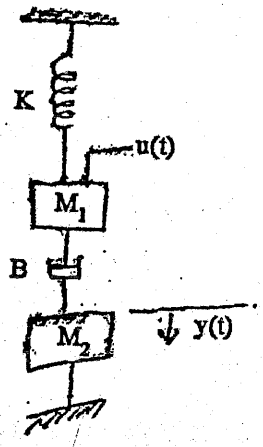
3. a) Determine values of a and b of the closed loop control system shown below, so that maximum overshoot for unit step input is 25% and the peak time is 2 sec. Assume that J=1 kg/m^3. [6]



b) Sketch Root locus plot for the system open loop transfer function $G(s)H(s) = \frac{k(s+2)}{s((s+1)(s^2+8s+64)}$. Discuss the region for stability, unstability and marginal stability. What is frequency of oscillation at the point of marginal stability? [10]

4. a) the open loop transfer function of closed loop system is $G(s)=\frac{2}{s(s+1)(2s+1)}$. Using Niquist Criterion, determine closed loop stability of this system. [8]

b) Consider a mechanical system shown in figure below. The external force u(t) is input to the system and displacement y(t) of the mass is the output. Obtain the state space representation of the system. [8]



5. Why lead compensator is required? Design a suitable lead compensating network for $G(S) = \frac{k}{s^2(1+0.25s)}$ to meet the following specification K_a=10 sec^{-1} P.M $\geq 35°$. [2+14]

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2075 Chaitra

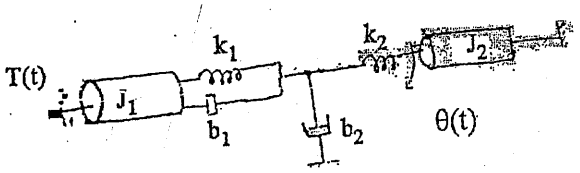
Exam.	Regular / Back		
Level	BE	Full Marks	80
Programme	BEL, BEX, BME, BAM, BIE	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: - Control System *(EE 602)*

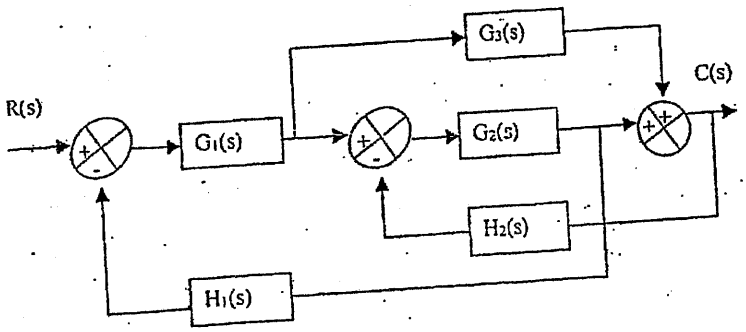
- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ ***Semilog graph paper will be provided.***
- ✓ *Assume suitable data if necessary.*

1. a) Which of the system is more sensitive to the disturbance and prove it how? Also discuss effect of gain on response of the system. [4+4]

   b) Find the transfer function $\frac{\theta(s)}{T(s)}$ for the mechanical system rotational system shown below: Also develop T-I analysis circuit. [8]



2. a) Using block diagram reduction technique, find the tr. Function $\frac{C(S)}{R(S)}$ of the figure given below. [8]



   b) A system has 40% overshoot and requires a settling time of 4 seconds when given a step input. Find peak time and rise time. [8]

3. a) Using R-H criteria fin the range of K for system having characteristics equation shown below, to be stable. [6]

$$S^4+2S^3+(4+K)S^2+9S+25=0$$

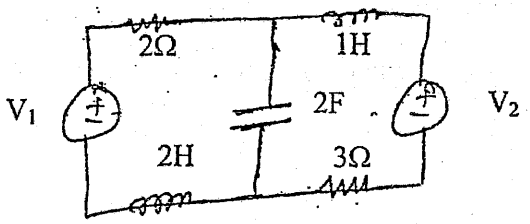
   b) Sketch Rout locus plot for the system with open loop transfer function. [6]

$$G(s)H(s)=\frac{k(s-1)}{s(s-1)}$$

   c) What sort of measures would you apply to track a reference from the actual output of the system? [4]

4. a) Using Nyquist criterion determine the stability of the feedback system whose open loop transfer function is given by $G(s)\,H(s)=\frac{1}{s(1+2s)(1+s)}$ and what is its gain margin? [10]

b) Develop state space model for circuit below. [6]



5. a) Consider a system shown below. The open loop transfer function is given by: $G(s)H(s)=\frac{2}{s(s+1)(s+2)}$. It is desired to compensate the system, so that the static velocity error constant K_v is 5 per second. The phase margin is at least 40^0 and gain margin is at least 10dB. Determine transfer function of appropriate lag compensator. [12]

b) Consider a point P in s-plane which actually indicate dominant closed loop pole of the system. How would you recognize that the root locus passes through the point P? [4]

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11 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2075 Ashwin

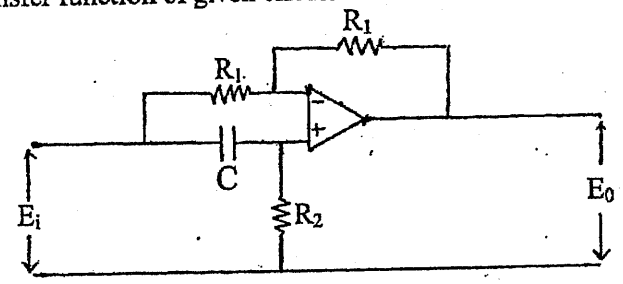
Exam.	Back		
Level	BE	Full Marks	80
Programme	BEL, BEX, BME, BAME, BIE	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: - Control System *(EE602)*

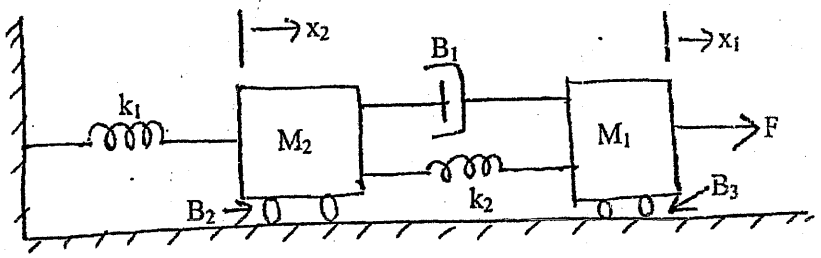
- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt <u>All</u> questions.*
- ✓ *The figures in the margin indicate <u>Full Marks</u>.*
- ✓ *Assume suitable data if necessary.*

1. a) Inspite of cost and complicated design, closed loop control system are widely preffered over open loop control system. Justify the statement with some examples. [4]

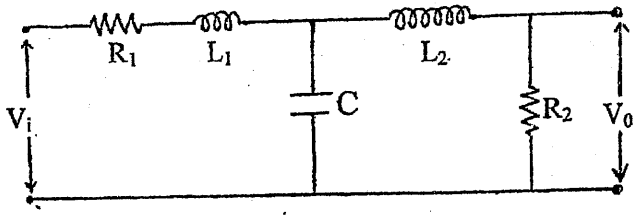
   b) Find the transfer function of given circuit. [4]



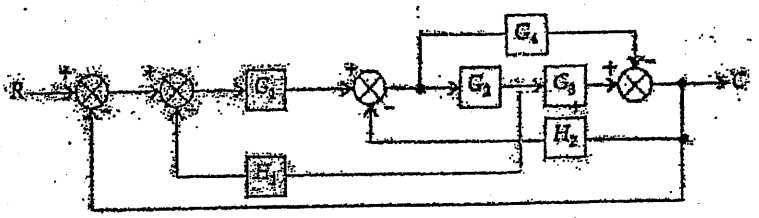
   c) For the mechanical system shown below find the transfer function $M_2(s)/F(s)$. Draw the force voltage analogy. [6+2]



2. a) Develop block diagram model for the circuit shown in figure below. [4]



   b) Using Masons gain formula, find the tr. Function $\frac{C(S)}{R(S)}$ of the fig given below. [8]



   c) Using R-H criteria, tell how many roots of polynomial is in right half s-plane. [4]
   $S^5 + 4S^4 + 2S^3 + 8S^2 + S + 4 = 0$

3. a) Fig (ii) is step response of system as in fig (i) find K and P. [6]

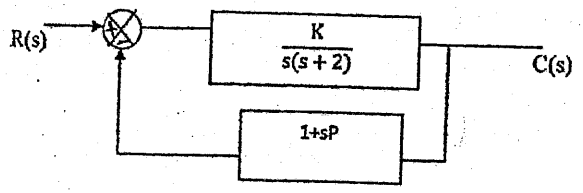


Fig. (i)

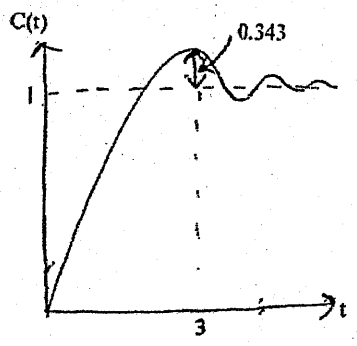


Fig. (ii)

b) Sketch the root locus for unity feedback the system having the forward path transfer function $G(S)=\frac{K}{(s^2+2s+2)(s^2+2s+5)}$ [10]

4. a) Using Nyquist criterion determine the stability of the feedback system whose open loop transfer function is given by

$$G(S)H(S)=\frac{(S+5)}{(S-2)(S+2)}$$

Also find GM. [8]

b) A system is characterized by the equation

$$\frac{Y(S)}{U(S)}=\frac{20(4s+2)}{s^3+5s^2+8s+2}$$

Find its state and output equation and express in matrix form. Then using your matrix, how do you get characteristic equation? [8]

5. a) Discuss effect of addition of a zero to a system. [4]

b) The open loop transfer function of a system is given by:

$$G(S)=\frac{1}{S(S+1)(0.5S+1)}$$

Compensate the system, such that, $K_v = 5\ sec^{-1}$ and phase margin is at least 40° and the gain margin is at least 10 dB with a lag compensator. [12]

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11 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2074 Chaitra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BEL, BEX, BME, BAME, BIE	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

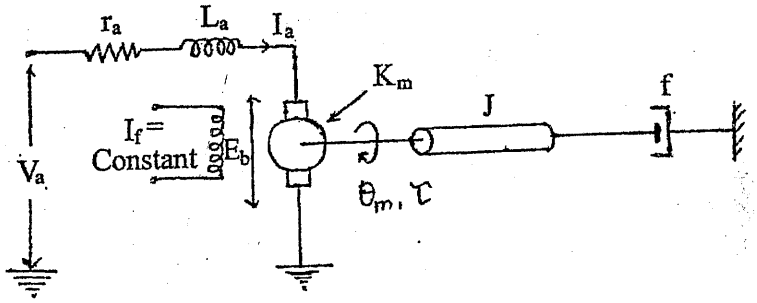
Subject: - Control System *(EE602)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

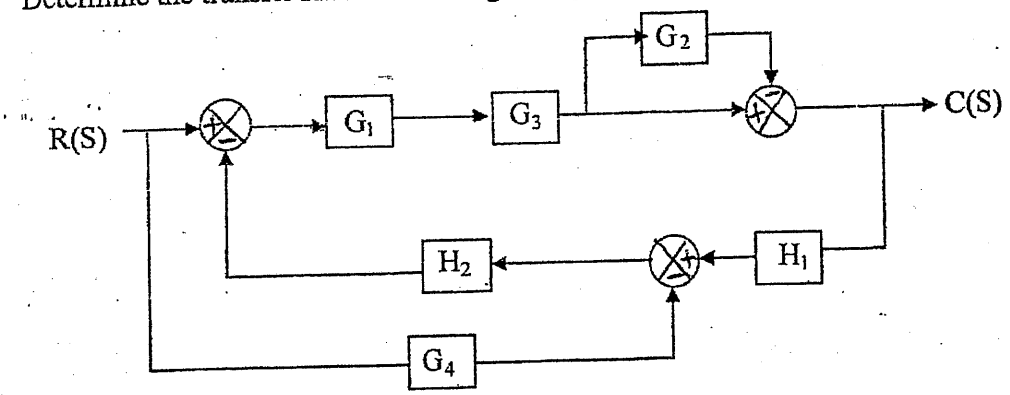
1. a) What is control system? Draw the block diagram of a closed loop control system and briefly explain the function of each block. [5]

   b) Show that the speed of response increases with the increase of the gain of the system. [3]

   c) Find the transfer function $\frac{\theta_m(S)}{V_a(S)}$ of the system below by constructing the block diagram. [8]



2. a) Determine the transfer function of the given system by reducing blocks. [8]



   b) Consider a unity feedback control system with the closed loop transfer function

$$\frac{C(S)}{R(S)} = \frac{Ks+b}{(s^2+as+b)}$$

   Determine the open loop transfer function. Show that the steady state error in the unit ramp input response is given by [5]

$$e_{ss} = \frac{a-k}{b}$$

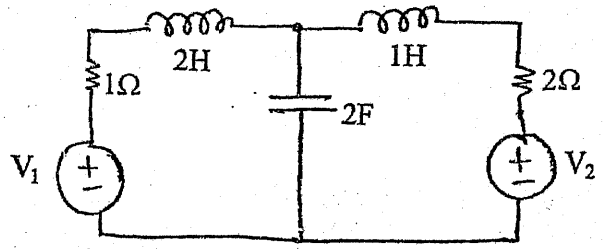
   c) How we can perform relative stability analysis using RH-Criteria? [3]

3. a) For a unity feedback system the open loop transfer function of a control system is given by [10]

$$G(S)=\frac{k}{s(s+4)(s^2+4s+20)}$$

Sketch the root locus for $0 \le K \le \infty$ and determine the breakaway point, the angle of departure from complex poles and the stability conditions.

b) Write the state equation for the circuit shown below. Also write output equation. [6]



4. a) Discuss working of PI controller. [4]

b) Suppose that the step response of a first order system is $C(t)=5(1-e^{-1/5})$. What are impulse and ramp responses? [4]

c) Sketch the Nyquist Plot of Unity feedback system having open loop transfer function and $G(S)H(S)=\frac{s+10}{(s-3)(s+3)}$. Comment on stability. What is gain margin? [8]

5. a) Discuss the purpose of lead and lag compensators. [4]

b) Design a suitable phase lag compensating network for $G(S)=\frac{k}{S(1+0.1s)(1+0.2s)}$ to meet the following specification [12]

$K_v = 30\ Sec^{-1}$

$P.M \ge 40°$

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21 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division

2074 Ashwin

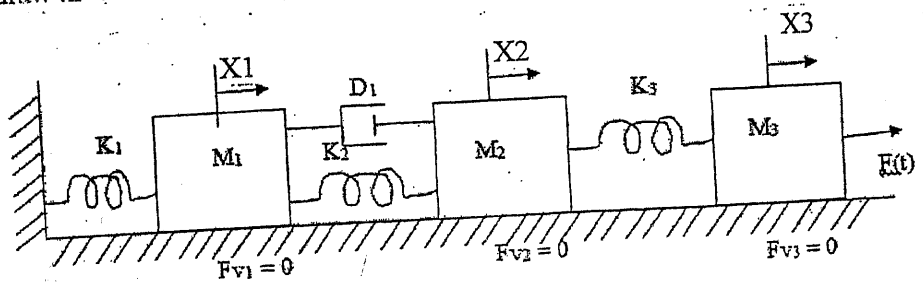
Exam.	Back		
Level	BE	Full Marks	80
Programme	BEL, BEX, BME, BIE	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: - Control System *(EE602)*

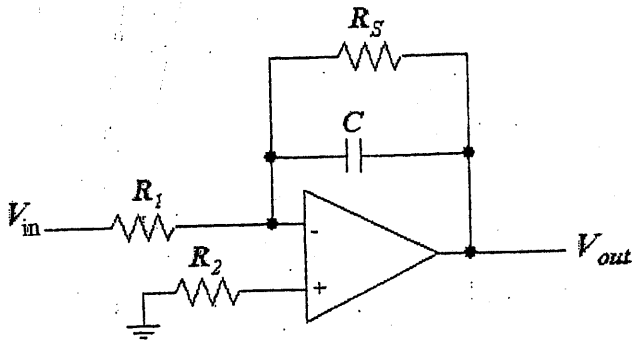
- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. a) How would a closed loop system differ from open loop one on its steps response? Give analytical explanation. [6]

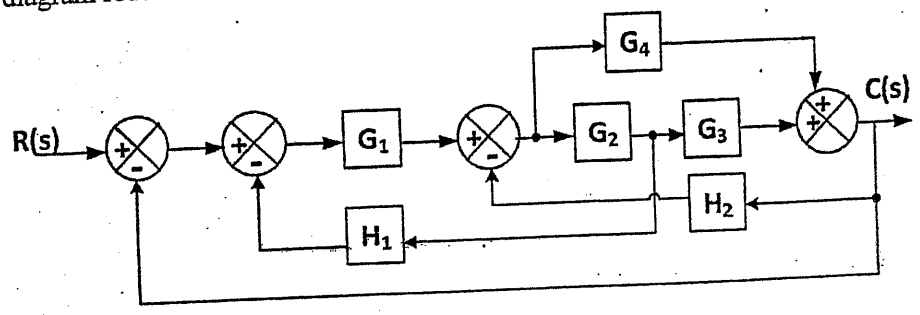
   b) Find the transfer function, $\frac{X2(S)}{F(S)}$, for the mechanical system of figure below. Also draw the F-V and F-I analogy circuit of the system. [6]



   c) Find transfer function of an op-amp model as below. [4]



2. a) Determine the overall transfer functions C(s)/R(s) of the given system by block diagram reduction technique. [8]



   b) Using R-H criteria, tell how many roots of polynomial given below is in right half s-plane, in left half s-plane and on jw axis. Comment on stability. [8]

$$s^6 + 3s^5 + 4s^4 + 6s^3 + 5s^2 + 3s + 2 = 0$$

3. a) The open loop transfer function of a control system is [8]

$$G(s)H(s)=\frac{(4s+1)}{s^2(s+1)(2s+1)}$$

Using Nyquist criterion, determine the open loop and closed loop stability of this system.

b) The open loop transfer function of a unity feedback system is given by [8]

$$G(S)=\frac{108}{S^2(s+4)(s^2+3s+12)}$$

Find the static error coefficients and steady state error of the system when subjected to an input given by $r(t)=2+5t+8t^2$

4. a) Draw Bode Plot for the system with transfer function $G(s)=\frac{20s+200}{(s^2+4s+25)(s^2+40s)}$.

Determine gain margin, phase margin and comment on stability of the system according to your plot. [8]

b) Given state equation and output equation, find transfer function $\frac{Y(S)}{U(S)}$ and determine the poles and zeros. [8]

$$X=\begin{bmatrix}0 & 1 & 0\\ -1 & -1 & 0\\ 1 & 0 & 0\end{bmatrix}X+\begin{bmatrix}0\\1\\0\end{bmatrix}u \quad \text{and} \quad y=\begin{bmatrix}0 & 0 & 1\end{bmatrix}X$$

5. a) State whether the statement "Derivative controllers are always used with other controllers" is true or false and justify your answer. [1+3]

b) Design a lead compensator for a system having open loop transfer function $G(s)H(s)=\frac{k}{s(1+0.1s)(1+0.001s)}$ so that the designed system should have PM $\geq 45°$, $K_v=1000\,\text{sec}^{-1}$ [12]

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21 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2073 Chaitra

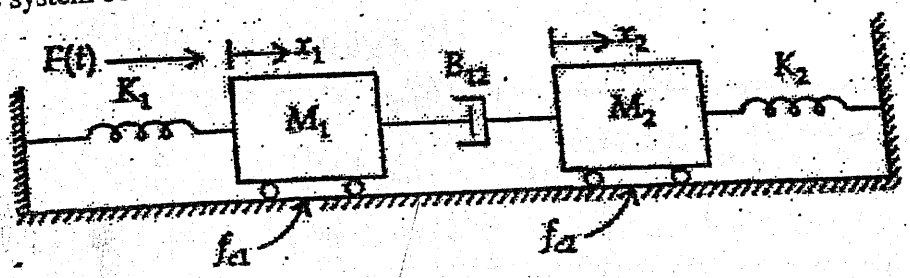
Exam.	Regular		
Level	BE	Full Marks	80
Programme	BEL, BEX, BME, BIE	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: - Control System *(EE602)*

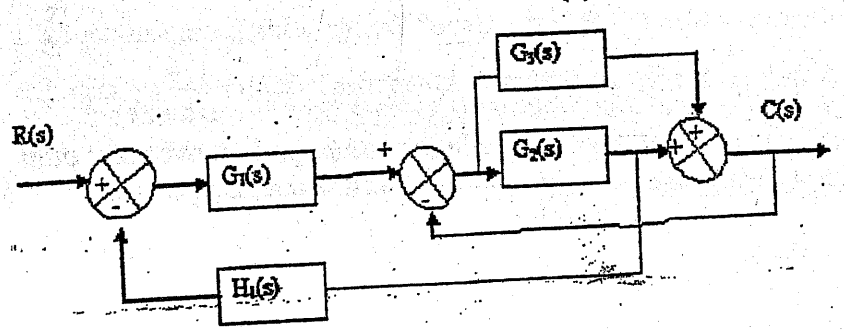
- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt <u>All</u> questions.*
- ✓ *The figures in the margin indicate <u>Full Marks</u>.*
- ✓ *Assume suitable data if necessary.*

1. a) What is control system? Draw the block diagram of a closed loop control system and briefly explain the function of each block. Mention also the advantages of closed loop system over open loop system. [8]

b) Construct the free body diagram and write the differential equations for the mechanical system given below and determine $X_2(s)/F(s)$. Also draw F-V analogy of the system below. [2+2+2+2]



2. a) Using Masons gain formula, find the tr, Function $\frac{C(S)}{R(S)}$ of the figure given below. [8]



b) The system below in figure (a) when subjected to a unit step input, the output response is as shown in figure (b). Determine the value of K and T. [8]

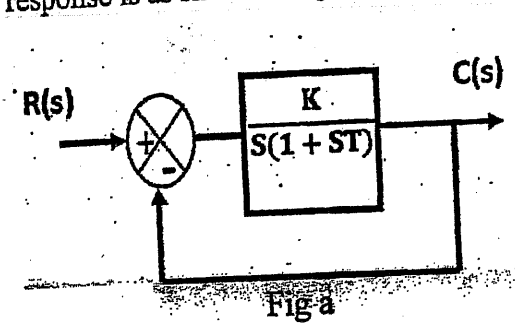


Fig a

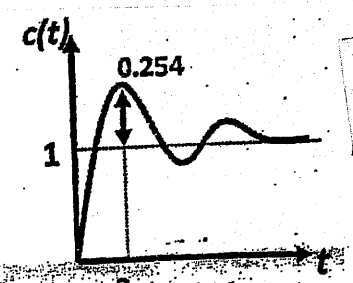


Fig b

3. a) Construct Routh array and determine the stability of the system whose characteristic equation is $s^6+2s^5+8s^4+12s^3+20s^2+16s+16=0$. Comment on the location of the roots of characteristic equation. [6]

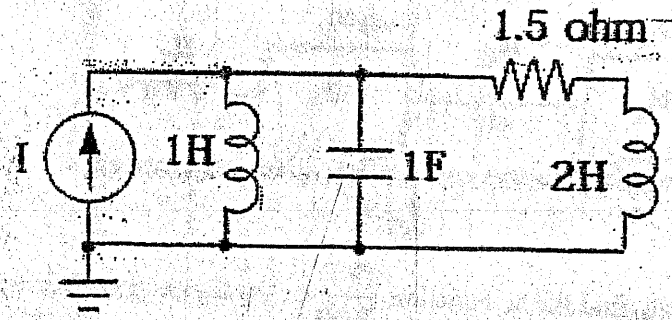
b) For a unity feedback system, the open loop transfer function of a control system is given by:

$$G(S)=\frac{K}{s(s+2)(s^2+6s+25)}$$

Sketch the root locus for $0 \le K \le \infty$ and determine the breakaway point, the angle of departure from complex poles and the stability conditions. [10]

4. a) Using Nyquist criterion, determine the stability of the feedback system whose open loop transfer functions is given by $G(s)\,H(s)=\frac{1}{s(1+2S)(1+S)}$ [8]

b) Develop state space equations for the following circuit considering voltage of 1F capacitor as output. "I" is input to the system. [8]



5. What would happen if zero is added to left half s-plane? Design a lead compensator for a unity feedback system with its feedforward transfer function as $G(s)=\frac{4}{s(s+2)}$ such that its settling time would be 2 sec but without change in maximum percent overshoot of its unit step response. Also velocity error constant should not be less than 2.5 per sec. [2+14]

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22 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2073 Shrawan

Exam.	New Back (2066 & Later Batch)		
Level	BE	Full Marks	80
Programme	BEL, BEX, BME, BIE	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

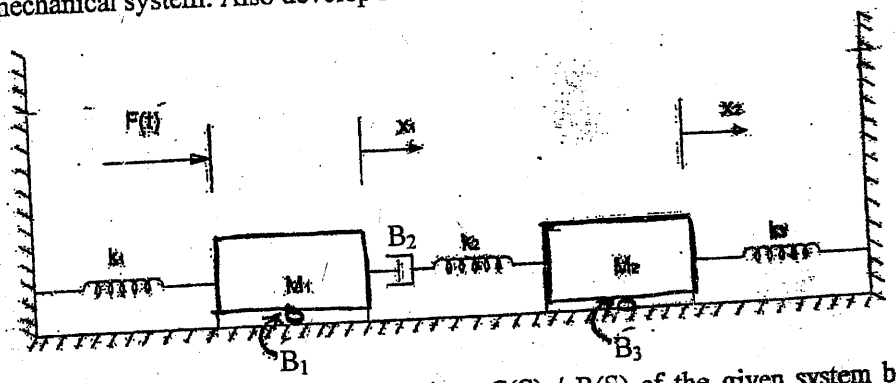
Subject: - Control System *(EE602)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

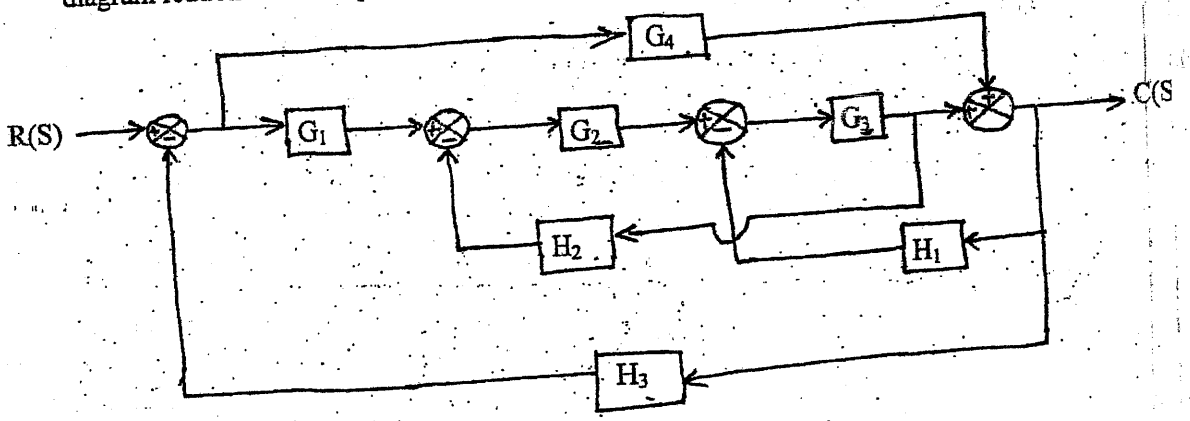
1. a) What kind of control system could have been in the following? Illustrate with necessary blocks and variables. [4×2]

   i) Governer system of Hydropower Station
   ii) Traffic light system of Kathmandu

   b) Find transfer function (consider displacement of mass M2 as output) for the given mechanical system. Also develop force-current analogous circuit. [8]



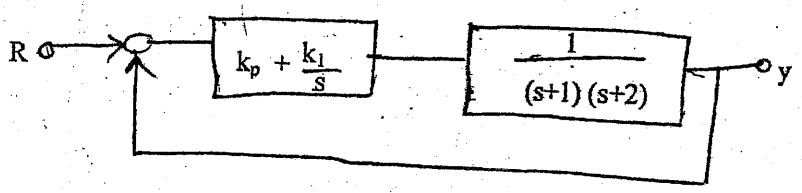
2. a) Determine the overall transfer functions C(S) / R(S) of the given system by block diagram reduction technique. [8]



   b) The system equations are given by: $\dot{x}(t) = \begin{bmatrix} 0 & 1 \\ -5 & -6 \end{bmatrix} x(t) + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u(t)$; and

   $y(t) = \begin{bmatrix} 1 & 0 \end{bmatrix} x(t)$; Find transfer function of the system and also check stability. [8]

3. a) For a closed loop system presented by [4]



Determine the range of controller gain (K_p, K_I) so that the PI controller provides the stable output.

b) A unity feedback control system has an open loop transfer function $G(S) = \frac{K(S+9)}{S(S^2+4S+11)}$. Sketch the root locus and determine: [8]

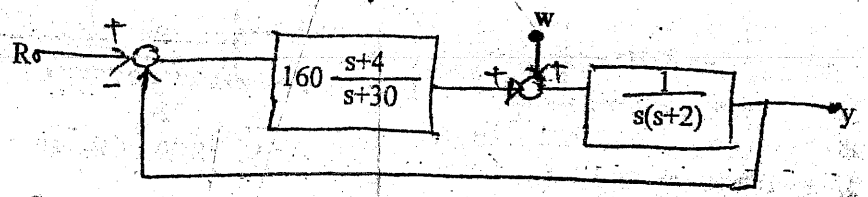
i) The range of 'K' for system to be stable
ii) Undamped natural frequency of oscillation

c) A closed loop servo is represented by the differential equation $\frac{d^2y}{dt^2} + 8\frac{dy}{dt} = 64z$ where 'y' is the displacement of the output shaft and 'u' is the displacement of the input shaft and z = u-y. Determine frequency of sustained oscillation, damping ratio and percentage maximum overshoot for unit step input. [4]

4. a) Draw the region in S-plane that satisfies following requirements. [4]

i) $S > 0.707$ (ii) $t_s < 2$ S

b) For a closed loop system given by [8]



i) Can the system track a step reference input 'r' with zero steady state error

ii) Can the system reject a step disturbance 'ω' with zero steady state error?

iii) Compute the sensitivity of closed loop transfer function to change in the plant pole at '-2'

c) How a controller with transfer function $G_c(S) = \frac{1+aTS}{1+TS}$ can be used as lead or lag compensator, explain. [4]

5. a) Design a suitable lead compensator for a system whose open loop transfer function is given by $G(S) = \frac{K}{s(1+0.2s)}$ [10]

The system should meet the following criteria

i) $K_v \geq 20\,\text{sec}^{-1}$
ii) P.M. $\geq 44°$

b) The differential equations related to a system are $\frac{dx_1}{dt} = -3x_1 + x_2$ and $\frac{dx_2}{dt} = -2x_1 + u$ for $t > 0$. Its output equation is given by $y = x_1$. Derive the transfer function of the system with these differential equation and output equation. [6]

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21 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2072 Chaitra

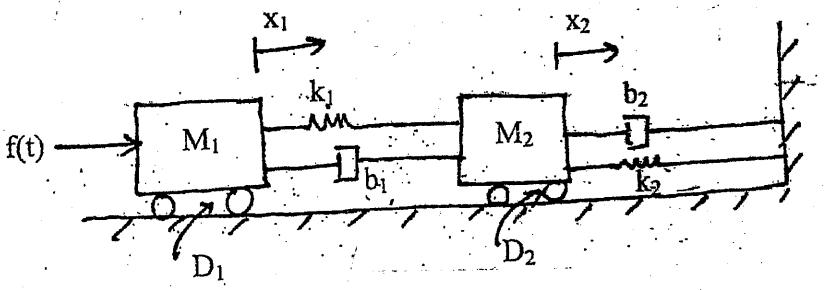
Exam.	Regular		
Level	BE	Full Marks	80
Programme	BEL, BEX, BME, BIE	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: - Control System *(EE602)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

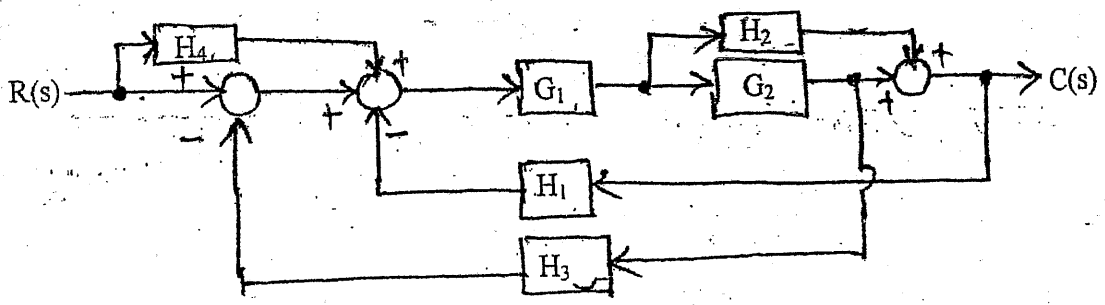
1. a) Define linear time invariant system. Justify the statement "modern complex systems are more pronounced with closed loop control system". [4]

   b) The given mechanical system has force f(t) as input and x_1 and x_2 as displacement outputs. Draw equivalent F-V analogous circuit and determine the transfer functions $X_1(S)/F(S)$ and $X_2(S)/F(S)$. [8]

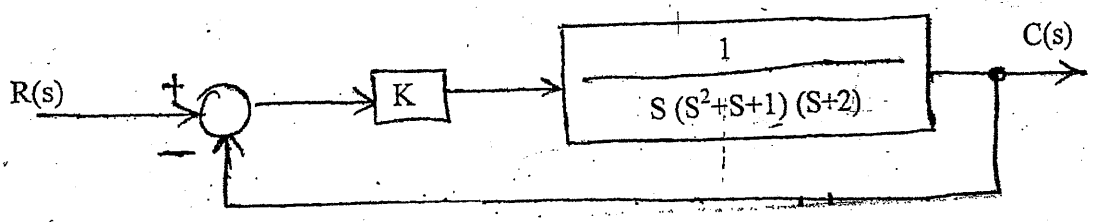


   c) Discuss, how a closed loop system has better disturbance rejection and command input tracking capabilities in comparision to an open loop system. [4]

2. a) Find Transfer function of the following system. [8]

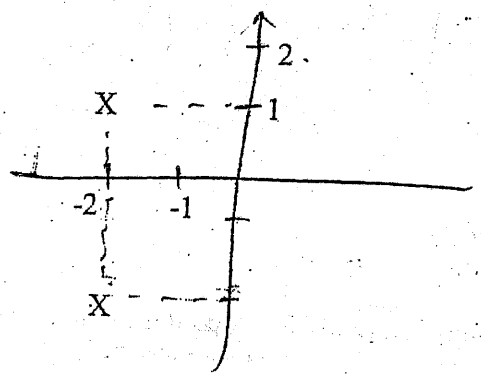


   b) Find the range of 'K' for stable operation using R-H criteria. [4]



   c) Explain how RH (Routh Hurwitz) method is used for determining relative stability. [4]

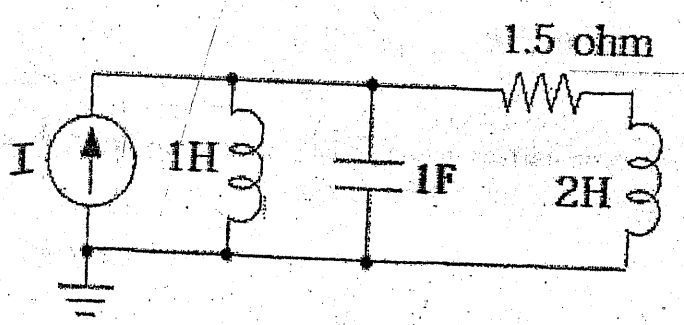
3. a) Open loop pole/zero plot of a unity feedback system are shown in figure below. Determine maximum overshoot and setting time for its step response. [6]



b) If desired damping ratio is '1' , which controller do you suggest, explain. [4]

c) Determine value of 'K' and 'b' so that the unity feedback system with open loop transfer function; $G(s)=\frac{K(s+1)}{s^3+bs^2+3s+1}$ [6]

4. a) Develop state space equations for the following circuit considering voltage of 2H inductor as output. I is input to the system. [6]



b) Draw Bode plot for the system with transfer function $G(s)=\frac{4s+40}{(s^2+4s+25)(s^2+50s)}$. Determine gain margin, phase margin and comment on stability of the system according to your plot. [10]

5. a) Compare the Lag and Lead compensator applications in control system. [4]

b) Design a suitable compensator for a unity feedback system with its feed forward transfer function as $G(s)=\frac{4}{s(s+2)}$ such that its maximum percent overshoot 16.3% and settling time 2 sec. for its step response. Also velocity error constant should not be less than 2 per sec. [12]

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21 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2072 Kartik

Exam.	New Back (2066 & Later Batch)		
Level	BE	Full Marks	80
Programme	BEL, BEX, BME, BIE	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: - Control System *(EE602)*

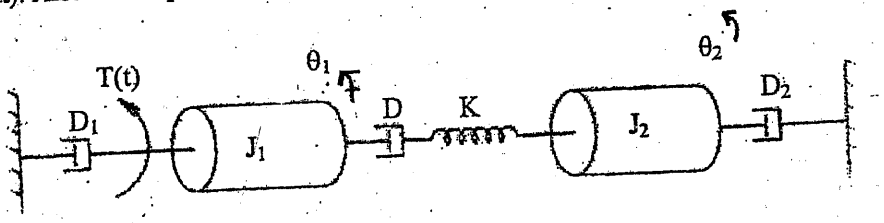
- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Necessary graph paper and semilog graph paper will be provided.*
- ✓ *Assume suitable data if necessary.*

1. a) What is control system? Mention its type and explain them with example and block diagram showing all necessary blocks and signals. [8]

   b) Explain the role of PD controller on transient and steady state performance specifications. [4]

   c) Explain why closed loop system has better disturbance rejection capability than open loop. [4]

2. a) Find transfer function of the system given below (take angular displacement of J_2 as output). Also develop Torque-Voltage analogy circuit. [8]



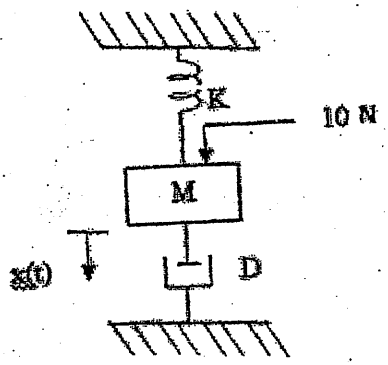
   b) What are the static error constants? Explain how they are applied in measuring steady state performance of given system. [4]

   c) Use RH criteria to find the position of roots of characteristic equation given by $C(s)=s^5+4s^4+2s^3+8s^2+s+4$; and hence determine the stability of the system. [4]

3. a) Construct the root locus for unity feedback system with OPTF $G(s)=\frac{k(s+2)}{s(s-1)}$ Hence show that the system is unstable for small value of gain and over damp at larger value of gain. [8]

   b) Discuss how the poles and zeros affect system dynamics. [4]

   c) Following figure shows a mechanical system and the response when 10 N of force is applied to the system. Determine the value of M, D and K. The displacement x is measured from the equilibrium position. [4]



4. a) Design a suitable compensator using root locus for a UFS with $G(s)=\frac{10}{s(s+1)(s+4)}$ to meet the specifications; damping ratio = 0.5 and undamped natural frequency = 2 rad/s. [12]

b) Define relative stability. Discuss how nyquist plot is used to determine the stability of a system. [4]

5. a) For a unity feedback system with $G(s)=\frac{250k}{s(s+50)(s+5)}$, select the value of 'k' so that the steady state error for a ramp input is 10%. At this value of 'k', construct the Bode plot. Hence determine approximate gain margin, phase margin, gain cross over frequency and phase cross over frequency. [8]

b) Given state equation and output equation, determine the poles and zeros of given system. [8]

$$\dot{X}=\begin{bmatrix}0 & 1 & 0\\ -1 & -1 & 0\\ 1 & 0 & 0\end{bmatrix}X+\begin{bmatrix}0\\ 1\\ 0\end{bmatrix}u \text{ and } y=\begin{bmatrix}0 & 0 & 1\end{bmatrix}X$$

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2080 Bhadra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BEL,BEX, BCT, BAG	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: - Communication English *(SH 601)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. Edit the following text. [5]

   Look at that thought he the land is all being sold and I shall get none of it so he spoke to his wife.

2. Read the following text carefully and interpret it so as to make the meaning clear. [5]

   There is a big difference between the natural slavery of man to nature and the unnatural slavery of man to man. Nature is kind of her slaves. If she forces you to eat and drink, she makes eating and drinking so pleasant that when we can afford it, we eat drink too much.Thus, instead of resenting our natural wants as slavery, we take the greatest pleasure in their satisfaction. The slavery of man to man is the very opposite of this. It is hateful to the body and the spirit. Our poets do not praise it; they proclaim that no man is good enough to be another man's master. Naturally the master class, through its parliments, schools and newspapers, makes the most desperate efforts to prevent us from realizing our slavery.

3. Study the following passage carefully. Then prepare its notes and summary. [5+5]

   Dowsing the millennia-old practice of finding hidden things. The most well-known activity of dowsing involves the use of a device such as a forked stick to locate underground water. To this end, the dowser walks slowly back and forth over an area of ground holding the dowsing tool out in front with both hands. It is said that the dowser, by concentrating carefully is somehow able to feel the energy of the flowing underground streams vibrating through the rod at certain frequencies, and thus is able to tell precisely where to dig or drill to find water. Sometimes the dowsing tool will twist and jerk or suddenly point downward. Some dowsers hold two L-shaped rods, one in each hand. In this case, when he or she walks over an area of underlying water, the rods cross over indicating the place where digging should commence. In recent years dowsing has gained in popularity not only as a method for finding underground water but also for trying to uncover other objects including buried treasure, oil or even dead bodies. A recent application has been the search for what some consider harmful energy fields in an attempt to avoid them. Even large businesses and official organizations pay dowsers for their detection skills. Although no one is completely sure how dowsing works, the testimonials of satisfied customers bear witness to the success of this ancient art.

4. Answer any two of the following questions: [2×5]

   a) What is the difference between knowledge and wisdom?

   b) Explain the importance of reading different types of books in human life.

   c) How do you justify the mother killing her own son and killing herself ?

5. Complete the following sentences choosing the correct answers from brackets: [0.5×10]

   a) These mistakes would not have been made if the authors ..... more careful. (would have been/had been)

   b) Would the world be different if it ..... rules by women? (would be/were)

   c) The committee.....decided to increase the salary of its workers.(has/have)

   d) I am never jealous.....his success.(with/of)

   e) The teacher is not satisfied.....his students' performance.(from/with)

   f) My father thanked me for what I.....for him.(had done/have done)

   g) Hurry up! The programme.....(will start, is about to start)

   h) The passive voice of " Your honesty has pleased me' is .....(I have been pleased with your honesty./I have been pleased by your honesty)

   i) The passive voice of " But, I will meet her" is.....(But, she will be met/It is reasoned that she will meet me.)

   j) If neither of them....., it is not all advisable to invest further.(is to be trusted/are to be trusted)

6. Put the following information into APA and MLA styles of citation: [4]

   Author: Sharon Crowley and Debra Hawhee

   Book: Ancient Rhetorics for Contemporary Students

   City of publication: London

   Edition: 3rd edition

   Publisher: Pearson Publications

   Year of Publication: 2004

7. Suppose you are the secretary of the newly formed committee of the college union. Write the minutes of the second meeting held recently inventing four agenda for the conduction of technical exhibition in your college. [5]

8. Suppose you have recently visited a high-tech city as a part of your study with your co-partners. Write a field report about your observation. [6]

9. Write, to ministry of population and Environment, a proposal on the ways of minimization of air pollution. Prepare title page, abstract, time schedule and cost estimate sections of your proposal. [10]

10. Write a report to be submitted to the Ministry of Physical Infrastructure and Transport, Singha Durbar, Kathmandu, on impacts of unplanned urbanization in Nepal. Prepare only the title page, letter of transmittal, findings and recommendations parts of the report. [10]

11. Write a short research article on the Role of Project Works for the Professional Development of Engineering Students. [10]

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2081 Baishakh

Exam.	Back		
Level	BE	Full Marks	80
Programme	BEL,BEX,BAG BCT	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: - Communication English *(SH 601)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. Edit the following text: [5]

   the weather is better this evening he said. where shall we go now. Shall we drive somewhere he added. I have no idea, she replies.

2. Read the given text and interpret its meaning: [5]

   Broken friendship may be repaired but the break will always show. Friendship is a precious thing-too precious a treasure to be carelessly broken or thrown away. The world handles the word 'friend lightly; its real, true deeper meaning is forgotten.Your friend is one who appreciates you-your faults as well as your virtues. He understands and sympathizes with your defeats and victories, your aims and ideals, your joys and temptations, your hopes and disappointments, as no one else does or can. It is your friend to whom you turn for counsel, for comfort, for praise; he may not be as learned as some or as wise as others.

   Blessed is the man or women into whose life has come the beauty and power of such a friendship. Prize it well. Do all in your power to keep such a friendship unbroken. Avoid the break, for when it comes it cannot be mended and the jarring note mars the harmony.

3. Study the following text carefully, prepare its note, and convert it into a summary. [5+5]

   To biomedical researchers all over the world, twins offer a precious opportunity to untangle the influence of genes and the environment- of nature and nurture. Because identical twins come from a single fertilized egg that splits into two, they share virtually the same genetic code. Any difference between them-one twin having younger-looking skin, for example-must be due to environmental factors such as less time spent in the sun.

   Alternatively, by comparing the experiences of identical twins with those of fraternal twins, who come from separate eggs and share on average half their DNA, researchers can quantify the extent to which our genes affect our lives. If identical twins are more similar to each other with respect to an ailment than fraternal twins are, then vulnerability to the disease must be rooted at least in part in heredity.

   These two lines of research-studying the difference between identical twins to pinpoint the influence of environment, and comparing identical twins with fraternal ones to measure the role of inheritance-have been crucial to understanding the interplay of nature and nurture in determining our personalities, behavior, and vulnerability of disease.

4. Answer any two of the following questions: [2×5]

   a) Elucidate the statement "Studies serve for delight, for ornament, and for ability".

   b) What is chain reaction and how does it support the Einstein's theory?

   c) What is the significance of the term ' Civil Peace'? What does it imply?

5. Choose the correct words from the brackets. [0.5×10]

   a) It's high time she..... a government job. (got, had got)

   b) The passive voice of "Her parents do not permit her to eat beef" is..... (The beef is not permitted to eat/She is not permitted to eat beef)

   c) Each of them.....hardworking at our college. (is, are)

   d) The negotiations.....Nepal, India and China are going well. (between/among)

   e) The passive of "They think that I am spy" is...../(It was thought that I am a spy/ I am thought to be a spy)

   f) Should you throw an object upward,.....(It would come downward automatically, It comes downward automatically)

   g) One of the students who.....studying is sitting on the table. (is, are)

   h) Work hard lest you.....(fail, should fail)

   i) He ordered me as if .....(I had been his servant, I were his servant)

   j) The food I want to order is not.....the menu. (in, on)

6. Document the following information in APA and MLA formats. [4]

   Name of the book: Introduction to Communication
   Author's name : E. Balaguruswami

   Publisher: Tata McGraw-Hill Publishing Company Limited
   Publishing Place : New Delthi
   Year of publication: 1999.

7. Suppose you are the secretary of any social club, write a notice with four-point agenda for the fifth monthly regular meeting of your club. [5]

8. Imagine that you are the Chief Consultant of a project of your field of engineering. Write the first quarterly progress report in memo format. [6]

9. Write a proposal for establishing an IT Company in Nepal to be submitted to the Ministry of Communication and Information Technology, Kathmandu. Write the Title Page, Abstract, Statement of the problem, and Cost Management Section of the proposal. [10]

10. Suppose that your engineering project proposal submitted to the Government of Nepal is accepted and that you have completed the project. Write title page, acknowledgement, abstract, and introduction of the report. [10]

11. Write in 500 words, a research article on " Less participation of female students in Technical Education'. [10]

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2080 Baishakh

Exam.	Back		
Level	BE	Full Marks	80
Programme	BEL, BEX, BCT, BAG	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: - Communication English *(SH 601)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. Edit the following text: [5]

   How could I despise you asked Gurov. You don't know what you are saying he adds. God forgive me she said with her eyes fills with tears.

2. Read the following text carefully and interpret it so as to make the meaning clear. [5]

   What is a master? I would say that he is not someone who teaches something, but someone who inspires the student to do his best to discover a knowledge he already has in soul. Teaching is not hard. The toughest part for a student is to practice it every day, until one achieves the necessary precision.

3. Read the following text carefully, prepare its notes and write a summary. [5+5]

   Education is an integral part of people's lives; it will either make them or break them in the prospect depending on their careers. Education is broadly diverse today compared to the 1950s because of progressions in teaching methods and other prominent inventions that implement more apparent teaching techniques. Online learning is one of the imminent trends in the education sector around the globe at present. This mode of learning is done through the internet. With advanced and upgraded technologies; this mode of learning has been made simpler. Online Education is also preferred in higher learning Institutions.

   In E-learning, the students study from home or any other place, that is most convenient for them. They can acquire learning material online. The study materials in online education could be texts, audio, notes, videos and images. Online learning has its various benefits. It is suitable for those who cannot visit or obtain the traditional education method for one reason or the other. Nearly 6.1 million college students are currently attending online courses, and this number is growing by around 30 percent yearly. Online education provides a myriad of advantages for people, as well as companies because it allows for, among others, flexibility. Online education's potential advantages involve increased educational access; it provides a high-quality learning opportunity, improves student outcomes and skills, and expands educational choice options.

4. Answer any TWO of the following questions. [2×5]

   a) "Even the best technician should also be good citizen". Do you agree? If yes, why?

   b) An ideal family always grants the space for hope of life in every difficulty. Elucidate it with reference to the text 'Civil peace'.

   c) How does aerofoil produce lift?

5. Choose the correct words from the brackets: [10×0.5]
   a) The injured .....been admitted in the hospital.(have, has)
   b) A school of fish.....kept into the pond. (is, are)
   c) The fireman has put..... the fire. (on, out)
   d) .....advising them, the monk gave them some amount. (Beside, Besides)
   e) If I had a bungalow, I.....a car. (would buy, would have bought)
   f) Had you worked hard, you.....the exam. (would pass, would have passed)
   g) As soon as he saw the house, he .....in love. (fell, had fallen)
   h) He behaves with me as if I.....his boss. (am, were)
   i) The passive voice of 'They considered me a tourist' is.....(I was considered to be a tourist, It was considered a tourist)
   j) The passive voice of 'Don't speak a word here' is .....(Let a word not be spoken here, No word is spoken here)

6. Put the following information into APA and MLA styles of citation: [4]
   a) Name of the author: Dahal, Ritesh
   b) Title of the article: Nepal and Its people
   c) Name of the newspaper: The Himalayan Times
   d) Page number: 11-13
   e) Date: 26 July 2022

7. On behalf of a secretary of your Community Health Club write a notice for the 6th meeting assuming four agendas related to Covid pandemic precaution. [5]

8. Suppose you have recently made an educational tour from your college as a part of your study with your friends. Write a trip report about your observation in memo format. [6]

9. Suppose you have recently made a study on the scope of IT in Nepal. Prepare a report to be submitted to the Ministry of Information Technology, Kathmandu. Write only title page, acknowledgement, abstract and introduction [10]

10. Write a proposal on "Possibility of Internet of Things (IOT) in Nepal" to be submitted to the Ministry of Science and Technology, Kathmandu. Prepare only letter of transmittal, objectives, problem, and cost estimate of your proposal. [10]

11. Write in 500 words, a research article on 'Causes of Delay in Development Work in Nepal'. [10]

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2079 Bhadra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BEL, BEX, BCT, BAG	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: - Communication English *(SH 601)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. Edit the following text. [5]

I count it as nothing, he told his sympathizers his eyes on the rope he was tying. What is egg-rasher Did I depend on it last week Or is it greater than other things that went with the war I say, let egg-rasher perish in the flames!

2. Read the following text carefully and interpret it so as to make the meaning clear. [5]

The survival of the publishing industry depends upon the existence of a public who will buy the printed word in the form of newspapers, books and magazines. Over the past several years, however, the advance of electronic media, particularly CD-ROMs, online computer services, and the internet, has made information available to the public electronically without the need for printed materials. As the availability of electronic media increases and as it is more easily accessible, the public has less need for printed materials.

3. Read the given passage carefully. And prepare notes and summary. [5+5]

The world needs to dramatically reduce its greenhouse gas emissions and fast, if there's any hope of preventing worse and more frequent extreme weather events. That means shifting to renewable sources of energy -- and, importantly, decarbonizing transportation, a sector that is now responsible for about a quarter of the world's carbon dioxide emissions. But the path to that cleaner future is daunting, clogged with political and societal roadblocks, as well as scientific obstacles. Perhaps that's one reason why the electric vehicle – already on the road, already navigating many of these roadblocks – swerved so dramatically into the climate solutions spotlight in 2021.

Just a few years ago, many automakers thought electric vehicles, or EVs, might be a passing fad, says Gil Tal, director of the Plug-in Hybrid and Electric Vehicle Research Center at the University of California, Davis. It's now clear to everyone that [EVs are] here to stay. Globally, EV sales surged in the first half of 2021, increasing by 160 percent compared with previous year. Even in 2020 - when most car sales were down due to the COVID-19 pandemic – EV sales were up 46 percent relative to 2019. Meanwhile, automakers from General Motors to Volkswagen to Nissan have outlined plans to launch new EV models over the next decade: GM pledged to go all - electric by 2035, Honda by 2040. Ford introduced electric versions of its iconic Mustang and F - 150 pickup truck.

"Consumer demand for EVs isn't actually driving the surge in sales", Tal says. The real engine is a change in supply due to government policies automakers to boost their EV production. The European Union's toughened CO_2 emissions laws for the auto industry went into effect in 2021, and automakers have already bumped up new EV production in the region. China mandated in 2020 that Evs make up 40 percent of new car sales by 2030. Costa Rica has set official phase-out targets for internal combustion engines.

4. Answer any two of the following questions: [2×5]

   a) How do studies groom up the natural intelligence of human being?
   b) Why is scientific attitude? Why is it required for everyone?
   c) Describe the technical process of refining the crude petroleum.

5. Choose the correct words from the brackets. [10×0.5]

   a) Stones are dumb unless man ..... them speak. (made/makes)
   b) It would have been better if they ..... (would not come/ had not come).
   c) He, accompanied by other members of the team, ... arrived. (has/ have)
   d) The police ..... arrested the suspected criminal. (has/ have)
   e) He sat ..... the shade of a tree. (in/ under)
   f) The baby climbed ..... the table. (into/ onto)
   g) The train started after we ..... for an hour. (played/ had played)
   h) No sooner had he left the office than the heavy rainfall ..... (started/ would start)
   i) The passive form of "No one could see that" is .....(That could not be seen/ That could be seen by no one)
   j) The passive form of "His conduct shocked me" is .....(I was shocked as his conduct/ I was shocked by his conduct)

6. Document the given details in MLA and APA style. [2+2]

   Name of the book: Living Stories, Telling Lives
   Name of author: Joanne S. Frye
   Date of publication: 1986
   Place of publication: Ann Arbor
   Publisher's name: University of Michigan press

7. Suppose you are the secretary of the newly formed club of your college. Write the minutes of the third meeting held recently in inventing four agenda for the organization of technical exhibition. [5]

8. You have participated in one day seminar on "The Future of Alternative Energy in Nepal" conducted by an international agency. Prepare a field report in letter format to submit to your company. [6]

9. Write title page, abstract, scheduling and cost estimate to submit a proposal for improving the existing parking facilities for the four wheeler and two wheeler vehicles in your local town. [10]

10. Write a report of your study on Unplanned Urbanization of Kathmandu City to submit to the Mayor of Kathmandu Metropolitan. Prepare only the title page, letter of transmittal, acknowledgement and recommendations. [10]

11. Write in 500 words a research article on "Nano Pollution and its Solution". [10]

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2079 Baishakh

Exam.	Back		
Level	BE	Full Marks	80
Programme	BEL,BEX,BCT,BAG	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: -Communication English *(SH 601)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. Edit the following text. [5]

   How stupid and worrying it is he thought when he wake up and look at the dark windows … here I have have a good sleep for some reason. What shall I do tonight.

2. Read the given text and interpret its meaning; [5]

   The forms and functions of verbal communication vary significantly around the world and reflect striking differences in values and beliefs. These culturally learned patterns usually function on a highly unconscious level and can result in serious conflict, misunderstanding, and negative stereotyping when people from different cultures interact. To minimize such tensions and problems and to enhance intercultural communication, international travelers should be aware of their own speaking style and the ways it differs from that of the culture they are visiting. By increasing their knowledge of what people in the host country tend to say and how they tend to say it, international visitors will be able to traverse the minefield of cultural differences and adjust to the new environment more easily.

3. Read the following text carefully; make notes and write summary after a close reading. [5+5]

   Modernization has generally enhanced the material level of civilization through out the world. But has it also enhanced the moral and cultural dimension of civilization? In some respects, this appears to be the case. Slavery, torture, vicious abuse of individuals, have become less and less acceptable in the contemporary world. Is this, however, simply the result of the impact of western civilization on other cultures and hence will a moral reversion occurs as western power declines? Much evidence exists in the 1990s for the relevance of the "sheer chaos" paradigm of world affairs: a global breakdown of law and order, failed states and increasing anarchy in many parts of the world, a global crime wave, transitional mafias and drug cartels, increasing drug addiction in many societies, a general weakening of the family, a decline in trust and social solidarity in many countries, ethnic religious, and civilizational violence and rule by the gun prevalent in much of the world. In city after city-Moscow, Rio de Janerio, Bangkok, Shanghai, London, Rome, Tokyo, Delhi, Karachi, Cairo, Washington-crime seems to be soaring and basic elements of civilization fading away.

   People speak of global crisis of governance. The rise of transitional corporation producing economic goods is increasingly matched by the rise of transitional criminal mafias, drug cartels, the terrorists gangs violently assaulting civilization. Law and order is prerequisite of civilization and in much of the world-Africa, Latin America, South Asia, the former Soviet Union, the middle east-it appears to be evaporating. On a worldwide basis civilization seems in many respects to be yielding to barbarism, generating the

image of an unprecedented phenomenon, a global dark age, possibly descending on humanity.

4. Answer any two of the following questions. [2×5]
   a) How do aerofoils function to control the aircraft in flight? (Aerofoils)
   b) How can a scientist get rid of a cause and effect confusion? (Straight and Crooked Thinking)
   c) Unnatural slavery of man to man is despicable. Elaborate. (Freedom)

5. Complete the following sentences choosing the correct answers from bracket: [10×0.5=5]
   a) The building does not conform.....safety regulations.(with, to).
   b) He is steeped.....the literature of ancient Greece and Rome. (with, in).
   c) It is time they brought the cows in. Its passive voice is ..... (It is time the cows were brought in / The cows were brought in time)
   d) Nobody has slept in that rooms for years. (That room has not been slept in for years / That room has not been used for sleeping purpose for years.)
   e) It.....if you had not caught it. (would break / would have broken)
   f) If it rained, I ..... at home. (should stay / could stay)
   g) He jumped up as if he..... (were stung / had been stung)
   h) It seemed at least twenty minutes since Smith..... for the village. (set off / had set off)
   i) The crown and glory of life..... character. (is / are)
   j) The trouble with all those cars..... slow speed. (was / were)

6. Put the following information into APA and MLA styles of citation. [4]

   Name of the book: The Atmosphere: An Introduction to Reference Meteorology

   Author's name: Frederick Lutgens and Edward Tarbuck.

   Publisher: Pearson Publshing Company Limited

   Date of publication: 2016

   Publishing place: London

7. As a secretary of a local youth club, write a notice including 5 agendas for the 4th meeting of this fiscal year focusing on the issue of mental health of children during the COVID pandemic. [5]

8. Prepare a progress report of ongoing sports week at your college in a letter format addressing the coordinator of students' welfare committee. [6]

9. Write a report on advancement in the field of science and technology in Nepal in the last ten years to submit it to Ministry of Science and Technology, Singhadurbar, Kathmandu. Show only title page, introduction, discussion, conclusion and recommendation parts of the report. [10]

10. Use of plastic bags is one of the factors of environmental degradation. You have a grand plan to solve the problem. Write a proposal to the Ministry of Environment offering your plan. Prepare only problem, objective, methodology, and cost estimate of your proposal. [10]

11. Write, in about 500 words, a research article on "Impact and Challenges of COVID-19 Pandemic and the Role of Information Technology in Education." [10]

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2078 Kartik

Exam.	Back		
Level	BE	Full Marks	80
Programme	BEL,BEX, BCT, BAG	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: - Communication English *(SH 601)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt <u>All</u> questions.*
- ✓ *The figures in the margin indicate <u>Full Marks</u>.*
- ✓ *Assume suitable data if necessary.*

1. Edit the following text. [5]

I have no idea whether the right pronoun for God is He, She or It. But this I'm sure of. If god could somehow be induced to take that test, God will not come out macho and not feminism, either, but right at the middle. Fellow androgynes, its a nice thought.

2. Read the given passage and interpret it. [5]

Learning style is not the only area undergoing demystification: our understanding of intelligence is also being reconstructed. The IQ score, developed early in the 20th century, is supposed to be a measure of a person's innate intelligence, with a score of 100 defined as normal, or average. The higher the score, the brighter the person. Some of us grew up in communities where IQ was barely mentioned. In many cases this lack of knowledge might have been a blessing. Others of us grew up with "IQ envy", in communities where IQ scores were a big part of our culture. Since the score is considered a fixed, permanent measure of intellect like a person's physical height, the scores engendered strong feelings. Friends who scored higher on an IQ test had a secret weapon, a mysteriously wonderful brain. But then our friend "genius" was stumped trying to unpack and plug in a toaster oven or got hopelessly lost trying to follow the simplest driving directions. We may have been equally puzzled when another friend, who scored horribly low on an IQ test, went on to fame and riches. What is this traditional assessment of intelligence supposed to mean?

3. Read the following text carefully, make notes and write a summary of it. [5+5]

Coronavirus disease (COVID-19) is an infectious disease caused by a newly discovered coronavirus. Most people infected with the COVID-19 virus will experience mild to moderate respiratory illness and recover without requiring special treatment. Older people, and those with underlying medical problems like cardiovascular disease, diabetes, chronic respiratory disease and cancer are more likely to develop serious illness.

The best way to prevent and slow down transmission is to be well informed about the COVID-19 virus, the disease it causes and how it spreads. Protect yourself and others from infection by washing your hands or using an alcohol based rub frequently and not touching your face. The COVID-19 virus spreads primarily through droplets of saliva or discharge from the nose when an infected person coughs or sneezes, so it is important that you also practice respiratory etiquette (for example, by coughing into a flexed elbow)

If COVID-19 is spreading in your community, stay safe by taking some simple precautions, such as physical distancing, wearing a mask, keeping rooms well ventilated, avoiding crowds, cleaning your hands and coughing into a bent elbow or tissue.

4. Answer any two of the following questions: [2×5]

   a) "Some books are to be tasted, others to be swallowed, and some few to be chewed and digested." Elucidate the statement.

   b) What elements of science can the ordinary citizen use in order to help his society to develop?

   c) How do modern boilers function?

5. Choose the best answer: [10×0.5]

   a) Conductors and conductivity .....a good passage. (are, is)
   b) The philosopher and the statesman.....required. (are, is)
   c) He has worked here.....this time last year. (for, since)
   d) The land is covered.....snow. (on, by)
   e) I pondered.....the question that was asked to me. (about, over)
   f) The soldiers.....better if they had been given clear orders. (would have fought, would fight)
   g) If you were to buy a car, it.....you a lot of money. (would cost, costs)
   h) She acts as if she.....an actress. (is, were)
   i) He congratulated me for what.....(I did, I had done)
   j) He returned to Kathmandu.....two days. (in, after)

6. Document the following details in APA and MLA style. [2+2]

   Anthology: Making Connections
   Editor: Kenneth J. Pakenham
   Edition: 2nd
   Publisher: Cambridge University Press
   Place: New Delhi
   Date: 2009

7. Suppose you are the secretary of Investment Company located at Bhaktapur, and the CEO wants to have a meeting with all the concerned personnel of the company in order to discuss social distancing protocol and other precautions in the office to avoid all possible infection of COVID-19. Now write a notice along with a four-point agenda to call the meeting. [5]

8. Suppose you are the chief consultant of an internet connectivity project at your college and the work is going on, write the first monthly progress report in a memo format. [6]

9. Prepare a cover page, abstract and recommendations of a report on CTEVT programme and employment opportunity. [10]

10. Write a proposal on construction of auditorium hall in your college, prepare rationale, estimated budget and conclusion only. [10]

11. Write a research article on effectiveness of virtual learning for the students of engineering in about 500 words. [10]

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2078 Bhadra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BEL, BEX, BCT, BAG	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: - Communication English *(SH 601)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. Edit the following text: [5]

Dr Brigitte halford, a professor of linguistics at Freiburg University in German agree bilinguals tends to use language better as a whole she says. 'They also display greater creativity and problem-solving ability, and they learn further languages more easily.' So with all of the benefit, why do we not show more enthusiasm for learning other languages.

2. Read the following text carefully and interpret it so as to make the meaning clear: [5]

The history of civilization shows man always how has to choose between making the right and wrong use of discoveries of science. This has never been truer than in our own age. In a brief period, amazing discoveries have been made and applied to practical purposes. It has become a platitude to say – we are living in an age of revolution.

3. Read the following text carefully, prepare its notes and write a summary. [5+5]

Acupuncture is a system of treatment of disease which has been practiced in China for nearly 5000 years. It consists in the rapid insertion of fine steel needles, about six centimeters long, on particular spots on the body of the patient. After inserting the needle, the doctor twirls the needle between his thumb and forefinger. There are hundreds of acupuncture points on the body. When acupuncture is made on a spot on the body, energy flows from there along line known as meridians to the diseased organ. The flow of energy helps to restore the balance of the system and thus correct the disorder. The points of treatment may be far from the seat of the disease. For example, to cure a toothache, the acupuncturist may insert a needle on the palm of the patient.

Although China is considered to be the country where acupuncture originated, some forms of treatment resembling it has been reported from other parts of the world by anthropologists. Among some ancient tribes, stones and arrows were used to prick the skin. In another form of treatment, the skin on particular spot of the body was burnt to affect a cure for certain diseases. Whether these kinds of treatment can rightly be classed with acupuncture can be known only after further research.

For long acupuncture was dismissed by the west as a form of superstition like witchcraft and magic cure. Even in China admiration for the western system of medicine was so great that the native systems of treatment were neglected or mistrusted. Moreover, the theoretical basis of acupuncture that was propounded in China was a mixture of spirituality, philosophy and physiology. This stood in the way of its acceptance by Chinese scientists.

During the 1960s acupuncture came to the notice of western scientists, who viewed it with skepticism as well as curiosity. Doctors from Europe went to China to make a firsthand study of this strange form of treatment. They were convinced by what they saw that acupuncture worked. Not only were diseases cured, but even operations were

performed after administering anesthesia by acupuncture. The patient of such an operation could see and know what was being done, but felt no pain. After the operation, he could get up and walk away. Doctors in other parts of the world took acupuncture seriously and some of them trained themselves and set up practices in their countries. In China itself the status acupuncture rose when Chinaman Mao officially ranked acupuncturist with other physicians.

4. Answer any TWO of the following questions: [2×5]
   a) What elements of science can the ordinary citizen use in order to help his society develop?
   b) Sketch the character of Dmitri Dmitritch Gurov in about 150 words.
   c) Russell says 'with the increase of knowledge and skill, wisdom becomes more necessary. 'Do you agree with him? Give your opinions.

5. Choose the best answer: [10×0.5]
   a) Rapid technological progress does not create tension.....workers. (within, among)
   b) How can I give.....when I am not at fault. (in, up)
   c) A red and black horse ..... grazing in the field. (is, are)
   d) Milton was one of the greatest poets that ..... ever lived. (has, have)
   e) The passive voice of 'We have decided to open a new branch' is .....(To open a new branch has been decided by us / It has been decided to open a new branch)
   f) The passive voice 'I don't like people telling me what to do' is.....(I don't like being told what to do / I do not like being told by the people)
   g) He walks as if he .....lame. (was / were)
   h) It's time we ..... our work. (started / start)
   i) If I were an orange, I ..... spherical and juicy. (shall be / should be)
   j) Unless she ..... there on time, they would have selected someone else. (reached / had reached)

6. Put the following information into APA and MLA style of citation: [4]
   a) Name of the author: Harris, Rob.
   b) Title of the article: Clinton on Climate Change.
   c) Name of the newspaper: The New York Times
   d) Date: 17 May 2007
   e) Page number: 20-21

7. Imagine that you are a secretary of a local social club. The third meeting of your club was held on 10th January 2020. Write the minutes of the meeting concerning any five agenda discussed in the meeting. [5]

8. Suppose that you are invited to submit a proposal an establishing a paper factory in the remote area of Gorkha district. Show the title page, abstract, statement of the problem, objectives and conclusion parts of your proposal. [10]

9. Imagine that you have undertaken the project on the construction of hydro-electricity supply centre at a remote village in your district and the work is going on. Write a second quarterly program report in memo format. [6]

10. Imagine that you are the chairman of a newly formed committee for studying the causes of road accidents in the highways of Nepal. Prepare title page, acknowledgements, table of contents and abstract of the report which you are going to submit. [10]

11. Imagine that you have carried out a study on the causes of deforestation in the hilly regions of Nepal. Write title page, acknowledgement, abstract and recommendation parts of your report. [10]

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2076 Chaitra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BEL, BEX, BCT, BAG	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: - Communication English *(SH 601)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt <u>All</u> questions.*
- ✓ *The figures in the margin indicate <u>Full Marks</u>.*
- ✓ *Assume suitable data if necessary.*

1. Edit the following text: [5]

   How you frightened me she said breathing hard still pale and overwhelmed. Oh how you frightened me. I am halfdead. Why have you come why.

2. Read the following text carefully and interpret its meaning. [5]

   Computers and the Internet have made a revolution in science and engineering. Studying computational models of reality can be cheaper and better than studying reality. Sometimes reality is impossible to measure or too steep to scale, and computational models are the only way to get any purchase on it. Those are the actual computer revolutions; the others are mostly potential and not real, locked up in awe-inspiring icebergs that just float around eliciting admiration and making trouble. The computer revolution is still frozen, latent, waiting to happen.

3. Read the following passage carefully, make notes and write a summary of it. [5+5]

   The critical period theory is consistent with a vast amount of data that has been accumulating for many years about patients suffering from aphasia, a loss of language abilities associated with brain damage from injury or disease. The data provide conclusive evidence that language is localized in the brain's left hemisphere. Seventy percent of adult patients with an injury to the left hemisphere suffer from some language disability. However, patients with injuries to the right hemisphere retain the ability to speak and understand language perfectly. Their problems lie elsewhere, in activities such as recognizing faces and patterns or finding their way from one place to another.

   Evidence for the effects of cerebral lateralization on language learning also comes mainly from research with patients suffering from aphasia after a hemispherectomy, surgery to remove one hemisphere of the brain. Lenneberg (1967), in his own research and in the relevant medical literature, found that 97 percent of children undergoing this operation before the age of ten recovered their language abilities after some temporary aphasia and continued to acquire their first language. In those rare cases where the same type of surgery was performed on adults, however, all the patients were left with complete and permanent aphasia. From this research, it seems that a child's brain has a degree of flexibility that allows the right hemisphere, when necessary, to take over the functions of the left. After lateralization, this flexibility declines significantly, and adults who lose language through brain injuries are unable to regain it. On the basis of these research findings, proponents of the critical period theory claim that it is this lack of flexibility in adults that limits their ability to acquire native-speaker pronunciation in a second language.

4. Answer any TWO of the following questions. [2×5]

a) What is unnatural slavery according to Shaw? [Of Studies]
b) What is the difference between impartiality and wisdom? [Knowledge and Wisdom]
c) An ideal family always grants the space for hope of life in every difficult. Elucidate it with reference to the text 'Civil peace'. [Civil peace]

5. Choose the correct words from the brackets. [10×0.5]

a) If he should wake up, I ..... to him (talk, will talk)
b) If you throw a stone into water, it .....(sinks, will sink)
c) The letter, together with some applications,.....lost yesterday. (was, were)
d) Message after message..... sent to her. (have been, has been)
e) Each of them.....happy. (were, was)
f) He has no adherence.....old system of rituals in marriage. (for, to)
g) She is accomplished.....music. (in, into)
h) They thanked me for what I.....(did, had done)
i) Shanti.....for me when I arrived. (had waited, was waiting)
j) The passive voice of 'He let her to play' is.....(He is let to play, He was allowed to play)

6. Write the following bibliographic information first in MLA and then in APA. [4]

Name of editors: Edwin D. Reilly, Anthony Ralston, and David Hemmendinger
Name of book: Encyclopedia of Computer Science
Edition: 4th
Year of publication: 2003
Name of publisher: Wiley
Place of publication: Chichester, UK

7. On behalf of the secretary of Engineering Association, write a notice for meeting along with agenda to be sent to the members of this association. [5]

8. Assume that you are requested to write a proposal on establishing an engineering college in your local town. Write a proposal to the concerned local authority including only abstract, objectives, rationale and methodology. [10]

9. Suppose you have recently participated in a one-day seminar on Vocational Education. Write a report to the Director of National Institute of Vocational Education, Putalisadak, Kathmandu. Prepare it in memo format. [6]

10. Write a report, to be submitted to the Ministry of Information and Communications, on development of information technology in Nepal in the last five years. Show only the title page, introduction, conclusion recommendations parts of the report. Also, write an outline of your report. [10]

11. Write a brief research article on the role of transportation in the development of tourism in Nepal. [10]

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division

2076 Ashwin

Exam.	Back		
Level	BE	Full Marks	80
Programme	BEL, BEX, BCT, BAG	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: - Communication English *(SH 601)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt <u>All</u> questions.*
- ✓ *The figures in the margin indicate <u>Full Marks</u>.*
- ✓ *Assume suitable data if necessary.*

1. Edit the following text. [5]

Who is knocking? whispered his wife lying beside him on the floor. I do not know he whispered back breathlessly the second knocking was so loud that the rickety old door could have fallen down.

2. Read the following text and interpret its meaning in your own language: [5]

If we observe the actions of mean, whether as individuals or as groups, and whether scientists or non-scientists, we find that they frequently fall into avoidable errors because of a failure to reason correctly. There are many reasons for this, though only a few can be dealt with here.

The first difficulty is bound up with (related to) the use of words. It frequently happens that what one person means when he uses a certain word is different from what others mean. Consider, for example, the words intelligence, oxygen, accurate and average. In intelligence, we face the problem that a word may not mean only one thing, but many-in this instance a very complicated set of aptitudes and abilities whose numbers and characteristics are not agreed upon by the specialists who study the phenomenon, and are even less understood by the layman (non specialist). In oxygen, we have a different problem, for although both; a research chemist and a chemical manufacturer identity the word theoretically with the element O, in practice they have different concepts about it. Thus, if the researcher performed a delicate experiment, using the manufacturer's oxygen, it might easily be a failure since the so-called O, whether used as a solid, liquid, or gas, would almost certainly contain other substances. Hence, another difficulty about words is that they often do not differentiate clearly enough between several varieties f the 'same' thing.

3. Read the following text carefully, make it note and write a summary. [5+5]

Plagiarism is the use of other person's ideas and expressions in your writing without acknowledge the source. The word comes from the Latin word 'plagiaries' and Alexander Lindey defines it as "the false assumption of authorship: the wrongful act of tacking the product of another person's mind and presenting it as one's own". In short, to plagiarize is to give impression that you have written or thought something that you have in fact borrowed from someone else, and to do so is considered a violation of the personal responsibility to acknowledge "academic debts".

The most blatant from of plagiarism is reproducing someone else's sentences, more or less verbatim, and presenting them as your own. Other forms include repeating another's particularly apt phrase without appropriate acknowledgement, paraphrasing someone else's argument as your own, introducing another's line of thinking as your own development of an idea, and failing to cite the source for a borrowed thesis or approach. Plagiarism falls outside the scope of copyright infringement. Copyright infringement, in

contrast, is using the work of a copyrighted work beyond the limit of fair use without the permission of the owner of copyright law are not plagiarism. The penalties of plagarism can be severe, ranging from loss of respect to loss of degrees, tenure or even employment. At all stages research and writing, you must guard against the possibilities of inadvertent plagiarism by keeping careful notes that distinguish between your own musings and thoughts and material you gather from others.

Even without considering the penalties of plagiarism, the best scholars generously acknowledge their debts to others. By doing so they not only contribute to the historiography of scholarship but also help younger scholars understand the process of research and discovery.

4. Answer any two of the following questions: [2x5]
   a) What is the conflict in the mother's mind and how did she resolve it? (The Mother of a Traitor)
   b) "Einstein was the greatest genius of the 20th century." Explain it. (What Einstein Did)
   c) Why do people make avoidable errors, and what sort of people makes them? (Straight and Crooked Thinking)

5. Choose the correct words from the brackets: [0.5×10]
   a) Many a flower ..... born to blush unseen. (is, are)
   b) Every boy and every girl ..... given sweets. (was, were)
   c) He is absent ..... the class. (from, in)
   d) Steel is made ..... iron. (of, from)
   e) I saw him ..... the race. (win, to win)
   f) If he comes to me, I ..... him. (help, would help)
   g) If one buys a car, it ..... money. (cost, costs)
   h) I should be ..... . (listened at, listened to)
   i) He, along with his teachers, ... playing. (is, are)
   j) The principal and accountant ..... on leave. (is, are)

6. Arrange the folllowing information into APA and MLA style of citation: [4]
   a) Name of the book: Solar energy
   b) Date of publication: 1996
   c) Place of publication: U.K.
   d) Publisher's name: Prentice Hall
   e) Name of the author: Hughes, A.

7. Inventing necessary details, write a notice with four point agenda for the forth coming fifth meeting of your local social club. [5]

8. As a Chief Consultant of Micro hydro-power project in the remote area of Dhading district, write the third monthly progress report in a memo format. [6]

9. Write a report to be submitted to the Chief Engineer, Department of Roads, on controlling the sound pollution of the Kathmandu Valley. Prepare only the Title page, Abstract, Conclusion and recommendation parts of the report. [10]

10. Suppose that you are invited to submit a proposal on establishing a paper factory in Nepal. Show the title page, abstract, objectives and conclusion parts of your proposal. [10]

11. Write a brief research article on the importance of English for the technical student. [10]

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2075 Chaitra

Exam.	Regular / Back		
Level	BE	Full Marks	80
Programme	BEL, BEX, BCT, BAG	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: - Communication English *(SH 601)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt <u>All</u> questions.*
- ✓ *The figures in the margin indicate <u>Full Marks</u>.*
- ✓ *Assume suitable data if necessary.*

1. Edit the following text: [5]

'aboard again monna marianna? take care you may be kill and nobody bother search for the culprit...

2. Read the following text carefully and interpret it so as to make the meaning clear. [5]
By teaching all other subjects, except values, we may produce great scientists, engineers, doctors, scholars, management experts, literatures etc. comparable with the best anywhere in the world but if the great professionals do not have peace of mind and qualities of love and kindness, what kind of society will we have?

3. Read the text given below carefully, make notes and write summary of it: [5+5]

When fission occurs, an average of 2-5 neutrons are emitted from the nucleus. If the fission process can be so arranged that one of these liberated neutrons is captured by another U-235 nucleus to produce another fission, then the reaction will become self-sustaining.

When emitted, neutrons travel at a high velocity, and it is known that such fast neutrons have little chance of being captured by fissile Uranium. However, if slowed down to thermal speeds, their probability of capture is greatly increased. In the normal thermal reactor, the uranium is surrounded by a large mass of moderating material. The liberated neutrons collide repeatedly with the light atoms of the moderator in such a way that they lose much of their energy and eventually become thermalised. The moderator may be either a liquid such as heavy water, or a solid such as graphite. Both these substances are of low atomic weight and have low neutron absorption cross-sections. With the graphite moderator, the uranium which is generally in the form of rods is inserted into channels cut out of the graphite. These channels are so arranged as to form a lattice structure, the object of which is to reduce neutron escape to a minimum. Provided that a sufficient mass of uranium is disposed in a number of rods through the moderator, a high enough proportion of the emitted neutrons will find their way to fissile nuclei to produce a chain reaction. The minimum quantity of uranium required to initiate the chain reaction is called the critical mass.

4. Answer **any two** of the following questions: [2x5]
   a) What do you mean by 'a sense of proportion'? (Knowledge and Wisdom)
   b) Why did the mother kill her own son? (The Mother of a Traitor)
   c) Describe Pahom's growing greed for land. (How Much Land Does a Man Need?)

5. Choose the best answer: [0.5x10]
   a) No sooner had he reached the station than the train .....(had left, left).

b) He liked books that ..... moral lessons. (gave, gives).
c) He, as well as they, ... coming to the party. (is, are)
d) More books than one ..... missing. (are, is)
e) The project will be over ..... next Monday. (before, within)
f) She came back to Kathmandu ..... two days. (in, after)
g) Be careful, or else you ..... those plates. (drop, will drop)
h) The passive voice of "Who did it" is ..... (By whom was it done?, Who is it done by)
i) The project is running ..... financial difficulties. (with, into)
j) Had I been there, I ..... every part of the city. (had visited, would have visited)

6. Put the following information into APA and MLA styles of citation. [4]
Author's name - Bernstein, T.M. & Often, S.B.
Year of publication – 1964
Title – The Careful Writer
Place of publication – New York
Publisher - Atheneum

7. Suppose you are the secretary of a local sports club. Write the minutes of the fifth meeting held recently inventing at least four agenda. [5]

8. Suppose you are the chief consultant of a urban internet connectivity project and the work is going on in your local town. Write a first quarterly progress report in memo format. [6]

9. Write a research article on the causes and consequences of noise pollution in the urban settlements in Nepal. [10]

10. Write a proposal on the maintenance and upgrading of Dhulikhe-Bahrabise section of Arniko Highway including abstract, statement of problem and lost estimate parts only. [10]

11. The Ministry of Road and Transport is concerned about the rapid increase in the number of road accidents on the highways. As a newly formed commission chairman, write introduction, discussion and conclusion parts of your report investigating causes of the road accidents in your local town. [10]

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17 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2075 Ashwin

Exam.	Back		
Level	BE	Full Marks	80
Programme	BEL, BEX, BCT, B.Agri.	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: - Communication English *(SH601)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. Edit the following text. [5]

A board game is a game played with counters or pieces that are placed or removed from or moved across a board simple board games often make ideal family entertainment. Since they are often appropriate for all ages. Some board games such like chess and Chinese checkers have strategic value and have been classic for centuries.

2. Read the given text and interpret its meaning. [5]

By teaching all other subjects, except moral values we may produce great scientists, engineers, doctors, scholars, management experts, litterateurs etc. comparable with the best anywhere in the world but if these great professionals do not have peace of mind and qualities of love and kindness, what kind of society will we have?

3. Read the following passage carefully and make notes and write a summary of it. [5+5]

Is classical music any way related to popular music? That is a controversial question. Advocates of classical music claim that it constitutes are and that pop music is only light entertainment. But, that is not always true. Some people have only elevated classical music to that special status by arguing that the works are more complex because of the range of notes involved. However, jazz, rap and many other forms of popular music sometimes do make use of a number of notes that are as complex as classical music. It is also argued that classical music songs are longer, sometimes extending to thirty minutes or more. Popular music songs are shorter and more repetitive so that they can be remembered for people to play or to sing.

Every language has its own popular music, like it has its own classical music. Indian popular music often known as Indi-pop or Hindi pop is a form of pop music in India. It is a fusion of various Indian folk and classical music styles and is also influenced by modern beats from different parts of the world. The major push given to Indi-pop was from Pakistani singer, Nazia Hassan. Indian pop has taken another interesting turn with the "remixing" of old Indian film songs-an attempt to make them sound more modern by adding new beats. These remixes have become very popular among the younger generation; they give the old melodies new life and vigour. The purists among the older generation however maintain that the beauty of the song is lost!

4. Answer any two of the following questions. [2×5]
   a) On what two aspects of science does the development of our world depend? (The Scientific Attitude)
   b) What lessons can we learn from the story "The Mother of a Traitor"?
   c) Even the best technicians should also be good citizens? Do you agree? Why?

5. Rewrite the following sentences using the correct alternative from the brackets. [0.5×10]

a) It's time the plane _____ (to land, is landing, landed).
b) The stream and the farm _____a good view. (offer, offers).
c) Some furniture _____to be ordered for the room. (have, has).
d) If I _____to choose one I'd go for the green (was, were)
e) Anybody _____this if you had not done. (will have done, may have done, would have done)
f) "I guess people are watching us", really? But I don't think we _____(will be watched, were being watched, are being watched)
g) Do you remember what Priya _____before she got her article published? (did, had done, would do)
h) By the start of the next century, I think people _____in the Mars. (have settled, can settle, will have settled)
i) This book has been translated _____several languages. (to , by, into)
j) Our teacher objects _____anyone's coming late. (to, against, for)

6. Put the following information into APA and MLA style of citation. [4]

Name of the book	-	Awakening Spirituality
Author's name	-	Dr. Binny Sareen
Publisher	-	Brahma Kumaris, Literature Department
Publishing place	-	India
Year of Publication	-	2012

7. Inventing all necessary details, draft a notice with a three point agenda for the 15th meeting of a Local Sports Club. [5]

8. Suppose you are doing a project on view tower building construction. Write a report about the progress of the work you have completed so far. [6]

9. Imagine you are going to write a proposal on establishing a soap factory. Write the introduction, statement of problem and objective parts of the proposal. [10]

10. Prepare a research article on the role of technical colleges in the development of nation. [10]

11. Imagine you are doing a project on construction of a suspension bridge in a village. Write the first monthly report in a memo format. (Assume necessary data yourself.) [10]

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17 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2074 Chaitra

Exam.	Regular	
Level	BE	Full Mar
Programme	BEL, BEX, BCT, B.Agri.	Pass M
Year / Part	III / I	Time

Subject: - Communication English *(SH601)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. Edit the following text:

   Your leader is my son she said and not one of the soldiers doubt it. They fell in beside her, singing his praises, saying how clever and brave he is, and she listen to them with head proudy raise, showing no surprise.

2. Read the following text carefully and interpret it so as to make the meaning clear. [5]

   The third great defect of our civilization is that it does not know what to do with its knowledge. Science has given us powers fit for the Gods, yet we use them like small children. For example, we do not know how to manage our machines. Machines were made to be man's servants; yet he has grown so dependent on them that they are in a fair way to become his masters. Already most men spend most of their lives looking after and waiting upon machines. And the machines are very stern masters. They must be fed with coal, and given petrol to drink, and oil to wash with, and they must be kept at the right temperature. And if they do not get their meals when they expect them, they grow sulky and refuse to work, or burst with rage, and blow up, and spread ruin and destruction all round them. So, we have to wait upon them very attentively and do all that we can to keep them in good temper. Already we find it difficult either to work or play without the machines, and a time may come when they will rule us altogether, just as we rule the animals.

3. Read the following passage carefully, make notes and write a summary. [5+5]

   Although religion does not inhibit the acquisition of wealth, although is does not hold up large fortunes as evil, the tenor of its teaching, by and large, is to induce an attitude of indifference to worldly things, things which gratify one's lower self and keep one engrossed in money-making. the students should be made to realize that the real goods of life are spiritual, love of things of the spirit and service of one's fellowmen, joy of an ordered disciplined life. These are blessings money cannot buy. What is wealth before such things of the spirit? Of all religious teachers Jesus Christ has dealt more comprehensively than any other with the problem of wealth in all its aspects. He may be called the greatest exponent of the science of wealth. With only four words "Blessed are ye poor!" he changed altogether the values which man attached to human existence and human happiness and acquisition and possession of wealth. Real bliss consisted, he taught, not in riches nor in anything else which the world regarded as prosperity or felicity, but in the joy and happiness derived from being at peace with one's fellowmen through perfect love and fellowship and selfless service and sacrifice.

   The word "poor" on the lips of the Master had a spiritual significance - the poor so far as they were poor in spirit, humble before God, simple, God-fearing, teachable, faithful. It could surely not have been his intention to hold up destitution and privation as a blessing in itself. That would have turned life into a terrible ordeal and it would have been heartless to exhort the poor to believe that money was not necessary for one's sustenance or the joys and blessings of life. Even things of the spirit cannot be had without money.

Extreme poverty is as liable to lead to the stagnation and impoverishment of the soul as excessive wealth. Not outward poverty but inward spirit was what Jesus Christ desired and demanded. Every religion asks a man to regard his wealth as a trust. Giving in charity for the relief of the poor and public welfare is not merely an act of compassion, not merely a religious duty, but also an act of social justice. All the gospels of wealth are based on the fundamental concept that none can claim an absolute or inherent right to property. Everyone holds it in trust from God to promote the good mankind. All rights to private property are subject to this primary obligation to God and man.

4. Answer any TWO of the following questions. [2×5]

   a) How can science be misused? Explain. [Use and Misuse of Science]

   b) How did Monna Marinna carry out her responsibilities as an ideal citizen and as an ideal mother? [The Mother of a Traitor]

   c) Describe the contribution of Einstein to the modern scientific world?

   OR

   Why did Joseph wood Krutch call grass a "miracle"?
   St. Peter said "all flesh is grass". Discuss.

5. Write a research article on 'The Effects of Air pollution in Kathmandu Valley'. [10]

6. Write the following bibliographic references first in MLA and then in APA. [4]

   Name of book: Computer Addiction A Study of Computer Dependency
   Name of publisher: Taylor and Francis
   Name of author: M.A. Shotton
   City of publication: London
   Year of publication: 1989
   Name of country: England

7. Suppose you are the secretary of a construction Committee. The 3rd meeting of the committee was conducted a few days ago. Imagine four relevant agendas and prepare minutes of the meeting.

8. Write down the elements of proposal, describe briefly. [5]

9. Suppose that you want to establish a new hydropower company or an IT company in Nepal, and that you have prepared a proposal for it. Now show the following parts of your proposal: [5]

   a) Technical section
   b) Management section
   c) Cost estimate

10. Suppose you are the chairman of a committee formed to investigate the access of internet to the students in your college. Write a report including title page, letter of transmittal, abstract and recommendation. [10]

11. Write the second monthly progress report on the project 'Construction of Micro-hydro power plant'. Invent necessary details. [6]

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27 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2074 Ashwin

Exam.	Back		
Level	BE	Full Marks	80
Programme	BEL, BEX, BCT, B. Agri.	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: - Communication English *(SH601)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. Edit the following text. [5]

But when the war is over, the country recedes from the consciousness and it is rarely even at the back of the mind. The question am I doing any good to the country doesn't occur to the mind; and even the question is what I am doing good or bad for the country occurs only rarely. A limited patriotism is better than none but it is not enough.

2. Read the given text and interpret its meaning. [5]

Computers have solved many problems for us, but they create some problems too. Say, for example, that you are writing a novel. After you are done with your first draft you decide to change your heroine's name from Linda to Lydia. With a typewriter you would have to retype every page containing the heroine's name. With word processing software, on a computer, you press just a few keys and the computer takes care of all the work. But technology hasn't solved all our problems. While many of Shakespeare's original documents survive, it takes only misplaced keystrokes to wipe out your next masterpiece.

3. Read the following passage carefully, make notes and write a summary of it. [5+5]

The dearth of natural resources on the Australian continent is a problem with which government officials there have long struggled. As long distance travel has become ever more important to the national economy. Tourism represents more than 10 percent of national export earnings annually, and in less developed regions such as the Western Territory, the percentage is much higher.

Unfortunately, this otherwise rosy prospect has one significant cloud on the horizon. In recent years, there has been a move towards returning some of the land to the Aboriginal people. As Western society and culture have flourished on Australian soil, tribal people have been forced ever farther inland in an attempt to maintain their traditional ways of living, a desire that the government has striven to respect.

One of the central beliefs of the Aboriginal religion is that certain natural formations have spiritual significance and must be treated accordingly. Strict guidelines determine who may visit these sites and at what times. Unfortunately, many of these sites are the very natural wonders tourists flock to see. If non-Aboriginal people are forbidden to visit these natural wonders, many may choose not to vacation in a region that sorely needs the income generated by tourism.

The Australian government has dealt with this dilemma thus far by trying to support both sides. The Aboriginal council is still trying to put an end to such use of certain sites, however, and it remains to be seen whether respect for tradition or economic desires will ultimately triumph.

4. Answer any TWO of the following questions: [5x2]

a. Why do people make avoidable errors? And what sorts of people make them? (Straight and Crooked Thinking)

b. How do modern boilers function? (Steam Boilers)

c. "Studies serve for delight, for ornament and for ability". Explain it. (Of Studies)

5. Choose the best answer. [0.5x10]

a. The passive voice of 'I let him go' is .....(He was let go/ He was let to go)

b. The passive voice of 'They saw the cat stealing the meat' is .....(The cat was seen stealing the meat/The cat was seen to be stealing the meat)

c. When he became rich, he threw ..... all his old friends. (off, over)

d. The project is running ..... financial difficulties. (in, into)

e. What you think and do .....praiseworthy. (is, are)

f. Letter after letter.....been sent to her. (has, have)

g. If I ..... to ask you, would you help me? (was, were)

h. .....that happen, I will quit the job. (should, if)

i. Note down my address lest you ..... (should forget, might forget)

j. It ..... a week since I saw Jill. (has been, is)

6. Write the following bibliographic information first in MLA and then in APA. [4]

Name of newspaper: New York Times

Title of article: Messi Is Barcelona's Boy Genius

Name of writer: Eduardo Galeano

Section and page number: N1

Date of publication: 22 May 2011

7. Assume that you have recently taken over as the secretary of a public limited company. Informal discussion with the senior officers reveals that the growth of the organization has been hampered because of frequent strikes by the workers. After going through your preliminary report the chairman has decided to call a meeting of the Board of Directors to discuss the issue in depth and to find a lasting solution to the problem. Draft a notice along with four-point agenda for the meeting. [5]

8. Suppose that you are chief engineer working on a five-year your engineering field, which began last year. Write the first quarterly progress report of the project. [6]

9. Imagine that you are requested to submit a proposal for establishing a sophisticated computer lab in one of the technical companies. Write title page, technical section and cost estimate of the proposal that you are going to submit. [10]

10. Prepare abstract, introduction and recommendations of a report on "Damage and Loss of Life due to Flood in Different Parts of Nepal". [10]

11. Write, in about 500 words, a research article on "Role of Engineers in Nation-building Campaign". [10]

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27 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2073 Chaitra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BEL, BEX, BCT, B. Agri.	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: - Communication English *(SH601)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. Edit the following text. [5]

Some argue that american politics has become so polarized that politicians will argue merly to gain power, and the subject to debate is often negligible. The vigorous dispute over where to place a comma in the republican platform for example was motivated not by any significance change of meaning but a desire not to show any deference of the other side.

2. Read the given text and interpret its meaning. [5]

The survival of the publishing industry depends upon the existence of a public who will buy the printed word in the form of newspapers, books and magazines. Over the past several years, however, the advance of electronic media, particularly CD-ROMs, online computer services, and the Internet, has made information available to the public electronically without the need for printed materials. As the availability of electronic media increases and as it is more easily accessible, the public has less need for printed materials.

3. Read the following passage carefully, make notes and write a summary of it. [5+5]

According to usage and conventions which are at last being questioned but have by no means been overcome, the social presence of a woman is different in kind from that of a man. A man's presence is dependent upon the promise of power which he embodies. If the promise is large and credible, his presence is striking. If it is small or incredible, he is found to have little presence. The promised power may be moral, physical, temperamental, economic, social, and sexual—but its object is always exterior to the man. A man's presence suggests what he is capable of doing to you or for you. His presence may be fabricated, in the sense that he pretends to be capable of what he is not. But the pretence is always toward a power which he exercises on others.

By contrast, a woman's presence expresses her own attitude to herself, and defines what can and cannot be done to her. Her presence is manifest in her gestures, voices, opinions, expressions, clothes, chosen surroundings, taste—indeed there is nothing she can do which does not contribute to her presence. Presence for a woman is so intrinsic to her person that men tend to think of it as an almost physical emanation, a kind of heat or smell or aura.

To be born a woman has been to be born, within an allotted and confined space, into the keeping of men. The social presence of women has developed as a result of their ingenuity in living under such tutelage within such a limited space. But this has been at the cost of a woman's self being split into two. A woman must continually watch herself. Whilst she is walking across a room or whilst she is weeping at the death of her father, she can scarcely avoid envisaging herself walking or weeping. From earliest childhood she has been taught and persuaded to survey herself continually.

P.T.O.

4. Answer any TWO of the following questions: [5x2]

a) What elements of science can the ordinary citizen use in order to help his society develop? (The Scientific Attitude)

b) Write the character of Dmitri Dmitritch Gurov in about 150 words. (The Lady with the Pet Dog)

c) Russell says 'with the increase of knowledge and skill, wisdom becomes more necessary'. Do you agree with him? Give your opinions. (Knowledge and Wisdom)

5. Choose the best answer: [0.5x10]

a) You, he and I _____ neighbours. (am, are)

b) The team _____ struggling for its victory. (is, are)

c) It's me who always _____ right decision. (take, takes)

d) He _____ as if he were illiterate. (talks, talked)

e) Had she reached airport in time, she _____ her flight. (wouldn't miss, wouldn't have missed)

f) If you buy this car, you _____ Rs. 25,00000/- only. (will have to pay, have to pay)

g) There's no one here I can confide _____ (in, on)

h) The king bestowed an honour _____ her. (to, upon)

i) The passive voice of "His conduct shocked me" is _____. (I was shocked by his conduct / I was shocked at his conduct)

j) The passive voice of "He urged the council to reduce the rates" is _____. (He urged that the rates should be reduced / He urged the rates to be reduced)

6. Change the following citations as indicated in brackets: [4]

a) Lyons, J. Language and Linguistics. USA: CUP, 2003. (into APA)

b) Imam, S.T. Brush UP Your English. India: Bharati Bhavan, 2003. (into APA)

c) Hall, Dauglas. (1989). Digital circuits and systems. New York: Macmillan. (into MLA)

d) Wolf, Daniel. (1995). Lives of notable gay men and lesbians. New York: Chelsea Publishing. (into MLA)

7. Suppose you are the newly appointed chairperson of the committee of the 14th National Technological Festival 2017. In order to make the festival highly effective and successful, you want to discuss some matters with other members of the committee. Now write a notice along with four-point agenda for the first meeting of the committee: [5]

8. Suppose you are senior engineer working on Electoral Supply Project, Kathmandu, Nepal. Write its first yearly progress report that you are going to submit to the project manager. Prepare it in letter format. [6]

9. Assume that as a Project Development Officer you have been asked by the National Institute of Computer Education, Kathmandu, to set up a Communication Technology Centre at Dhobighat, Kathmandu for training professionals in the use of latest technological aids for face-to-face and distance communication. Write a technical proposal to be submitted to the Director of the Institute. Prepare only title page, technical section and cost estimate of your proposal. [10]

10. There has been minimum rainfall in winter in Kathmandu this year. Write a report on the problems caused by it to the Kathmanduits. Prepare an outline of your report and then write cover page, abstract and introduction in detail. [10]

11. Write, in about 500 words, a research article on "Significance of power-point presentation in technical communication". [10]

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21 TRIBHUVAN UNIVERSITY

INSTITUTE OF ENGINEERING

Examination Control Division

2073 Shrawan

Exam.	New Back (2066 & Later Batch)		
Level	BE	Full Marks	80
Programme	BEL, BEX, BCT, B. Agri.	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: - Communication English *(SH601)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. Edit the following text: [5]

Arundhati Roy the famous novelist and activist who won the booker prize in 1997 for her novel. The God of small things was born in shellong Meghalaya on november 24, 1961 to a Keralite mother and a Bengali father.

In 1984 Arundati began a brief career in films. She played the role of a village girl in the moule massey sahib and also wrote the screen play for the film in which Annie gives in those ones.

Roy began writing the god of small thengs in 1992 and finished it in 1996.

2. Read the following text carefully and interpret it so as to make the meaning clear. [5]

Ever since humans have inhabited the earth, they have made use of various forms of communication. Generally, this expression of thoughts and feelings has been in the form of oral speech. When there is a language barrier, communication is accomplished through sign language in which motions stand for letters, words, and ideas. Tourists, the deaf, and the mute have had to resort to this form of expression. Many of these symbols of whole words are very picturesque and exact and can be used internationally; spelling, however, cannot.

3. Read the following passage carefully and (i) make notes and (ii) write summary. [5+5]

To solve the most urgent health problems of developing countries, expert have recommended that priority should be given to primary health care. **This approach to health care,** as we have seen, emphasizes health maintenance through disease prevention and control. Many of the developing world's deadliest disease The experts point out; can be prevented if clean water and adequate sanitation are provided. Other disease can be prevented by mass vaccination programs. Still other can be controlled by effective health education that gives people information about ways to avoid malaria-carrying mosquitoes or about the importance of nutrition, especially for pregnant women and young children.

Primary heath care, as we have seen, does not merely focus on prevention and ignore the treatment of disease. Another priority for poorer nations is to provide timely diagnose and basic treatment for the general populations instead of technologically advanced and expensive treatment for a few wealthy people. Under international program, the governments of developing countries are given incentives to build community health centers and train health workers. Patients receive immediate attention from doctors, nurses and health workers who have to the necessary diagnostic training and equipment and have an adequate supply of drugs. These local health centers are much more accessible to people who need treatment than a few hospitals in the larger cities.

If poorer countries can offer **this type of health care,** the health of their general populations will improve rapidly. A number of developing countries have already shown that primary health care programs can be successful. Cuba eliminated polio in 1972, even before the disease was eliminated in the United States. In 1974, the World Health Organization began a program to immunize the world's children against six vaccine-preventable diseases during their first year of life. By 1994, the vaccinations were protecting 80 percent of children and the annual number of child deaths had fallen by 3 million. Another WHO program, whose goal was to wipe out polio in the Americas, began in 1985. The goal was achieved in 1991. In the year, nearly 2 million children in Peru were vaccinated in one week after polio had been diagnosed in a two-year-old boy. The boy, Luis Fermin, recovered and proved to be the last case of polio in the Americas.

4. Answer any two: [5×2]

   i) What was the mother's delemma and how did she solve it? (The mother of A Traitor by maxim Gorku)
   ii) What do you mean by a sense of proportion? (Knowledge and Wisdom)
   iii) Describe the contribution of Einstein to the world? (What Einstein did?)

5. Choose the correct words from the bracket: [0.5×10]

   i) Neither he nor his relative ..... turned up. (has, have)
   ii) Either sugar or tea ..... suitable for the drink. (is, are)
   iii) He asked me what I ..... do for a living. (will, should)
   iv) She has a taste ..... music (of, for)
   v) He was told not to worry ..... the matter. (with, about)
   vi) It is no use ..... to come now. He is very busy. (to ask him, if you asked him)
   vii) He was an ..... scientist. (remiment, imminent)
   viii) A fool's paradise mean ..... (to have happy dreams, live in illusions)
   ix) She yelled ..... him. (to, at)
   x) The news ..... false. (is, are)

6. Write the following bibliographic references first in MLA and then in APA. [4]

   Name of the book: The Remains of the Day
   Name of the publisher: Faber
   Place of publication: London
   Year of publication: 1989
   Name of the author: Kazuo Ishiguro

7. As the C.R (class representive) of your class, write the Notice, Agenda and Minutes of the meeting: "Farewell programme for the seniors". [5]

8. Suppose you have been working on a project of your engineering field for a few months. Write the second monthly progress report of the work you have completed in letter format. [6]

9. Write a brief research article on reducing Air Pollution in the Kathmandu Valley. [10]

10. Suppose that you are interested in establishing a new software company in Kathmandu. Write title page, introduction and technical section of your proposal that you are going to submit to the Ministry of Science and Technology, Singh durbar, Kathmandu. [10]

11. Write a report on "Development of communication system" in remote areas of Nepal. Invent necessary details. [10]

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27 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2072 Chaitra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BEL, BEX, BCT, B. Agri.	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: - Communication English *(SH601)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. Edit the following text: [5]

But the Bengali lady with green who kept darting looks at the drummer rather than on the beautiful sitar player whispered suddenly he keeps staring at me Minakshi. Or, perhaps it is I who keep staring at him. I cant take my eyes off him Minakshi.

2. Give the interpretation of the following text: [5]

It is not only in public ways, but in private life equally, that wisdom is needed. It is needed in the choice of ends to be pursued and in emancipation from personal prejudice. Even an end which it would be noble to pursue if it were attainable may be pursued unwisely if it is inherently impossible of achievement. Many men in past ages devoted their lives to a search for the philosopher's stone and the elixir of life. No doubt, if they could have found them, they would have conferred great benefits upon mankind, but as it was, their lives were wasted.

I think the essence of wisdom is emancipation, as far as possible, from the tyranny of the here and the now. We cannot help the egoism of our senses. Sight and sound and touch are bound up with our own bodies and cannot be made impersonal. Our emotions start similarly from ourselves. An infant feels hunger or discomfort, and is unaffected except by his own physical condition. Gradually with the years his horizon widens and in a proportion as his thoughts and feelings become less personal and less concerned with his own physical states, he achieves growing wisdom. This is of course a matter of degree. No one can view the world with complete impartiality; and if anyone could, he would hardly be able to remain alive. But, it is possible to make a continual approach towards impartiality, on the one hand, by knowing things somewhat remote in time or space and, on the other hand, by giving to such things their due weight in our feelings. It is this approach towards impartiality that constitutes growth in wisdom.

Can wisdom in this sense be taught ? And, if it can, should the teaching of it be one of the aims of education ? I should answer both these question in the affirmative.

3. Read the following passage carefully, make notes and write a summary of it. [5+5]

A recent investigation by scientists at the U.S. Geological Survey shows that strange animal behaviour might help predict earthquakes. Investigators found such occurrences within a ten-kilometre radius of the epicentre of a fairly recent quake. Some birds screeched and flew about wildly; dogs yelped and ran around uncontrollably.
Scientists believe that animals can perceive environmental changes several hours or even days before the mishap. Animals were noted as being restless for several weeks before a Tashkent, Uzbekistan, earthquake. An hour before the disaster, domestic animals refused to go indoors, and dogs howled and barked furiously. In 1960, an earthquake struck Agadir in Morocco. Survivors recall that stray animals, including dogs, were seen streaming out of town before the earthquake. In a safari zoo near San Francisco, llamas would not eat the evening before a 1979 quake, and they ran around wildly all night.

Unusual animal behaviour preceding earthquakes has been noted for centuries. British Admiral Robert Fitzroy reported huge flocks of screaming seabirds over Concepcion, Chile, in 1835. An hour and a half later, dogs were seen fleeing, and ten minutes later the town was destroyed. Similar stories of chickens running around in apparent states of panic, horses trembling, and dogs barking incessantly were recorded throughout the eighteenth and nineteenth centuries by survivors of earthquake destruction in India, Yugoslavia, Peru, Mexico, and the United States.

In 1976, after monitoring bizarre animal behaviour, the Chinese predicted a devastating earthquake. Although hundreds of thousands of people were killed, the government was able to evacuate millions of other people and thus keep the death toll at a lower level.

4. Answer any TWO of the following question: [2×5]

a. 'Is it she?' 'It is she?' What does this exchange tell us about what the people thought of her? What did they do when they saw her? Why? (The Mother of a Traitor)

b. What are the two ways in which science can help society to develop? (The Scientific Attitude)

c. What is chain reaction? Describe it in brief. (Chain Reaction)

5. Choose the best answer: [0.5×10]

a. Should you do it, I .....happy. (will be, would be)
b. If she ..... you, she would write an application. (was, were)
c. He hates parting .....his money. (with, from)
d. The firm have provided me .....a car. (with, no preposition)
e. The Passive Voice of 'Hear him now' is ..... (Let him be heard now/He should be heard now)
f. The Active Voice of 'Who was helped by whom?' is .....? (Who did help whom/Who helped whom)
g. More than one student ..... playing. (is, are)
h. The Prime Minister and Chancellor ..... coming. (is, are)
i. It's time you ..... those trousers. (wash, washed)
j. I wish I .....meet her. (should, would)

6. Put the following information in to APA and MLA styles of citation. [4]

   a) Book Name = The ACS style Guide: A manual for Authors and Editors

      Author's name = Janet S. Dodd

      Publishers = American Chemical Society

      Place of Publication = Washington, DC

      Year of Publication = 1986

   b) Journal = Computer Publishing

      Author = Jan V. White

      Article = Colour in Context

      Date of Publication = February, 1991

      Page nos = 55-57

7. Suppose you are the secretary of Sony Electronics Private Limited, Baluwatar, Kathmandu and the 7th meeting regarding the problems of the staff of the limited has been held recently. Inventing the most relevant agenda, write minutes of the same. [5]

8. As a chief contractor of an affordable, earthquake resistant housing project, write the second quarterly progress report in memo format, invent necessary details. [6]

9. Write in about 500 words, a research articles on "Development of Information Technology in Nepal". [10]

10. Design the title page and write the Abstract, Table-of-Contents and Recommendation for the proposal titled "Building of an Auditorium" in your campus. [10]

OR

"Formation of A Student Project Club".

11. Imagine that you have already prepared a report on "Environmental Pollutions in Asia". Show the Title page, Abstract, Introduction and Recommendation sections of your report. [10]

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