Electrical

IV/I

Question Bank

TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2080 Bhadra

Exam.	Regular		
Level	BE	Full Marks	40
Programme	BEL	Pass Marks	16
Year / Part	IV / I	Time	1½ hrs.

Subject: - Technology Environment and Society (*CE 708*)

- ✓ 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. Describe the characteristics of information age. Justify the technology plays an important role to unmask old social problems. [4+4]
2. Describe the LEP approach with suitable examples and list out the advantages and disadvantages of the LEP approach. [8]
3. List out the major environmental issues in Nepal. Describe briefly the causes and mitigation measures. Also discuss how those environmental issues need global effort and what are those effort. [4+4]
4. Define indoor air pollution. Explain the severity of environmental and health problems due to air pollution in Kathmandu. [3+5]
5. Write short notes on: (Any Two) [2×4]
   a) Human induced climate change
   b) Acid rain and its consequences
   c) Conflict of resources
   d) Biomass to Biogas

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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	IV / I	Time	$1^1/_2$ hrs.

Subject: - Technology Environment and Society (*CE 708*)

- ✓ 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. Describe about the appropriate technology and intermediate technology with suitable examples. [8]
2. Describe the LEP approach with suitable examples and list out the I-2 advantages and disadvantages of the LEP approach. [8]
3. Discuss about major technological developments during initial industrial revolution and how industrial revolution lead to major environmental issues. [8]
4. Define on-site sanitation. And, discuss the crucial role of health education regarding the sanitation problems in the context of Nepal. [2+6]
5. Justify the statement, "Climate change is highly threatening to Human civilization", with suitable examples. [8]

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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	IV / I	Time	1 1/2 hrs.

Subject: - Technology Environment and Society (*CE 708*)

- ✓ 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 technology. Discuss the impacts of technology on society and environment. [2+6]
2. Discuss the participatory development approach with suitable examples. [8]
3. Discuss the key reasons those caused to happen world war II with its political and economic effects. [8]
4. Describe about fecal oral infection route and their preventive measures. [8]
5. Write short notes on: (Any Two) [2×4]
   a) Causes and impacts of climate change
   b) Deforestation and its consequences
   c) Appropriate technology

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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	IV / I	Time	1½ hrs.

Subject: - Technology Environment and Society *(CE 708)*

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

1. What are the characteristics of the information age? Describe how the digital technology is being utilized in the fight against COVID-19 pandemic? [4+4]
2. What are appropriate and intermediate technologies? Why is labor based or labor intensive technology necessary for LDCs like Nepal? [4+4]
3. What are the key features of infrastructure development policies of Nepal? Are these features reflected in the fiscal year 2078/79 B.S. budget? [8]
4. What is population explosion? What are the reasons for it? How do you view the current trend of decreasing population in the developed countries? [2+3+3]
5. What are the major immediate environmental issues for Nepal? How can the use of technology be beneficial in solving them? [4+4]
6. Write short notes on: [2×4]
   a) On site sanitation
   b) International efforts to mitigate climate change

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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	IV / I	Time	1½ hrs.

Subject: - Technology Environment and Society *(CE 708)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt <u>All</u> questions.*
- ✓ *<u>All</u> questions carry equal marks.*
- ✓ *Assume suitable data if necessary.*

1. How does technological advancement shift employment? Explain with suitable examples.
2. What is LEP? Discuss about ethnographic approach and participatory approach for community management.
3. Write down the major economic, social and political impacts of the World War II.
4. Discuss the characteristics of information society. How has industrial society entered into information society?
5. a) Briefly discuss on severity of Indoor Air Pollution problem in Nepal.
   b) What do you mean by organic farming? Write down the advantage of typical organic farming practice.
6. Define climate change. Elaborate on the usefulness of alternative (renewable) energy regarding climate change issues.

TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2076 Chaitra

Exam.	Regular		
Level	BE	Full Marks	40
Programme	BEL	Pass Marks	16
Year / Part	IV / I	Time	1½ hrs.

Subject: - Technology Environment & Society *(CE 708)*

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

1. Write short notes on:
   a) Technology is irreversible.
   b) Conflict of technology with examples.
2. Discuss about components of sustainable development. How do you relate LEP approaches with sustainable development?
3. State and explain environmental sanitation. Also discuss pathways of fecal-oral infection Transmission route.
4. Differentiate between information age and industrial age. Also explain information is power and wealth.
5. What are current environmental issues? Compare the environmental issues of Nepal to global issues.
6. What are the impacts of climate change in Nepal? Explain briefly the international efforts towards mitigation of climate change impact.

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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	IV / I	Time	1 ½ hrs.

Subject: - Technology Environment and Society *(CE 708)*

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

1. Explain the differences between Industrial age and Information age. Also explain knowledge is wealth. [8]
2. Describe the pros and cons of using structured questionnaires. In what situations should you conduct this procedure? Also write about focus group meeting. [8]
3. What do you mean by conflict of resources? What are the main causes of conflict of natural resources? Also explain ecology ecosystems. [8]
4. Explain differences between on-site and off-site sanitation. Describe fecal-oral transmission route and list out preventive measures against fecal-oral infections. [8]
5. a) Explain what is global warming? Write down international effects to mitigate it. [4]
   b) Describe causes and impacts of deforestation in Nepal. [4]
   [4+4]
6. Write notes on: (Any two)
   a) European Renaissance
   b) Industrial Revolution
   c) Impacts after World War II
   d) Major global environmental issues

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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	IV / I	Time	1 ½ hrs.

Subject: - Technology Environment and Society *(CE 708)*

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

1. Write short notes on:
   a) Technology both as a curse and a blessing
   b) Significance of appropriate technology in Nepal
2. a) What is Ethnography study? Explain how information is collected in this approach.
   b) Explain why Resource Mapping is carried out.
3. Summarize the impacts of World War I and II. Also describe population explosion.
4. Discuss all the major environmental issues of Nepal. Also write down probable strategies to mitigate those issues.
5. What are causes of air pollution in Kathmandu Valley? Describe its effect and possible mitigation measures.
6. What is climate change? State and explain gases which causes climate change. Also write major symptoms of climate change in Nepal.

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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	IV / I	Time	1 ½ hrs.

Subject: - Technology, Environment and Society *(CE708)*

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

1. What do you understand by the term technology? How it changes culture and traditions of a society?
2. Define participatory appraisal. Explain focus group discussion and resources mapping.
3. What is environment sanitation? Discuss fecal oral infection transmission route.
4. Why knowledge is important in the information age. Also write down characteristics of the information age.
5. What are climate change gases? Write down the probable impact and mitigation measures of the climate change.
6. Write down causes, effects and mitigation measures of air pollution.

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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	IV / I	Time	1 ½ hrs.

Subject: - Technology Environment and Society *(CE708)*

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

1. Discuss how technology changes people values, culture and tradition of a society.
2. Explain, what is information age? Also write down how the industrial society entered into information society.
3. Explain water pollution. Write down fecal oral infection route and discuss their mitigation measures.
4. What is climate change? State and explain gases which cause climate change. Discuss all the possible interventions to mitigate climate change.
5. a) Explain conflict of technology.
   b) Discuss technology can unmask old social problems.
6. Write notes on:
   a) Focus group discussion
   b) Major environment issues of Nepal

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14 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2073 Chaitra

Exam.	Regular		
Level	BE	Full Marks	40
Programme	BEL	Pass Marks	16
Year / Part	IV / I	Time	1 ½ hrs.

Subject: - Technology Environment and Society *(CE708)*

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

1. Explain technology can unmark social problems of a society.
2. What is the role of a users' committee? Also explain participatory techniques to collect information from a community.
3. What is organic pollution in drinking water? Discuss in detail aerobic and anaerobic decomposition process.
4. Write down causes, effects and mitigation measures of air pollution.
5. What is information society? Explain how agricultural society entered into information society.
6. Write short notes on any two:
   a) Climate change
   b) Conflict of technology
   c) Impact of World War I and II

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14 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2074 Ashwin

Exam.	Back		
Level	BE	Full Marks	40
Programme	BEL	Pass Marks	16
Year / Part	IV / I	Time	1 ½ hrs.

Subject: - Technology Environment and Society *(CE708)*

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

1. Discuss technology provides shift in employment opportunity.
2. What is participatory approach? Also explain appropriate technology and labour intensive technology.
3. Explain in detail why 13, 14, 15 centuries are called Great Renaissance or intellectual revival of Europe.
4. What are climate change gases? Write down its mitigation measures. Also explain international efforts to tackle its problem.
5. Explain how fecal-oral infections transfer from one person to another. Also discuss preventive measures.
6. Write short notes on any two.
   a) Air pollution
   b) Information age
   c) Focus-Group Discussion

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13 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	IV / I	Time	1 ½ hrs.

Subject: - Technology Environment and Society *(CE708)*

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

1. What do you mean by technology? Discuss about its benefits in education sector. [2+6]
2. Describe the LEP approach for the development of Nepal. Explain community empowerment process of participatory approach. [4+4]
3. What do you mean by climate change? Discuss about its cause, impact and mitigation measures. [2+6]
4. Discuss about the global environmental issues. Also discuss key environmental issues of Nepal. [4+4]
5. What are characteristics of agriculture, industrial and information age? [8]
6. Explain how does technology change culture and tradition of a society? [8]

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01/07

16 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2072 Chaitra

Exam.	Regular		
Level	BE	Full Marks	40
Programme	BEL	Pass Marks	16
Year / Part	IV / I	Time	1 ½ hrs.

Subject: - Technology Environment and Society *(CE708)*

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

1. What are appropriate and intermediate technologies? Why is labor based or labor intensive technology necessary for LDCs like Nepal?
2. What are resources mapping? How is wealth and poverty ranked?
3. What is population explosion? What are the reasons for it? How do you view the current trend of decreasing population in the developed countries?
4. What are the major immediate environmental issues for Nepal? How can the use of technology be beneficial in solving them?

OR

Discuss the severity of inorganic water pollution problem in Nepal? Give your plans to mitigate their problems.

5. What are the current international efforts being made to mitigate the problems caused by climate change? Are they enough?

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16 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2072 Kartik

Exam.	New Back (2066 & Later Batch)		
Level	BE	Full Marks	40
Programme	BEL	Pass Marks	16
Year / Part	IV / I	Time	1 ½ hrs.

Subject: - Technology Environment and Society *(CE708)*

- ✓ 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. How does technology impact on culture, traditions and society? [5]
2. Elaborate the statement that "Information is wealth and power in modern society." [5]
3. What is community management? How can an engineer facilitate it? [4]
4. What is participatory approach and how can it empower the community? [4]
5. What was the role of the two world wars in advancing technology? How did they shape the new cultural values? [5]
6. What is t he conservation of environment? How can it be done without hindering the development? [4]
7. Discuss the severity of water and air pollution problem in Nepal? Give your plans to solve this problem effectively and in short time. [8]
8. "Nepal is one of the least responsible countries for global climate change but it is one of the most affected." Elaborate the statement. [5]

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16 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2071 Chaitra

Exam.	Regular		
Level	BE	Full Marks	40
Programme	BEL	Pass Marks	16
Year / Part	IV / I	Time	1 ½ hrs.

Subject: - Technology Environment and Society *(CE708)*

- ✓ 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 how technology can unmask old social problems. [6]
2. Why climate change is a threat to civilization? Explain its impact and mitigation measures in detail. [6]
3. Compare and contrast industrial age and information age. [4]
4. What is ecosystem? What are the primary reasons of human interventions in the ecosystem? Recommend feasible solution regarding these issues. [6]
5. What is pollution? What is onsite sanitation and health education? Discuss on fecal oral infection transmission route and effective prevention measures. [6]
6. Write notes on: (any three) [12]
   a) Focus Group Discussion
   b) Resources Mapping
   c) Appropriate Technology
   d) Renewable and Non renewable resources

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13 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2071 Shawan

Exam.	New Back (2066 & Later Batch)		
Level	BE	Full Marks	40
Programme	BEL	Pass Marks	16
Year / Part	IV / I	Time	1½ hrs.

Subject: - Technology Environment and Society *(CE708)*

- ✓ 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. Define technology and its impact on societies. Define appropriate technology and its relevancy to LDC. [7]

Or

Technological innovation reveal the old social problem but "science without humanity" is sin, discuss.

2. What is LEP? Discuss about ethnographic approach and participatory approach for community management. What is the role of an engineer in community development? [6.5]

3. The great renaissance of Europe in 13^{th}, 14^{th} and 15^{th} century is foundation to enter the industrial society from agricultural one. Discuss [6.5]

or

How do you enlighten the civilization? Compare agriculture society with industrial society and how industrial societies enter into information society?

4. What is ecosystem? What are the main causes of human interventions in the ecosystem? Make clear the term conservation and preservation of natural resources. [7]

5. Describe the fecal oral transmission route. How you evaluate the health education regarding the water and air pollution in environment. [6.5]

6. What is climate change and what are the cause and impacts of CC? What can be feasible solution to preserve the climate change effects in LDC? [6.5]

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13 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2070 Chaitra

Exam.	Regular		
Level	BE	Full Marks	40
Programme	BEL	Pass Marks	16
Year / Part	IV / I	Time	1½ hrs.

Subject: - Technology Environment and Society *(CE708)*

- ✓ 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) Write down impact of technology on environment and society. [4]
   b) Compare the characteristics of information society with industrial society. [4]
2. What are the key features of infrastructure development polices of Nepal? [7]
3. a) Explain Stone Age civilization. [4]
   b) Explain conservation and protection of environment. [4]
4. a) What are the sources and types of water pollution? [4]
   b) What is the relation of air pollution and climate charge? [4]
5. Write short notes on: (any three) [3×3]
   i) Technology is irreversible
   ii) Importance of health education
   iii) Organic farming
   iv) Participatory approach

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11 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2070 Ashad

Exam.	New Back (2066 & Later Batch)		
Level	BE	Full Marks	40
Programme	BEL	Pass Marks	16
Year / Part	IV / I	Time	1½ hrs.

Subject: - Technology Environment and Society *(CE708)*

- ✓ 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 technology provides shift in employment due to its advancement. [8]
2. Explain in detail labour based, environment friendly and participatory (LEP) approach in infrastructure development. [8]
3. What do you mean pathogenic pollution in drinking water? Also write down its transmission route and prevention measures. [8]
4. Write detailed notes on: [4×4]
   a) Climate change
   b) Impact of world war I and II
   c) Global and national environmental issues
   d) Technology and water air pollution

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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	IV / I	Time	3 hrs.

Subject: - Power Electronics (*EE 701*)

- ✓ 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 working of power diode with the help of V-I curve. What do you mean by reverse recovery characteristic of a power diode? [8]

   b) Explain gate triggering circuit of a Thyristor. [8]

2. a) Draw the circuit diagram of a single phase full controlled rectifier having supply Input RMS voltage of 230 V, 50 Hz. with a highly inductive load so that load current is constant and equal to 25 Amp. [8]

   i) Explain its operation for firing angle $\alpha = 30°$.
   ii) Derive the expression for average and RMS values of the output voltage
   iii) Calculate the value of average output voltage.

   b) Explain the symmetrical angle control method for improving input power factor in single phase controlled rectifier. [8]

3. a) Explain the operation of step up chopper and obtain the expression for output voltage. [8]

   b) With the help of suitable circuit diagram, explain the operation of three phase inverter with six steps output voltage. [8]

4. a) With the help of suitable circuit diagram and waveform, explain the operation of single AC voltage controller with R load. Do the same circuit could be modified to control the load at micro –hydro power as ELC controller? Justify. [8]

   b) Explain the working of single phase cyclo-converter which will double the time period of input AC voltage with suitable circuit diagram and waveforms. Also calculate the rms value of output voltage. [8]

5. a) Explain the series connection of two single phase full converter with necessary circuit diagram and waveforms. Also, explain their operation in rectification and inversion mode. [8]

   b) Why HVDC line is preferred over HVAC line to transport large power over a long distance? Make a mathematical comparison between above two system in terms of saving in line conductor. [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	IV / I	Time	3 hrs.

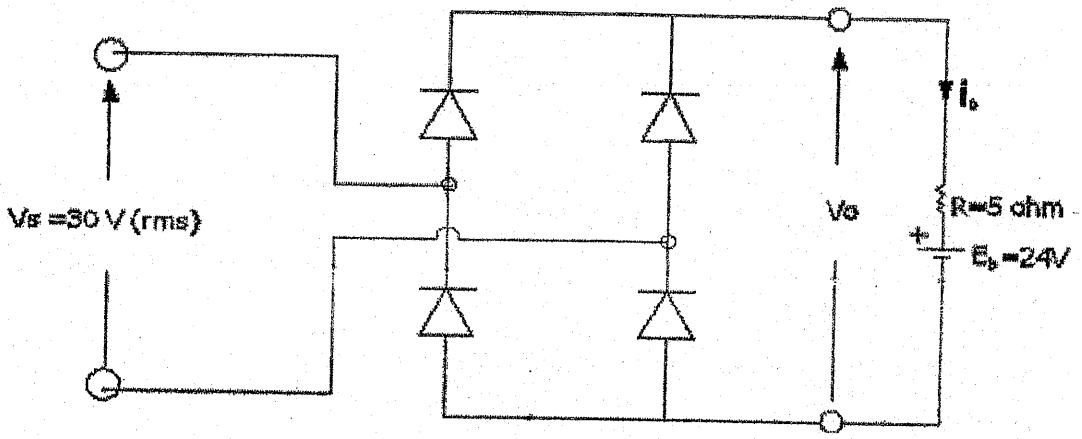
Subject: - Power Electronics (*EE 701*)

- ✓ 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 V-I characteristic of thyristor. Also compare latching current with holding current with suitable examples. [6+2]

   b) For the circuit shown below, calculate

      i) Average value of charging current.
      ii) Efficiency of the charging system. [8]



2. a) Explain the operation of a single phase full converter circuit with highly inductive load with neat circuit diagram and associated waveforms. If the load current is constant and equal to 20Amp, draw the waveform input ac current i_S for firing angle of 30° and calculate the fundamental component of i_S. [8]

   b) Explain the operation of step up dc chopper and derive the equation for output voltage. [8]

3. a) Explain the operation of a three phase single way controlled rectifier circuit with highly inductive load. Derive the expression for Average value of the output voltage. Also draw the waveform of output voltage for firing angle of 90°. [8]

   b) Describe the series operation of two single phase full converter to obtain high output voltage. [8]

4. a) Explain the principle of AC voltage controller with resistive load along with derivation of expression for rms output voltage. [8]

   b) Explain the operation of series connection of two single phase full converter. How it can be used in rectification mode and inversion mode? [8]

5. a) Explain the operation of single phase inverter with square wave output voltage and single phase AC motor as load. [8]

   b) Explain the operation of 3-phase sinusoidal PWM inverter with neat circuit diagram and associated waveforms. [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	IV / I	Time	3 hrs.

Subject: - Power Electronics (*EE 701*)

- ✓ 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 Commutation Techniques. Differentiate between Natural and Forced Commutation with suitable circuit examples. [8]

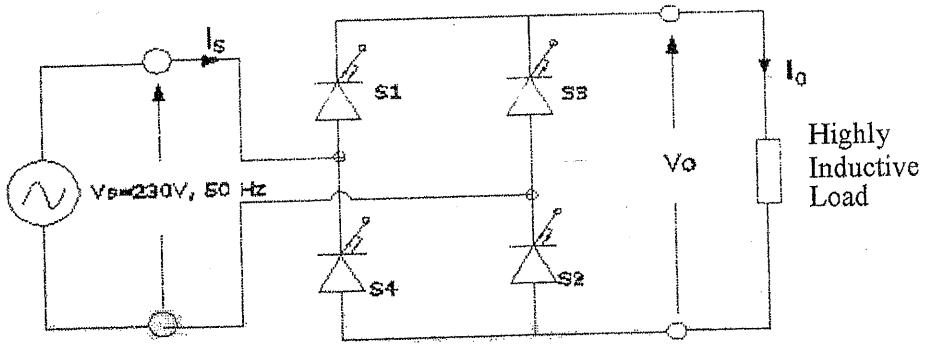
   b) Explain Switching Characteristics of BJT. Explain a gate signal Generating signal for BJT. [8]

2. a) Figure below shows a single-phase controlled rectifier with 4 nos of GTO switches. The average value of the output voltage is controlled by extinction angle control method. The load current is constant and equal to 20Amp due to highly inductive load. For an extinction angle of 30°. [8]

   i) Draw the waveform of load voltage, load current and input ac current.

   ii) Average and RMS value of output voltage.

   iii) Calculate the magnitude and phase of fundamental component of the input ac current.



   b) With the help of suitable circuit diagram and waveforms, explain the operation of three phase full wave bridge rectifier using diodes. Derive the expression for average value and rms value of the output voltage. [8]

3. a) Explain the operation of a single phase inverter with ac motor as load. Derive the equation for current drawn by the motor of positive half cycle. [8]

   b) Explain the operation of a three phase sinusoidal PWM inverter with neat circuit diagram and waveforms. [8]

4. a) A single-phase inverter with resistive load R_0 = 5 ohms and L_0 = 20mH and the input voltage is 200V dc with a centre point of dc source grounded. The inverter is operated to give an output ac voltage of 50 Hz. Fond the time domain equation of the load current using Fourier series up to 3rd order. Also, find the Harmonic factor and THD of output voltage. [8]

   b) Explain the operation single phase AC voltage controller. Derive the expression for RMS value of the output voltage. How it can be used on Elc of MHP scheme? [8]

5. a) Explain the working of three phase to single phase cyclo-converter with suitable circuit diagram and waveforms. [8]

   b) Make a mathematical comparison between HVAC and HVDC lines to justify line conductor saving in HVDC line. [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	IV / I	Time	3 hrs.

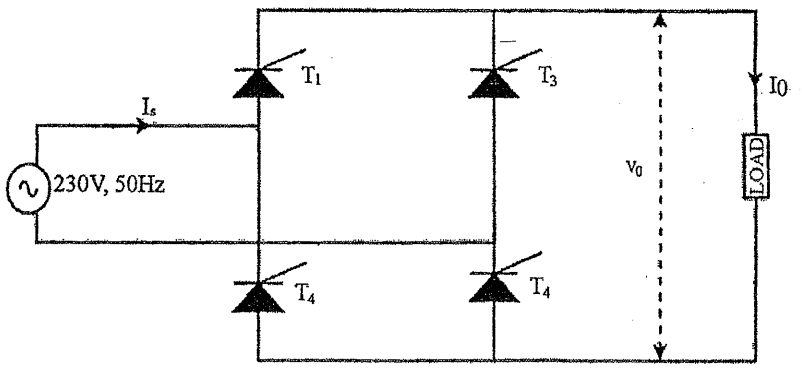
Subject: - Power Electronics (*EE 701*)

- ✓ 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 a transistor can be used as a static switch. Describe how gate signal for the base of a transistor can be generated to turn ON and OFF a transistor. [8]

   b) Explain the di/dt protection scheme and dv/dt protection scheme for a thyristor. [8]

2. a) Figure shows single phase full converter circuit with highly inductive load so that load current is constant and equal to 25 A. Explain its operation for firing angle of 30°. Draw the input and output waveforms of voltages and currents. Calculate the fundamental component of input AC current. [8]



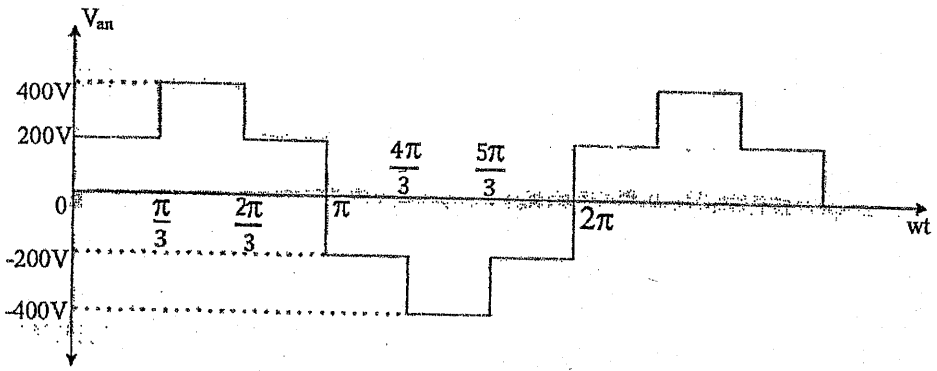
   b) Explain the operation of 3-phase single way uncontrolled rectifier and describe expression for average output voltage. [8]

3. a) A step-down chopper is connected to RLE load with R=10 ohms, L=15.5 mH and E = 20 V with an input voltage of 220 V, the duty cycle, k = 0.5 and chopping frequency f = 5kHZ. Determine, [8]

      i) Minimum instantaneous load current
      ii) Peak instantaneous load current
      iii) Maximum peak to peak current in the load
      iv) Average load current

   b) With the help of suitable circuit diagram explain the 180° conduction mode of three phase inverter. And also draw the output waveforms of instantaneous phase and line voltage for star-connected load. [8]

4. a) Calculate the rms value of fundamental and 3rd harmonics component of output voltage for 180° conduction mode of three phase inverter shown in figure below. [8]



b) With the help of suitable circuit diagram and waveform, explain the operation of single AC voltage controller with R-load and calculate the rms value of output voltage. [8]

5. a) Explain the operation of single phase step down cycloconverter with necessary circuit diagram and waveform. [8]

b) Explain the series connection of two single phase full converter with necessary circuit and waveforms. [8]

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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	IV / I	Time	3 hrs.

Subject: - Power Electronics *(EE 701)*

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

1. a) Explain the switching characteristics of a power transistor. How turn on control and turn off control operation operated on base drive circuit of transistor?

   b) Explain the di/dt and dv/dt protection of the thyristor with necessary diagram and waveforms.

2. a) Draw the circuit diagram of single phase full wave rectifier with associated waveforms. A single phase full wave thyristor rectifier has an input voltage of 220V rms. The load is a resistance of 50 ohms and firing angle is 45 degree in each positive half cycle. Find average output voltage, rms output voltage.

   b) Draw and explain the output waveforms of three phase full bridge rectifier with R load. Find the average value of output voltage.

3. a) Write down the principle of step up chopper with neat diagram and waveforms. Derive the output value of load voltage and determine the condition for controllable power transfer range.

   b) For three phase 180 degree conduction river, draw the output waveforms for V_{RY}, V_{YB}, V_{BR}, V_{NO}, and V_{RN}, where the notation has their usual meaning.

4. a) Single phase full bridge inverter has an RLC load with R = 10Ω, L = 31.5mH and C = 112μF. The inverter frequency is 50Hz and dc input voltage is 220V.

   (i) express the instantaneous load current in fourier series
   (ii) RMS value of fundamental component of load current
   (iii)THD of load current

   b) Explain the operation of single phase AC voltage controller with necessary circuit diagram and waveforms. Derive the expression for rms value of output voltage.

5. a) With suitable input frequency value explain the single phase step down cycloconverter and draw the output waveform for ¼th of frequency.

   b) Compare AC transmission over HVDC transmission. Justify that total power loss in HVDC is only 2/3th of total power loss in HVAC transmission lines.

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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	IV / I	Time	3 hrs.

Subject: - Power Electronics *(EE 701)*

- ✓ 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 reverse recovery characteristics of Diode with necessary waveforms. The reverse recovery time of a diode is 3 μs and the rate of fall of the diode current is 30 A/μs. Determine storage charge and peak reverse current. [8]

   b) Draw the V-I characteristics curve of thyristor. What is an avalanche breakdown and forward breakdown voltage of thyristor? Mention with its symbolic diagram. [4]

   c) Explain the V-I characteristics of power transistor. How it can use as a static switch? [4]

2. a) Single phase full wave rectifier charges a battery from a single phase supply of 230 V, 50 Hz. The battery has interval emf of 200 volts and its internal resistance is 0.5 ohms. Calculate: [8]
   (i) Average value of charging current
   (ii) Power supplied to the battery
   (iii) Gross power output from the rectifier
   (iv) Additional resistance to be connected in series to reduce the charging current by 30%.

   b) Explain the operation of three phase single way controlled rectifier with purely resistive load. Derive the expression of average and RMS value of output voltage. Draw the waveforms of output voltage for $\alpha = 30°$ and $60°$ and calculate average value of output voltage. [8]

3. a) A step down chopper has an input of 200V it is feeding on RLE load having R = 2Ω, L = 10 mH, E = 20 V, the chopping cycle has a time period of 1000 μs and transistor is on for 300 μs in each cycle. [8]
   (i) Find weather the load current is continuous or not.
   (ii) Find the average load current.

   b) How does modulation index change the rms value of output voltage of inverter? Derive the Fourier series of single pulse width modulation and determine the fundamental value. [8]

4. a) Obtain the switch states for three phase VSI of 180 degree conduction mode. Draw the waveform of output phase voltages of same inverter showing suitable modes of operation. [8]

   b) A single phase full wave inverter has a resistive load of 5 ohm. The dc input voltage is 30. Find (i) rms value of output voltage (ii) rms value of fundamental component of output voltage (iii) output power (iv) peak current in each thyristors. [8]

5. a) Explain the operation of three phase Cyclo-converters with necessary circuit and waveforms. [8]

   b) Justify that the total power loss of HVDC transmission line is only 2/3th of total power loss in HVAC transmission line. Make necessary assumption if necessary. [8]

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2076 Chaitra

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

Subject: - Power Electronics *(EE 701)*

- ✓ 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 how a transistor can be used as a static switch. Describe a base current signal generating circuit using an opto-coupler. [8]

   b) Figure 1.b shows a full wave rectifier circuit used to change a 12V battery through a 2 ohm resistor. [8]

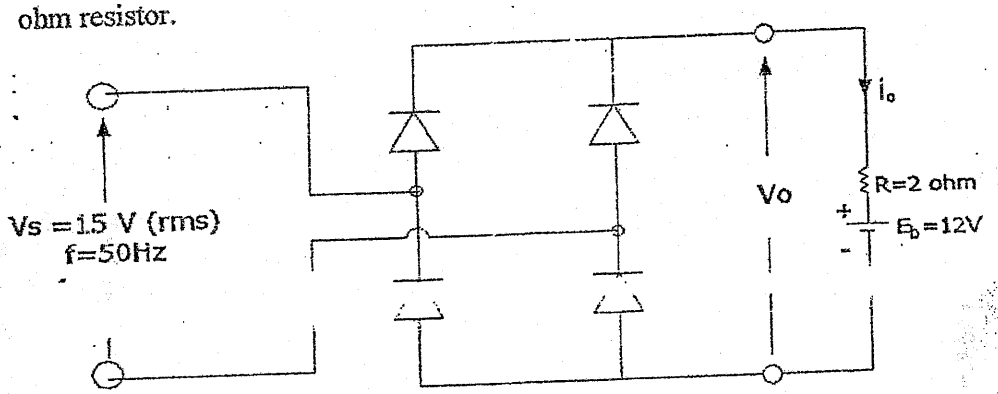

Fig.1.b

(i) Draw the waveform of output voltage V_0 and charging current i_0.
(ii) Calculate the average and rms value of charging current.
(iii)Power supplied to the battery.
(iv)Power output from the rectifier.
(v) Efficiency of the charging sytem.

2. a) Explain the operation of single phase half wave rectification using thyristor with resistive load. Draw the waveform of output voltage and the voltage appearing across the thyristor. Derive the expression for RMS value of output voltage. [8]

   b) Explain the operation of a three phase single way controlled rectifier circuit with highly inductive load. Derive the expression for average value of the output voltage. Draw the wave form of output voltage for firingle of 60°. [8]

3. a) Explain the principle of step up dc chopper and deduce the expression for average output voltage. [8]

   b) A step down dc chopper has a 20 ohm resistor load and input voltage 220V. When the converter switch is ON, its voltage drop in chopper switch is 1V and the chopper frequency is 2KHz. If the duty cycle is 0.8, calculate: [8]

   (i) Average value of the output voltage
   (ii) Efficiency of choper circuit

4. a) Explain the operation of single phase ac voltage controller with resistive load. If the input voltage is 220V, 50Hz, calculate the rms value of output voltage for firing angle of 90°. [8]

b) In which circumstance, HVDC transmission line has advantages over the HVAC transmission line? Prove that a HVDC line with two conductors {tansmit same amount of power as transmitted by HVAC line with three conductors of same size. What type of power electronic converter is used in HVDC line and why? [8]

5. a) Explain the operation of a three phase Sinusoid PWM inverter with neat circuit diagram and associated waveforms. How switching instants for inverter switch pair of a phase are determined. [8]

b) Figure 5 shows the waveform of output voltage (per phase) of three phase inverter. Calculate RMS value and peak value of fundamental component of the output voltage. [8]

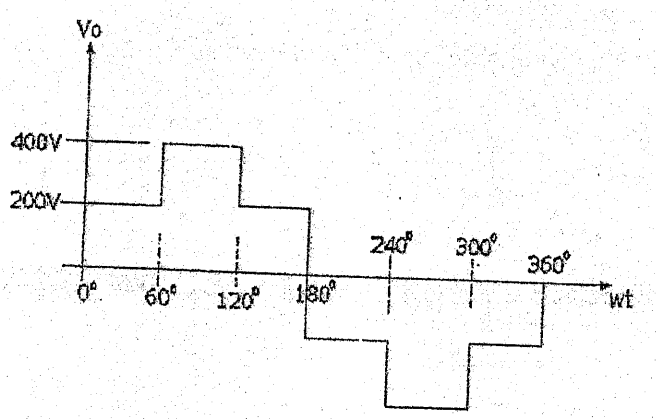

Fig.5

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2076 Ashwin

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

Subject: - Power Electronics *(EE 701)*

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

1. a) Explaining the reverse recovery characteristics of diode.
   b) Explain the V-I characteristics of a power thyristor. How an opto-coupler can be used to isolate the gate signal generator and power circuit.
2. a) Explain the operation of three phase single way controlled rectifier with highly inductive load. Derive the expression of average and RMS value of output voltage. Draw the waveforms of output voltage for $\alpha = 30°$ and calculate average value of output voltage.
   b) Explain the operation of a single phase AC voltage controller. Derive the expression for RMS value of the output voltage as the function of firing angle.
3. a) Explain class C and class E dc chopper.
   b) Explain the operating principle of step up dc to dc chopper.
4. a) With the help of suitable circuit diagram, explain the operation of six steps three phase inverter. And also draw the output waveforms of instantaneous phase and line voltage for star connected load.
   b) Explain the operation of a three phase sinusoidal PWM inverter with neat circuit diagram and waveforms.
5. a) Explain Bridge configuration of single phase cyclo converter with necessary circuit diagram, waveform. Also tabulate the conduction sequence.
   b) Why HVDC transmission is preferred over HVAC transmission for transport of large power over long distance? Perform mathematical expression and make comparison between HVDC and HVAC transmission.

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2075 Chaitra

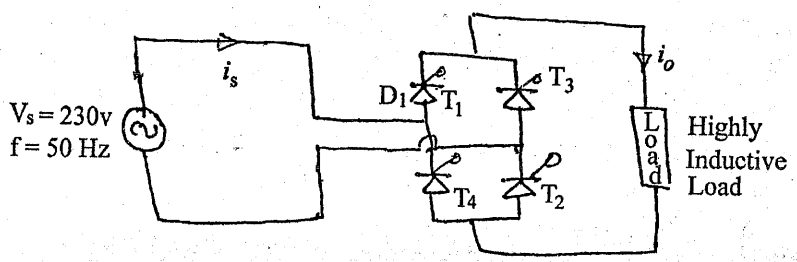
Exam.	Regular / Back		
Level	BE	Full Marks	80
Programme	BEL	Pass Marks	32
Year / Part	I V/ I	Time	3 hrs.

Subject: - Power Electronics *(EE 701)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt <u>All</u> questions.*
- ✓ *<u>All</u> questions carry equal marks.*
- ✓ *Assume suitable data if necessary.*

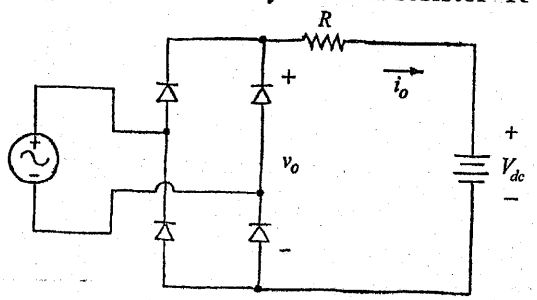
1. a) Explain the V-I characteristic of a thyristor. Also explain a thyristor firing circuit.

   b) For a circuit shown in figure below, Draw the wave forms of each diodes and thyristor also derive the expression of average and RMS value of output voltage as the function of firing angle α. Assuming load current is constant at 10A, calculate the magnitude all phase of fundamental component of input AC current i_s.



2. a) Draw the circuit diagram and waveform of output voltage of a single phase full bridge diode rectifier. The input ac voltage is 220V, 50 Hz. Calculate average value and fundamental component of output voltage.

   b) For the full-wave bridge rectifier circuit of Figure below, the ac source is 120 V rms at 50 Hz, R = 2 Ohm and Vdc = 80 V. Determine the power absorbed by the dc voltage source and the power absorbed by the load resistor 'R'.



3. a) The supply voltage of a step down chopper is 230V dc, load resistance is 10 ohms. Take the voltage drop of 1V across chopper when it is ON. For a duty cycle of 0.4, calculate the average and rms value of output voltage.

   b) Draw the circuit diagram of Type-E four quadrant chopper and explain its operation for all four quadrants.

4. a) Explain the operation of three phase sinusoidal Pulse width modulation inverter.

   b) Explain the operating principle of single phase current source inverter with necessary waveforms.

5. a) Explain the bridge configuration of single phase step-down cycloconverter with necessary circuit diagram and waveform. Also tabulate the conduction sequence.

   b) What are the differences between HVAC and HVDC transmission lines? Perform a mathematical comparison between HVAC and HVDC lines.

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Examination Control Division
2075 Ashwin

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

Subject: - Power Electronics *(EE701)*

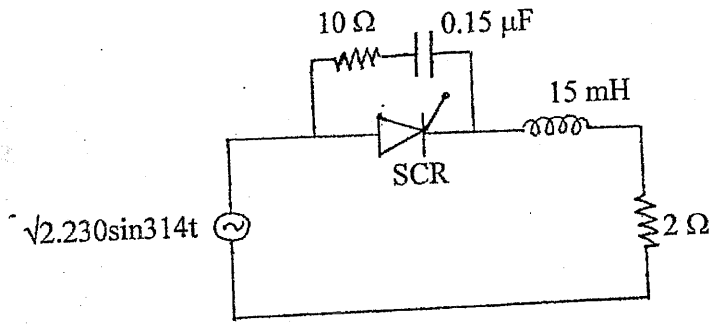
- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt <u>All</u> questions.*
- ✓ *<u>All</u> questions carry eqiual marks.*
- ✓ *Assume suitable data if necessary.*

1. a) Explain how a transistor can be used as static switch. Also explain base signal generating circuit for transistor switch.

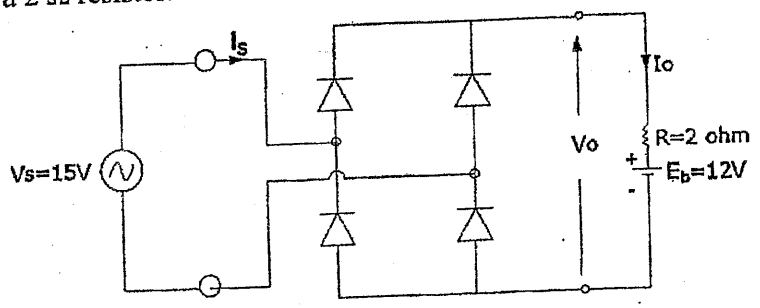
   b) For the circuit shown in below:

   i) Calculate the maximum value of di/dt and dv/dt of the SCR

   ii) Find the RMS and average current rating of SCR for firing angle delays of 90°



2. a) In figure below shows a full-wave rectifier circuit used to charge at 12 V battery through a 2 Ω resistor.



Calculate:

i) Average value of charging current
ii) Power supplied to the battery
iii) Gross output power from rectifier
iv) Additional resistance to be connected in series with 2 Ω resistors to limit the average value of charging current to 0.5 amp.

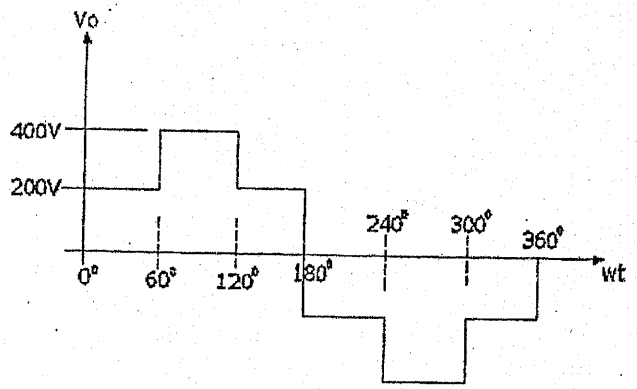
b) Explain the operation of three-phase single way-controlled rectifier circuit with necessary waveforms. Also derive the expression for average value of the output voltage.

3. a) Determine the average value of output voltage and the fundamental component of the load current of step down chopper having input voltage of 220V DC, load resistance 20 Ω and duty cycle of 45% Given: chopping frequency of chopper is 1 kHz.

   b) Explain the operation of single PWM techniques for inverter control and therefore determine the rms value of output voltage.

4. a) Explain the operation of a single phase current source inverter with ac motor as load.

   b) In figure below shows the waveform of output voltage (per phase) of three phase inverter. Calculate RMS value and fundamental component of the output voltage.



5. a) With mathematical aid, explain how full converters can be used for reverse power flow in bipolar link of HVDC transmission.

   b) Explain the operation of ac voltage controller and its application in electronic load controller for Micro-Hydro power plant.

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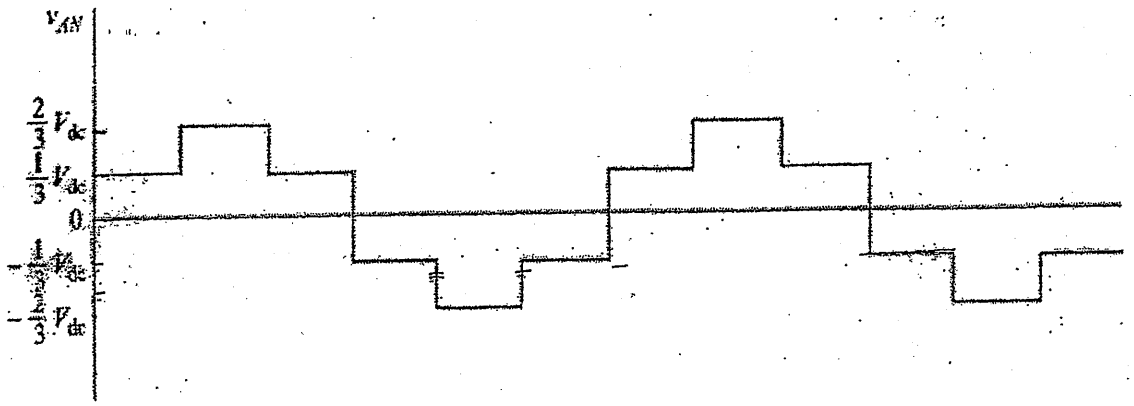
INSTITUTE OF ENGINEERING
Examination Control Division
2074 Chaitra

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

Subject: - Power Electronics *(EE701)*

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

1. a) Explain the V-I characteristics of a thyristor. Also explain a thyristor firing circuit.
   b) Explain the dv/dt protection and di/dt protection methods for a thyristor.
2. a) Draw the circuit diagram of single phase full converter with highly inductive load and explain its operation. If the load current is constant at 15A, draw the waveform of input as current and calculate the fundamental component of the input ac current.
   b) A single phase fullwave rectifier charges a battery from a single phase supply of 230 V, 50 Hz. The battery has interval emf of 200 volt and its internal resistance is 0.5 ohm. Calculate:
      i) Average value of charging current
      ii) Power supplied to the battery
      iii) Gross power output from the rectifier
      iv) Additional resistance to be connected in series to reduce the charging current by 30%
3. a) Explain the operation of step up dc chopper.
   b) Draw the circuit diagram of Type-E four quadrant chopper and explain its operation for all four quadrants.
4. a) The given waveform in figure below is the output voltage and three phase inverter. Calculate the fundamental component and 3rd harmonic component of the output voltage.



   b) The single phase ac controller has input voltage of 230V, 50Hz and the positive and negative thyristors are triggered at an angle of 90° and π+90° respectively. The series RL load has R = 20 Ω, L = 50mH then determine the rms value of load voltage and load current.
5. a) Explain the operation of single phase cyclo-conterter. What are its applications?
   b) Explain the series connection of two single phase full converter with necessary circuit diagram and waveforms. How these series connected circuit can be operated in rectification mode and inversion mode?

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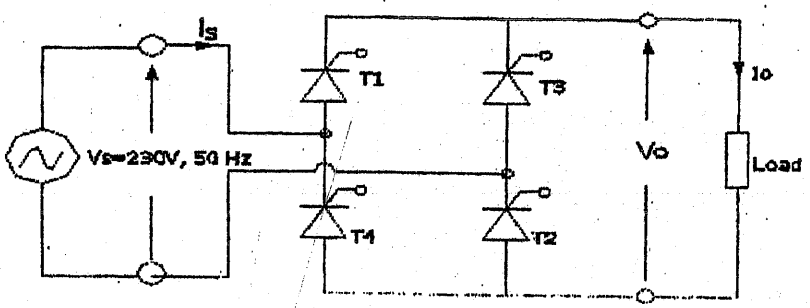
15 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2074 Ashwin

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

Subject: - Power Electronics *(EE701)*

- ✓ 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 a method of thyristor turn ON mechanism. Also explain about thyristor force commutation techniques. [8]
   b) Explain how a transistor can be used as a power swith. [8]
2. a) Figure shows a single phase full converter circuit with highly inductive load so that load current is constant and equal to 25 amp. Explain its operation for firing angle = 30°. Draw the waveforms of input voltage Vs, output voltage V_0 and input current i_s. Calculate the fundamental component of input current and Input power factor. [8]



   b) Explain the operation of three-phase single way rectifier with diode with neat circuit diagram and waveforms. Derive the expression for average and rms values of the output voltage. [8]
3. a) Explain the operation of three phase AC to DC conversion using three Thyristors. Draw the input and output voltage waveform and find average and rms value of output voltage expression from the obtained waveform. Assume highly inductive load. [8]
   b) Explain the operation of step up chopper. Derive the expression for the average and rms value of output voltage. [8]
4. a) Explain the operation of single phase PWM inverter. Derive the expression for rms value of output voltage and also write down the output voltage in the form of Fourier expression. [10]
   b) With the help of suitable circuit diagram and waveform, explain the operation of single phase cycloconverter. [6]
5. a) Explain the operation of ac voltage controller and its application in electronic load controller for micro hydro plant. [8]
   b) Explain the series connection of two single phase full converter with necessary circuit diagram and waveforms. How these series connected circuit can be operated in rectification mode and inversion mode? [8]

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INSTITUTE OF ENGINEERING
Examination Control Division
2073 Chaitra

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

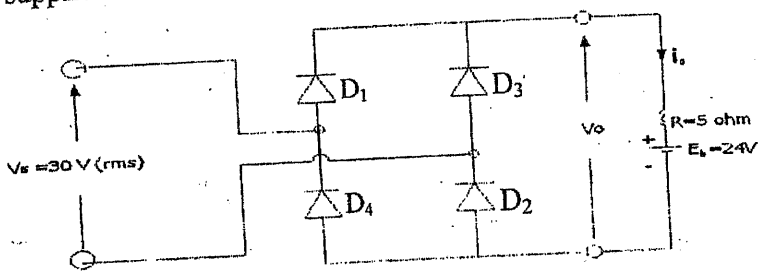
Subject: - Power Electronics *(EE701)*

- ✓ 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.*

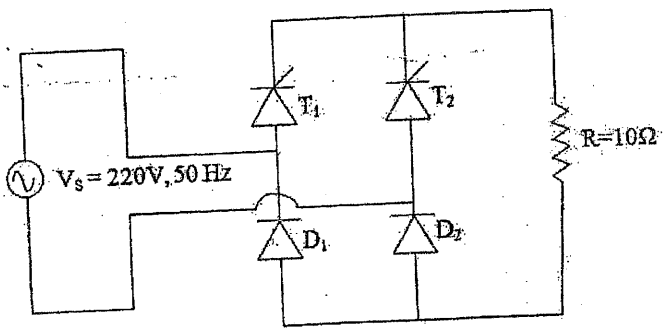
1. a) Explain V-I characteristics of a Thyristor and explain the meaning of latching current and holding current. Describe a gate signal generating circuit for firing a Thyristor. [8]

   b) Below figure shows a full-wave diode rectifier circuit used to charge a 24V battery through a 5 ohm resistor. Calculate: [8]

   (i) Conduction period of charging current *io*.
   (ii)Average value of charging current *io*
   (iii)Power supplied to the battery and gross power output from the rectifier



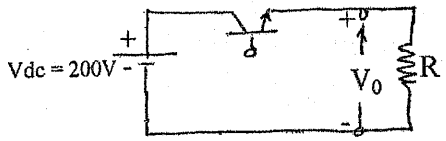
2. a) Figure shows below a full wave controlled rectifier with resistive load. The load voltage is 230V, 50 Hz and it is operated at firing angle 45°. Draw the waveform of output voltage, output current and ac input current. Calculate average value of output voltage, output dc power and input power factor. [8]



   b) Explain the operation of symmetrical angle control method for power factor improvement. Derive the expression for average and RMS value of the output voltage. [8]

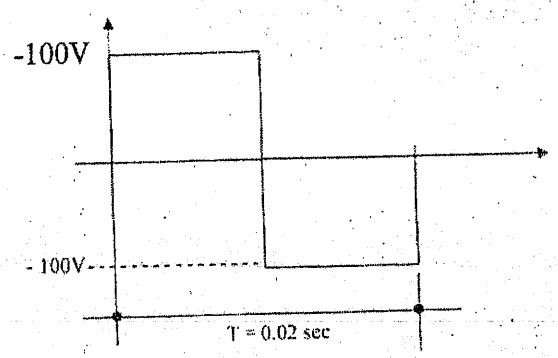
3. a) Explain the operation of single phase inverter with ac motor as load. Derive the equation for current drawn by the motor of positive half cycle and negative half cycle. [8]

b) Figure below shows a step down dc chopper. If it is operated in variable frequency mode with ON time constant at 3msec. Calculate the OFF time for a duty cycle at 30% and average value of output voltage. [8]



4. a) Explain the operation of a three-phase Sinusoidal PWM inverter with circuit diagram and associated waveforms. How the switching instants of the switch pair of a phase are determined. [8]

b) The following figure below shows the waveform of the output voltage of a single phase inverter with an inductive load of R = 5 ohm and L = 10mH connected in series. Calculate the magnitude and phase of fundamental component of the output voltage and write down the time domain equation of the load current considering Fourier series up to 5^{th} Order. [8]



5. a) A single phase full wave ac voltage controller feeds a load of R = 10Ω with an ac input voltage of 230 V, 50Hz. Firing angle for both the thyristors is 45°. Calculate rms value of output voltage, load current, input power factor and average value of current of thyristors. [8]

b) Justify that the total power loss of HVDC transmission line is only 2/3 th of total power loss in HVAC transmission line. Make assumption that the power loss per conductor is same for both lines and also the transmission capacity of both lines are same. [8]

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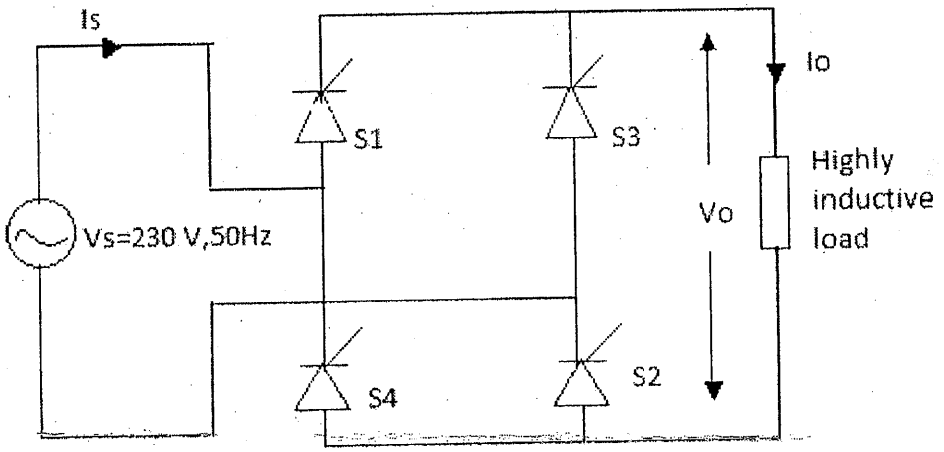
14 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2073 Shrawan

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

Subject: - Power Electronics *(EE701)*

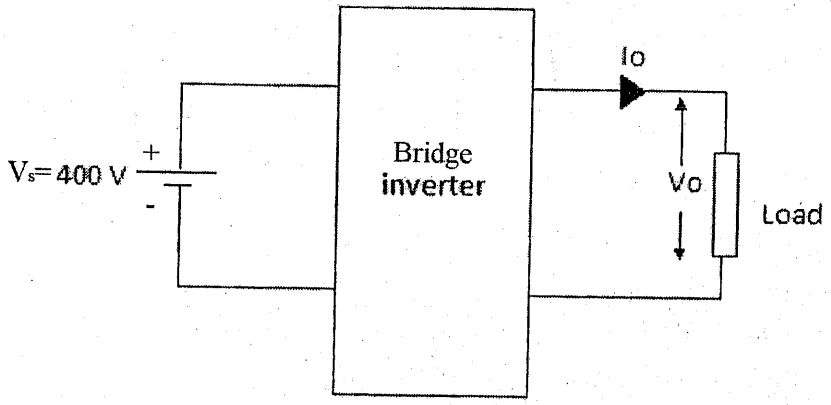
- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ ***All** questions carry equal marks.*
- ✓ *Assume suitable data if necessary.*

1. a) Draw a snubber circuit for an SCR. How does it provide dv/dt protection?
   b) Explain how a BJT can be used as a switch in power circuit.
2. a) The average value of output voltage of single phase full converter with 4 GTO switches is controlled by extinction angle control method. The load current is constant and equal to 20Amp due to highly inductive load. For the extinction angle of 30°, draw the waveforms of load voltage, load current and input ac current. Also find RMS value of output voltage, magnitude and phase of fundamental component of the input ac current.



   b) Explain the operation of three phase single way controlled rectifier with thyristor with neat diagram and waveforms. Derive the expression for average and RMS value of the output voltage.
3. a) Explain the operation of a step down chopper with dc motor as load.
   b) With the help of suitable circuit diagram explain 180° conduction mode of three phase inverter? And also draw the output waveforms of instantaneous phase and line voltage for star connected load.

4. a) A single phase full bridge inverter with dc input voltage of V_s=400V and generating output square wave of 50Hz is connected to inductive load having R=10 Ω and L=50mH. Calculate the magnitude and phase of fundamental component and third harmonic component of output voltage and load current.



b) Explain the operation of ac voltage controller with purely resistive load. Also explain the use of ac voltage controller in ELC

5. a) With the help of suitable circuit diagram, describe the operation of reversible power flow on DC line.

b) What are the advantages of HVDC transmission line with compare the HVAC transmission line. Perform a mathematical analysis to compare power transfer capacities of these lines.

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15 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2072 Chaitra

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

Subject: - Power Electronics *(EE701)*

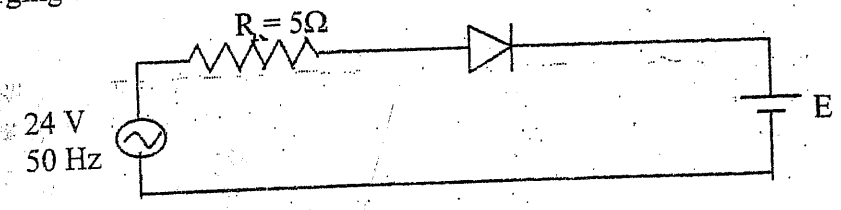
- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ ***All** questions carry equal marks.*
- ✓ *Assume suitable data if necessary.*

1. a) Explain the V-I characteristics of a power thyristor and illustrate its application in power circuit. How an opto-coupler can be used to isolate the gate signal generator and power circuit?

   b) Explain the V-I characteristics of power transistor and illustrate how it can be used as a static switch?

2. a) With the help of suitable circuit diagram and waveforms, explain the operation of extinction angle control for power factor improvement in rectifier circuit. Derive the expression for average value and rms value of output voltage.

   b) For the circuit shown in figure below, the battery voltage is E = 12 V. The average charging current should be 10A.



Calculate:

i) The conduction angle of the diode
ii) Power supplied to the battery
iii) Average value of charging current
iv) The rectifier efficiency

3. a) Describe the principle of step up chopper. Derive an expression for the average output voltage in terms of input voltage and duty cycle.

   b) Explain the operation of a three phase inverter for 180 degree conduction with neat circuit diagram and waveforms. How the fundamental component of output (per phase) voltage can be calculated?

4. a) Explain the operation of signal phase square wave inverter. Derive the expression for rms value of output voltage and fundamental component of output voltage.

   b) With the help of suitable circuit diagram and waveform, explain the operation of single phase ac voltage controller using resistive load. Derive the expression for rms value of output voltage.

5. a) Explain bridge configuration of single phase cycloconverter with necessary circuit diagram, waveform. Also tabulate the conduction sequence.

   b) Justify the statement "HVDC power transmission is only economical than HVAC transmission if bulk amount of power has to be transmitted over a long distance". And also justify that the power transmission capacity of HVDC and HVAC lines are equal.

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15 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	IV / I	Time	3 hrs.

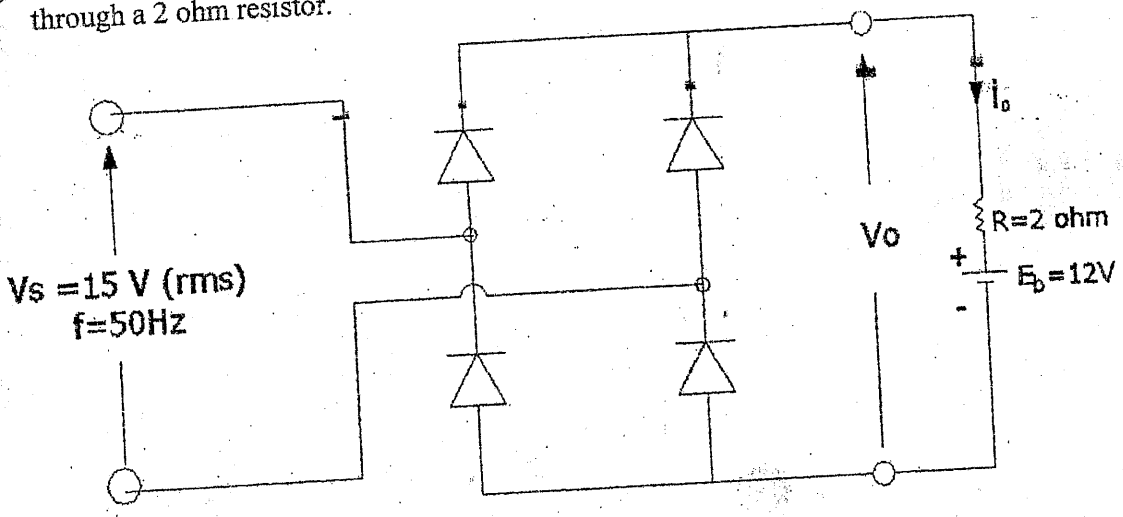
Subject: - Power Electronics *(EE701)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt <u>All</u> questions.*
- ✓ *<u>All</u> questions carry equal marks.*
- ✓ *Assume suitable data if necessary.*

1. a) Explain the di/dt and dv/dt protection scheme of a thyristor. What factors should be considered while designing gate control circuit.

   b) Explain the operation of pulse train generation for gate firing circuit for thyristor showing all the necessary components.

2. a) In figure below shows a full-wave rectifier circuit used to charge a 12V battery through a 2 ohm resistor.



   i) Draw the waveform of output voltage V_0 and Charging current i_0
   ii) Calculate the average and rms value of charging current
   iii) Power supplied to the battery
   iv) Power output from the rectifier
   v) Efficiency of the charging system

   b) Explain the operation of three-phase single way controlled rectifier with highly inductive load. Derive the formula for average value of output voltage. Draw the waveform of output voltage for firing angle equal to 60°.

3. a) Explain the operation of step up chopper with necessary diagrams and expressions.

   b) Explain the operation of type E chopper with armature of dc motor as load.

4. a) Explain the operation of three phase inverter consisting of three sets of single phase inverter and each set is conducted with a phase difference of 120° to each other. Take the loads to be purely resistive. Draw the waveform of each phase voltage (V_R, V_Y and V_B) along with the neutral voltage (V_N). Also draw the waveform of V_{RN}.

   b) Draw the circuit of a three phase to single phase bridge type cycloconverter and explain its working.

5. a) Explain the operation of single phase ac voltage controller with resistive load. If the input voltage is 220V, 50 Hz, calculate the RMS value of output voltage for firing angle of 90°.

   b) In which circumstance, HVDC transmission line has advantages over the HVAC transmission line? Prove that a HVDC line with two conductors can transmit same amount of power as transmitted by HVAC line with three conductors of same size. What type of power electronic converter is used in HVDC line and why?

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15 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2071 Chaitra

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

Subject: - Power Electronics *(EE701)*

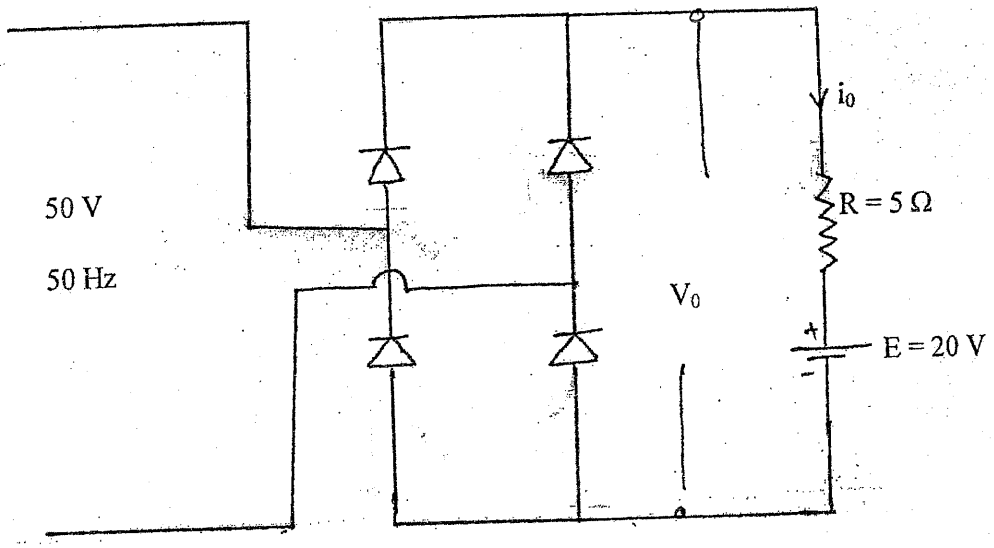
- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt <u>All</u> questions.*
- ✓ *<u>All</u> questions carry equal marks.*
- ✓ *Assume suitable data if necessary.*

1. a) In which circumstances, a thyristor may subjected to high di/dt and dv/dt. Why these are harmful to thyristor. Explain how a thyristor can be protected against high di/dt and dv/dt.

   b) Explain how a transistor can be used as a static switch. Describe how gate signal for the base of a transistor can be generated to turn ON and OFF a transistor.

2. a) In figure below shows a full wave rectifier circuit which is used to charge a 24 V battery through 5Ω resistor. Draw the necessary waveforms related with the operation of this circuit and hence determine:

   i) Average value of charging current
   ii) Power supplied to the battery
   iii) Gross output from rectifier
   iv) Efficiency of rectifier



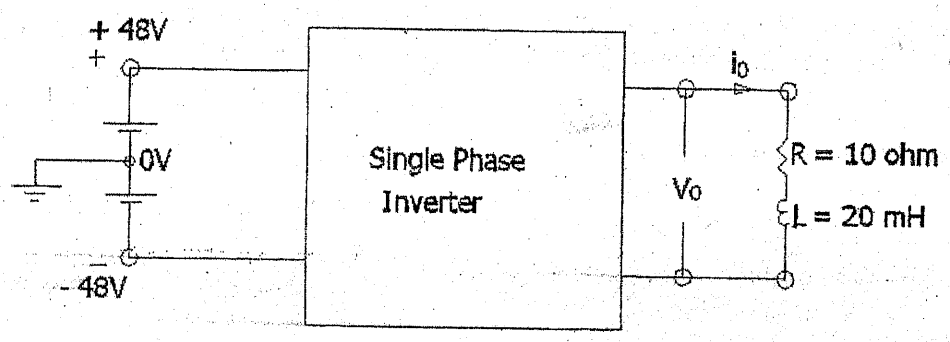
   b) Explain the operation of three phase single way controlled rectifier for firing angle $\alpha = \pi/6$ with associated waveforms and hence deduce the expression for average and root mean square value of the output voltage assuming highly inductive load.

3. a) With the help of suitable circuit diagram and waveforms, explain the operation of 3 phase full wave bridge rectifier using diodes. Derive the expression for average value and rms value of output voltage.

   b) Explain the operation single phase full converter with highly inductive load. How it can be operated in rectification as well as in inversion mode?

4. a) Explain the operation of a three phase Sinusoidal PMW inverter with neat circuit diagram and waveforms.

   b) In figure below shows the schematic diagram of a single phase inverter giving square wave AC output voltage V_0 with frequency of 50 Hz. Calculate the magnitude and phase of fundamental and third harmonic component of the output voltage and load current.



5. a) Why HVDC transmission is preferred over HVAC transmission for transport of large power over long distance? Perform mathematical operation and make comparison between HVDC and HVA Transmission.

   b) Explain the operation of single phase AC voltage controller with necessary circuit diagram and waveforms. Derive the expression for RMS value of the output voltage.

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14 TRIBHUVAN UNIVERSITY
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2071 Shawan

Exam.	New Back (2066 & Later Batch)		
Level	BE	Full Marks	80
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Year / Part	IV / I	Time	3 hrs.

Subject: - Power Electronics *(EE701)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
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1. a) Describe the switching characteristics of power MOSFET. What is meant by threshold gate voltage? [8]

   b) A power diode has a reverse recovery time of 2.4 μs. If di/dt is 30 A/ μs, find (i) stored charge (ii) peak inverse current. [4]

   c) What is latching current and holding current? [4]

2. a) A diode whose internal resistance is 20Ω is to supply power to 1000 Ω load from a 230 V ac supply in case of half wave rectification. Calculate the following . [8]

      i) Peak load current

      ii) dc load current

      iii) dc diode volatge

   b) A three phase full wave converter is operated from three phase star connected, 230 V, 50 Hz supply with resistance R = 10 ohm. An average output voltage of 50% of the maximum possible output voltage is required. Determine (i) the firing angle (ii) average and rms values of load current and (iii) rectification efficiency. [8]

3. a) Explain the operation of a step down chopper in variable frequency mode. If it is operated with on time constant at 5msec. Calculate the OFF time for a duty cycle of 40% and average value of the output voltage. [8]

   b) Describe the series operation of two single phase full converter to obtain high output voltage. Also find the average value and rms value of the output voltage waveform. [8]

4. a) Obtain the Fourier series of line to line output voltage of square wave inverter and hence show that all triplen harmonics are absent from it. [8]

   b) What is sinusoidal pulse-width modulation? How is it obtained? Explain with the help of neat diagram. [8]

5. a) A single-phase full wave ac voltage controller feeds a load of resistance 20 ohm with an input voltage of 230 V, 50 Hz. If the firing angle for both thyristor is 45°, calculate: [8]

      i) rms value of output voltage
      ii) Load power and input power factors
      iii) Average and rms current of thyristors

   b) A single phase bridge type cyclo-converter has input voltage of 230V, 50Hz and load of R = 10Ω. The output frequency is one third of input frequency. For firing angle of 30°, calculate: [8]

      i) rms value of output voltage
      ii) rms value of output current
      iii) rms current of each converter
      iv) rms current of each thyristyor

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14 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2070 Chaitra

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

Subject: - Power Electronics *(EE701)*

- ✓ 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) Explaining the reverse recovery characteristics of diode and show that

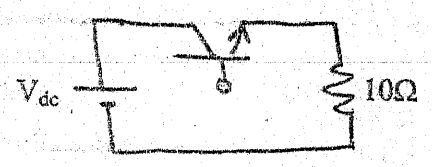
$$I_{RR} = \left[2 * Q_{RR} * \left(\frac{di}{dt}\right)\right]^{1/2}$$ [8]

   b) Explain how a transistor can be used as a static switch. Describe how gate signal for the base of a transistor can be generated to turn ON and OFF a transistor. [8]

2. a) Show that the fundamental component of input current leads input voltage by a phase angle of $\beta/2$ in case of extinction angle control method of power factor improvement assuming highly inductive load and β be the extinction angle. [8]

   b) Explain the operation of three-phase bride rectifier with 6 numbers of diodes. Derive the expression for Average and RMS values of output voltage. [8]

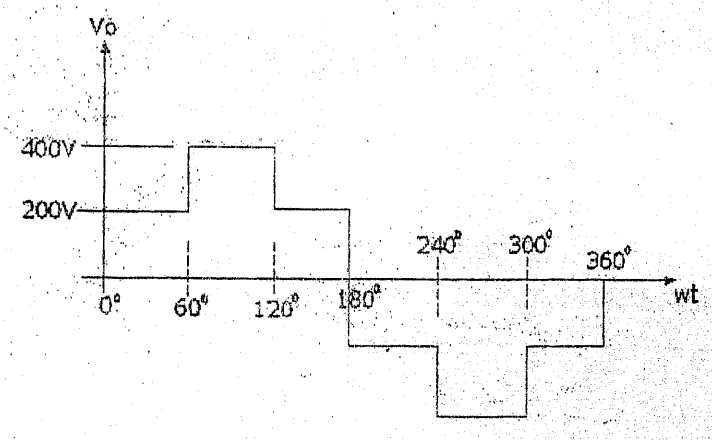
3. a) The supply voltage of a step down chopper is 230V dc, load resistance is 10Ω. Take the voltage drop of 2V across chopper when it is on. For a duty cycle of 0.4, calculate average and rms value of output voltage. [8]



   b) Explain the process of reversible power flow on HVDC line and obtain the relation between firing angle of both converters. [8]

4. a) Explain the operation of a single phase inverter with ac motor as load. Derive the equation for current drawn by the motor of positive half cycle and negative half cycle. [8]

   b) Figure below show the waveform of output voltage (per phase) of three phase inverter. Calculate RMS value and peak value of fundamental component of the output voltage. [8]



5. a) Draw the circuit of a single phase cycloconverter using a center tapped transformer; Prepare a table showing the conduction pattern of thyristors and current paths for an output frequency of one-third the input frequency. [8]

   b) Explain the role of ACVC in ELC while explaining the operating mechanism of ELC. [8]

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14 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2070 Ashad

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

Subject: - Power Electronics *(EE701)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
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1. a) Explain the dv/dt protection method for a thyristor. [6]

b) Describe a micro-controller based firing circuit for a thyristor with opto-coupler as isolation circuit. [6]

c) Fig.1c shows the single phase half-wave controlled rectifier with di/dt protection provided by the series inductor. The load is a purely inductive having an inductance of 100 mH. Calculate the value of L_S so that di/dt is limited to 500A/sec. [4]

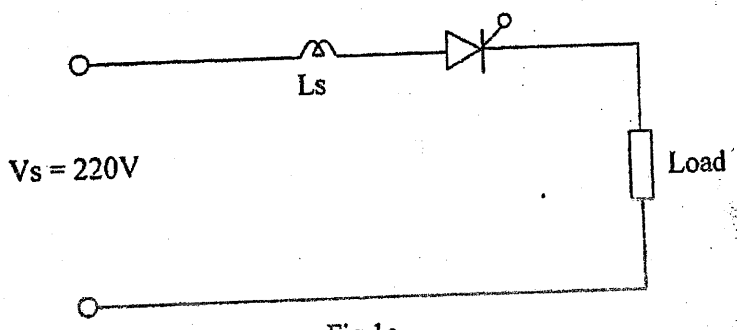

Fig.1c

2. a) Fig. 2a shows a full-wave rectifier circuit used to charge a 24V battery through a 5 ohm resistor. [8]
Calculate:
i) Conduction period of charging current io.
ii) Average value of charging current io
iii) Power supplied to the battery

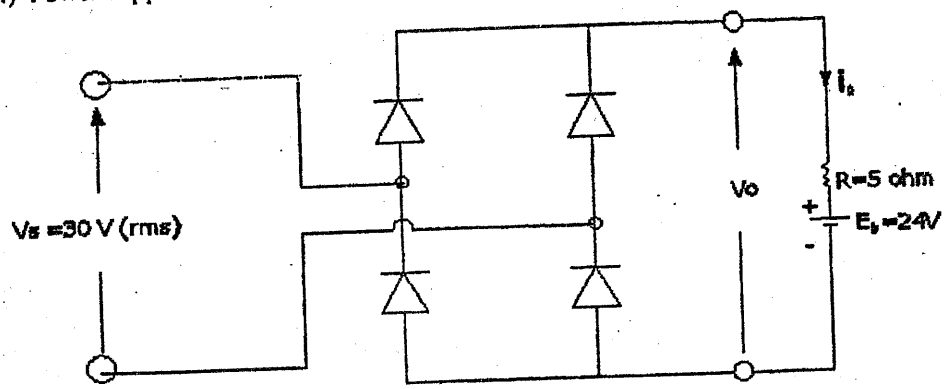

Fig. 2a

b) Explain the operation of three-phase single way rectifier with diode with neat circuit diagram and waveforms. Derive the expression for average and rms values of the output voltage. [8]

3. a) Explain the operation of Type-B and Type-C dc chopper with neat circuit diagram. [8]

b) Explain the series connection of two single phase full converter with necessary circuit diagram and waveforms. [8]

4. a) Explain the operation of a three-phase Sinusoidal PWM inverter with circuit diagram and associated waveforms. How the switching instants of the switch pair of a phase are determined. [8]

b) The following Fig.4b shows the waveform of the output voltage of a single phase inverter with an inductive load of R= 10 ohm and L= 20mH connected in series. Calculate the magnitude and phase of fundamental component of the output voltage and write down the time domain equation of fundamental component of load current. [8]

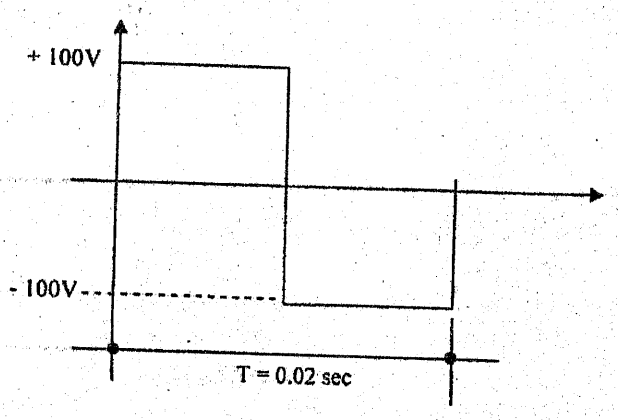

Fig.4b

5. a) Explain the operation of ac voltage controller and its application in electronic load controller for micro hydro plant. [8]

b) **Explain the operation of single phase cyclo-converter with required mathematical expression and waveform.** [8]

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14 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2069 Chaitra

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

Subject: - Power Electronics *(EE701)*

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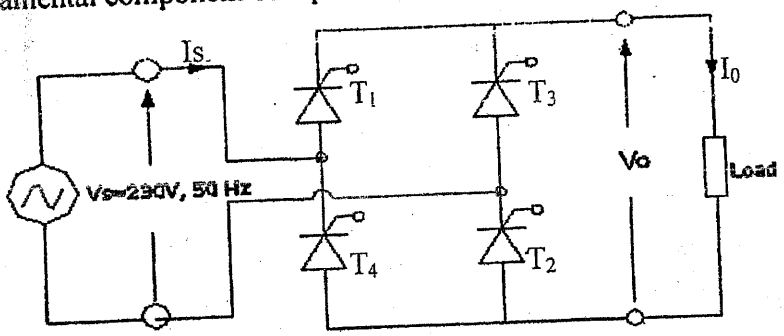
- ✓ *Assume suitable data if necessary.*

1. a) Explain how a power transistor can be used as a switch in the electric circuit. How an opto-coupler can used to isolate the gate signal generator and power circuit? [8]

   b) Explain the di/dt protection scheme and dv/dt protection scheme for a thyristor. [8]

2. a) Figure below shows a single phase full converter circuit with highly inductive load so that load current is constant and equal to 10 amp. Explain its operation for firing angle of 45^0 and draw the waveforms of input voltage Vs, output voltage V_0 and input current Is. Calculate the fundamental component of input current. [8]

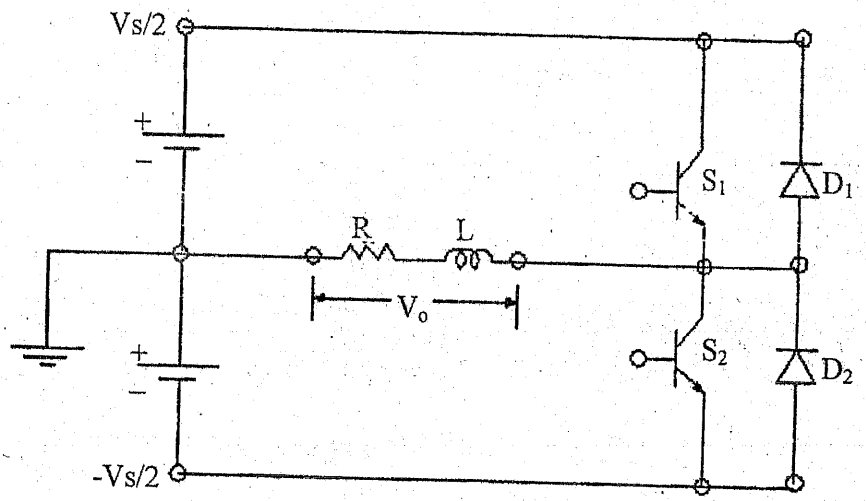


   b) Explain the operation of three-phase single way controlled rectifier with thyristor with neat circuit diagram and waveforms. Derive the expression for average value of the output voltage. [8]

3. a) Explain the operation of type-E dc chopper illustrating its capability of driving a dc motor in all four quadrants. [8]

   b) What are the differences between HVAC and HVDC transmission lines. Perform a mathematical comparison between HVAC and HVDC lines. [8]

4. a) Figure below shows the circuit diagram of single phase square wave inverter with inductive load The required frequency of output voltage is 120 Hz. Calculate the ON period and OFF period of switches S_1 and S_2. Derive the time domain equation of load current for first positive half cycle of output voltage. [8]



b) The single phase inverter shown in Figure above is operated as pulse width modulated (PWM) inverter with frequency ratio = 1 and modulation index = 0.5 The intersection between the triangular carrier wave and square wave ac modulating signal is used to determine the switching instant of switches S_1 and S_2. Assuming purely resistive load [8]

i) Draw the waveforms of triangular carrier wave, square wave ac modulating signal and output voltage.
ii) Determine the switching instant of switches S_1 and S_2
iii) Determine the RMS value of output voltage

5. a) Explain the operation of ac voltage controller with purely resistive load. Derive the expression for calculating rms value of the output voltage. If the load is inductive (R-L load), derive the expression for time domain equation for load current. [8]

b) Starting from the operation of single Phase cyloconverter, discuss step up and stepdown single phase cycloconverter with suitable waveform and circuit diagram. [8]

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division

2080 Bhadra

Exam.	Regular		
Level	BE	**Full Marks**	80
Programme	BCE, BEL, BAG, BGE	**Pass Marks**	32
Year / Part	IV / I	**Time**	3 hrs.

Subject: - Project Engineering (*CE 701*)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
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1. a) What is a project? What are its main attributes? Write the major activities carried out in the implementation phase of a project. [1+2+5]

   b) Discuss on scope of project engineering. Explain in detail the project operates in dynamic environment with suitable example. [2+6]

2. a) Why project appraisal is necessary for initiating a project? What are the major aspects that needed to be considered to carry out the appraisal of project? [2+4]

   b) Why project proposal is considered as the important document for imitating any project? Explain in regards with its contents. [6]

3. a) Find all the components of CPM from the following information: (USE AOA) [12]

S.N.	Activity	Duration (Weeks)	Predecessor	Successor
1	A	1	-	C, E
2	B	6	-	C, D
3	C	2	A, B	F
4	D	2	B	H
5	E	4	A	G
6	F	3	C	G, H
7	G	4	E, F	I
8	H	2	D, F	I
9	I	5	G, F	J
10	J	3	I	-

   b) Explain the differences between CPM and PERT. [4]

4. a) Differentiate between Monitoring and Evaluation. What are different tools of project quality control? [2+4]

   b) Suppose you have a project that is scheduled to be completed in 10 days at a budgeted cost of 100,000. At the end of day 6, you do an analysis and you determine the job is 70% complete and you have spent 65000. [6]

      i) Is the project ahead, behind schedule or on time?
      ii) Is the project expected to complete on budget, under or over budget?
      iii) What is project's SPI and CPI at Day 6^{th} ?

5. a) Define risk. Explain on different types of project risk. [2+4]

   b) How could you effectively manage risk in a project? Explain on qualitative and quantitative risk management system. [2+4]

6. a) Define the term project finance and what are the sources of financing in any project? Write down and explain about the determinants of structure decision to be undertaken for investment proposal. [2+4]

   b) Differentiate between conventional and project financing. A project has an initial investment of Rs 25,00,000 and the salvage value of Rs. 5,00,000. The annual revenue of the project is Rs 10,00,000 and the annual expenses is Rs 2,00,000. Calculate ARR, NRV, Profitability index (PI) and simple payback period of a project. [6]

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division

2081 Baishakh

Exam.	Back		
Level	BE	Full Marks	80
Programme	BCE, BEL, BAG, BGE	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Project Engineering (*CE 701*)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
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1. a) Describe, what are the activities to be performed in termination phase of project life cycle. [4]

   b) Differentiate between goal and objective of any project giving suitable example. Define project environment and explain how task environment of any project influences ability to achieve project's objectives even though it provides resources and limitations. [4+4]

2. a) Define project appraisal. State and explain what are the contents to be included in the project appraisal report. [1+5]

   b) Why any project needs to be formulated properly and concisely? State and analyse the various techniques used in project formulation to provide project parameters in terms of reference (ToR) of a project. [2+4]

3. a) Draw a network diagram from the following data: [10]

   i) Find Critical Path, Critical activities. (ii) Find ES, EF, LS, LF, TF, FF, Ind.F and Int.F.

Activities	Predecessors	Duration (Weeks)
A	None	1
B	None	3
C	A	2
D	A, B	4
E	B	3
F	C, D	5
G	D	1
H	D	2
I	E, H	6
J	E, H	3
K	F, G, I	2
L	K, J	4

   b) What is Work Breakdown Structure (WBS)? Discuss importance of WBS. [2+2]

4. a) Differentiate between quality assurance and control. What are the different types of cost associated with quality? [2+6]

   b) A project is undertaken where the work has to be completed within 60 days with a budget of Rs. 20,000. The cost breakdown per month is Rs. 10,000. The work scheduled in each month is half of the total work to be completed. According to the progress reports, at the end of the first month, only 25% of the total work has been completed and 50% of the total budget has been spent. Also, for the completion of 25% work, the actual cost incurred is 50% of the total budgeted cost. Perform EVA and comment on performance. [6]

5. a) Define concept of risk in project. Explain different categories of project risk. [2+4]

   b) Elaborate risk management cycle. How the project risk can be managed effectively? [2+4]

6. Write down sources of project financing. Explain about steps of capital budgeting process. Discuss net present value (NPV) used in capital budgeting decision. [2+3+2]

7. Write short notes on: [3×3]

   a) Importance of Work Breakdown Structure (WBS)
   b) Project monitoring, evaluation and controlling
   c) Project quality control

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division

2080 Baishakh

Exam.	Back		
Level	BE	**Full Marks**	80
Programme	BCE, BEL, BAG, BGE	**Pass Marks**	32
Year / Part	IV / I	**Time**	3 hrs.

Subject: - Project Engineering (*CE 701*)

- ✓ 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 project in your word and explain its phases. [6]

   b) Explain characteristic of project comparing with final year project. [6]

2. a) Describe step by step process of project appraisal. [6]

   b) Describe different methods of project formulation. [10]

3. a) Draw a network diagram for a hydropower project having information as given below. Find out ES, EF, LS, LF, TF, FF and IntF, IndF and then analysis the situation of the project stating Critical Path, Project Completion Time and Critical Activities. [12]

Activity	Duration (month)	Predecessors
A	3	-
B	5	-
C	8	-
D	4	A
E	7	A
F	2	B
G	1	C
H	7	A
I	4	E,F,G
J	9	C

   b) What is project planning? Explain the importance of project planning. [4]

   c) Define Resource Schedule. What are key difference between Resources Leveling and Resources Smoothing? [1+3]

4. a) Differentiate between quality assurance and quality control. Explain the different types of cost associated with quality. [8]

   b) You have a project that is schedule to be completed in 10 days at a budgeted cost of Rs. 100,000. After the completion of 6 days, you do an analysis and you determined the job is 70% of work is complete and the expenditure is Rs. 65,000. Based on this data, is your work performance is on track? Perform EVA and comment on your own performance. [6]

5. Why risk analysis is important during project planning? What might be the different types of risk in a project? What are the strategies for risk response planning? [2+4+4]

6. a) Explain capital structure planning. [3]

   b) A project has a capital structure consisting of 4000 ordinary share @ Rs. 100 per share and loan capital of $ 600,000 @ 10% interest per year. It wants to raise additional capital of $1 million and has two option: [5]

      i) 4000 ordinary share @ Rs. 100 per share and loan capital of 6000,000 @ 10% interest per year;

      ii) 2000 ordinary share @ Rs. 100 per share, Rs. 300,000 preference share @ 12% dividend per year; and loan capital of 500,000 @ 12% interest per year.

      Select best option if EBIT = Rs. 350,000 and tax rate = 30%.

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2079 Bhadra

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

Subject: - Project Management (*CT 701*)

- ✓ 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 project. Discuss final year project characteristics of your own. How you compare SMART objective of your final year project? [1+3+3]
   b) What is PMBOK? Explain problem tree approach for solving project management issues. [2+2]
2. a) Describe PMI's framework for project management. List out common enablers of project success. [2+2]
   b) Distinguish product life cycle with project life cycle. [4]
3. a) What is system view of project management? Explain about three sphere model of system management. [2+3]
   b) What is work breakdown structure (WBS)? How does it affect the work estimate of tasks/activities? [2+3]
4. a) What is project charter? How we calculate probability index for a project? [2+2]
   b) Distinguish project scope with product scope. What is the significance of scope verification in project scope management? [2+2]
5. For a particular project budgeted cost of work schedule was Rs. 9,50,000 and budgeted value of the work performed was Rs. 8,00,000 at a point of reporting date i.e at 20 weeks from starting date. But, the actual cost of work performed was 10,00,000 and the project completion time is 45 weeks. The project having estimated cost of Rs. 50,00,000. Based on above information, draw features of that project and comment on each parameter of earned value analysis. [6]
6. From the table below:

S.N	Activity	Duration (days)	Predecessor	Successor
1	A	5	-	B,C,D
2	B	3	A	E
3	C	2	A	F,H
4	D	3	A	G
5	E	2	B	H
6	F	1	C	I
7	G	3	D	I
8	H	1	C,E	-
9	I	2	F,G	-

   a) Draw the network diagram of activities involved in the project, show forward pass and backward pass calculation in Network of each node and indicates the critical path. [4+2+1]
   b) What is the total duration of project completion? [1]
   c) Calculate the total float, free float, Independent float and Interfering float for each activity. [4]

7. Quality is one of the most important factors to be controlled for effective delivery of project objectives. How quality assurance and quality control is implemented in order to deliver a successful project. [6]

8. Why reporting system is required in a project? Explain the hazards of communication error in a project. [2+2]

9. Why risk management is an essential part of project management? Describe the risk identification techniques in ICT project. [2+4]

10. a) What do you mean by project procurement management? Explain the different process adopted for procurement in ICT project. [1+4]
    b) What is balance scorecard? And why it is important in large organization? [1+1]
    c) What is project management maturity? [2]

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2079 Baishakh

Exam.	Back		
Level	BE	Full Marks	80
Programme	BCE, BEL, BAG, BGE	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Project Engineering *(CE 701)*

- ✓ 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 project environment? How can you say that the project operates under the dynamic environment? Explain with an example. [2+5]

   b) What are the major activities that are required to be carried out during the initiation phase of a project? [5]

2. a) Explain the procedure for developing project proposal. [6]

   b) Explain in brief about different techniques of project formulation. [6]

3. a) In which situations we have to use Bar chart, CPM and PERT for scheduling of the project. [2]

   b) Draw the network diagram and Compute EST, EFT, LST, LFT, TF, FF, IF and interfering floats of each activities of a project having precedence relationship is given below. The time duration are in days. [12]

Activity	A	B	C	D	E	F	G	H	I	J
Predecessors	-	A	A	A	B	D	C	G	E	F, H, I
Duration	10	12	8	6	10	8	4	10	6	4

4. a) Discuss Cost control, Cost Control Cycle and method of Cost Control in brief. [1+2+3]

   b) A construction work had to be completed in 10 days with 50 labor days at Rs 1000 per day i.e., with total cost of Rs 50,000. At the end of third day, only 25% work was completed with the use of 18 labor days at Rs 800 per day. Perform EVA and comment on its performance. [8]

5. Why project risk management is necessary? What are the different nature of risk? Discuss on the major types of risks that might occur in planning and implementing the hydropower project? [2+4+6]

6. Define capital budgeting and its importance. A firm has equity capital consisting of 5000 ordinary share @ Rs 100 per share and Rs. 3,00,000 preference share at 12% interest per year and Rs. 2,00,000 loan at 10% interest per year. If firm's earnings before interest and tax is Rs. 3,50,000 and tax rate applicable is 25%. Determine earning per share and book value. [3+4]

7. Write short notes on: [3×3]

   a) Feasibility Study
   b) Project Proposal
   c) SWOT analysis

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2078 Bhadra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BCE, BEL, BAG, BGE	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Project Engineering *(CE 701)*

- ✓ 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 Project and describe it's characteristics in brief. [6]
   b) Discuss Project Risk Management. As a project manager how will you manage risk in a Project? [6]
2. What is project appraisal? Discuss on the content and the procedure for developing a good proposal? [2+10]
3. Find all components of CPM from the following information using AOA method. [14]

S.N.	Activity	Predecessors	Duration (week)
1	A	-	3
2	B	-	2
3	C	A	4
4	D	B	3
5	E	B	3
6	F	C	3
7	G	C, D	2
8	H	E	5
9	I	F, G, H	3

4. a) Define project Schedule control. Explain about schedule control cycle. How to keep project on schedule? Explain it. [6]
   b) A company has signed fixed cost contract to installed 1000 new parking meters at cost of Rs. 20,00,000. Old parking meters have to be removed from their stands and replaced with new ones. The cost of doing this is Rs. 2000 per meter. It is estimated that 25 meters is installed each day. On the review date at day 18 only 400 meters has been installed and it was found that actual cost of work performed equals to Rs. 10,00,000. Find out all the parameters of earned value analysis and comment on the performance status of this project. [8]
5. a) Why risk response planning is important in project? What are the response strategies for negative risk? [6]
   b) What do you mean by Project Procurement management? Explain different process adopted for procurement in construction project? [6]
6. Describe Capital Budgeting Process. A project has total capital of Rs. 10,00,000 which consist of Rs. 4,00,000 preference share @12%, 2,50,000 debt@10% and 3500 ordinary share @ Rs. 100. If the earnings before interest and tax is Rs. 8,00,000. Determine EPS and book value of share value of share if tax rate applicable is 20%. [3+4]
7. Write short notes on: [3×3]
   a) Project management and its function
   b) Resource leveling and its process
   c) Quality control and its techniques

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2076 Chaitra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BCE, BEL, BAG, BGE	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Project Engineering *(CE 701)*

- ✓ 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 citing project characteristics. How a project can be differentiated form other permanent systems? [5]
2. Mention project life cycle and discuss various activities carried out in each phase of a project. [6]
3. Define bilateral, multilateral and joint venture project. Explain the major elements that influence the external environment of a project. [3+4]
4. Explain the necessity of an appraisal in a project. Explain in detail the techniques of project formulation. [4+4]
5. What is dummy activity? Write down the use of critical path in a CPM network diagram. Find all the components of CPM from the following information. Use AOA method. [1+3+13]

S.N.	Activity	Duration (week)	Predecessor
1	A	1	-
2	B	3	-
3	C	2	A, B
4	D	5	B
5	E	3	B
6	F	1	C, D
7	G	3	D
8	H	4	D, E
9	I	5	F, G, H

6. Define resource leveling and smoothing? Prepare a 4 level WBS of any engineering project of yours interest. [2+4]
7. As a project manager how will you control the project during implementation phase? Explain with an aid of project control cycle. [6]
8. A project has a planned budget of Rs. 30,00,000 and schedule of 24 months. During its implementation you have monitored the following data: Perform EVA and comment on the performance and also the draw S-curve to forecast the final completion budget and schedule. [8]

Months	5	10	15	20
Work completed	20%	45%	60%	70%
Actual Expenditure (Rs)	7,00,000	13,00,000	20,00,000	24,00,000

Or,

How EVA is used in controlling cost of a project during project implementation. Explain EVA with 3 different examples requiring different approach in control.

9. Define project risk management. What is qualitative and quantitative risk analysis? What are the major steps that you take in managing risks? [2+6+4]
10. What is capital budgeting? Explain its features. [2+3]

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2076 Ashwin

Exam.	Back		
Level	BE	Full Marks	80
Programme	BCE, BEL, BAG, BGE	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Project Engineering *(CE 701)*

- ✓ 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 project. Explain the how technology and capital can be transferred in a joint venture project with a suitable example? [2+4]

   b) Differentiate between a goal and objective of the project. Explain goal setting criteria of a project with a suitable example. [2+6]

2. a) Write down three number of objectives and three number of limitations of any project proposal. Explain a good project proposal should give answer of which types of questions. [3+3]

   b) Differentiate between project appraisal and project formulation. Explain in details about techniques of project formulation. [2+4]

3. a) Define Work break down Structure (WBS) with example specifying levels and code. [8]

   b) Draw network diagram. Compute EST, EFT, LST, LFT, TF, FF, interfering float and independent float. Write down the significance of calculating total float in network analysis. [16]

Activity	A	B	C	D	E	F	G	H	I
Predecessor	-	A	A	A	B	C	D	C, E	F, G
Successor	B, C, D	E	F, H	G	H	I	I	-	-
Duration (day)	5	4	2	3	2	1	3	1	2

4. a) Define monitoring, evaluation and controlling. What are the major difficulties faced by a project manager in implementing the project control system in Nepal. [3+5]

   b) 50 units of plantation have to be done in 3 weeks period. Per unit cost of plantation is estimated as Rs 2500 of which progress monitoring was done 1 week after the work was started. Only 20 units of plantation was found completed and the account record showed that the actual expenditure per unit was Rs 2500. Perform EVA and comment on the performance. [6]

5. a) Define project risk. Write down tools and techniques used for risk identification in a project. As being a engineering student, how do you carry out risk response planning. [2+4+4]

   b) Is preference shares are sources of project finance? Explain it. Explain about the determinants of capital structure decision made in any business firm. [2+4]

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2075 Chaitra

Exam.	Regular / Back		
Level	BE	Full Marks	80
Programme	BCE, BEL, BAG, BGE	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Project Engineering *(CE 701)*

- ✓ 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 project? Explain its dimensions and characteristics. [2+5]
   b) Explain different environments within which a project need to be conducted. [5]
2. a) Why project appraisal is necessary for initiating a project? What are the major aspects that needed to be considered for carrying out the appraisal of a hydropower project? Discuss. [2+6]
   b) Explain in detail the procedure for developing the project proposal. [6]
3. a) Why schedule is important in planning a project? Find all the components of CPM from the following information. Use AOA method. [3+14]

S.N	Activity	Duration (month)	Predecessor	Successor
1	A	1	-	C, D
2	B	3	-	E
3	C	2	A	F, G
4	D	2	A	H
5	E	5	B	I, J, K
6	F	1	C	I
7	G	3	C	I, J, K
8	H	3	D	I, J, K
9	I	5	E, F, G, H	L
10	J	1	E, G, H	L
11	K	4	E, G, H	M
12	L	1	I, J	-
13	M	2	K	-

   b) Prepare a bar chart of an irrigation project mentioning at least 6 activities. Also show the milestones in a chart. [7]
4. a) What is project control cycle? Explain it with elements of control. [2+4]
   b) Perform EVA on the basis of following given information of "Earthquake Affected Monasteries Reconstruction Project" (EMRP) which was monitored after 6 months of its implementation. State controlling statements on the basis of your evaluation. [8]

Descriptions of project	Standard (Budget/Plan) information	Descriptions of project	Monitored information regarding progress (Completed)
1. Number of monasteries to be reconstructed	753 units	1. Reconstructed monasteries	179 units
2. Reconstruction project to be completed in	30 months	2. Average expended reconstruction cost per unit	Rs. 7.8 millions
3. Average reconstruction cost per unit	Rs. 9.3 millions		

5. a) Define risk, its types and sources. As a project manager how would you rectify the possible risk on your project? Give your answer considering all possible steps falls under Risk Management. [10]
   b) What are the sources of project finance? A project has an initial investment of Rs. 3,00,000 which gives annual return of Rs. 50,000 for 8 years. The salvage value after 8 years will be Rs. 10,000. Make your investment decision based on ARR, Payback period, IRR and Profitability index (PI) method. [2+4]

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05 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division

2075 Ashwin

Exam.	Back		
Level	BE	Full Marks	80
Programme	BCE, BEL, BGE, B. Agri.	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Project Engineering *(CE701)*

- ✓ 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 importance of project appraisal. Differentiate between technique and finance proposal of a project. [8]

   b) Discuss the techniques of project formulation. [8]

2. a) Explain project appraisal and its importance. [8]

   b) Describe the essence of writing a good proposal. [8]

3. a) Draw CPM network diagram and compute ES, EF, LS, TF, FF, Int.F and IF from the information given below. Also compute project duration and mark the critical path. [12]

Activity	A	B	C	D	E	F	G	H	I
Duration (week)	5	4	0	6	7	8	6	3	2
Predecessor	-	-	A	A	B,C	B,C	D,E	F	GH

   b) Write the advantages of Bar chart. [4]

4. a) What would be the impact on project due to unmanaged risk in project? Write down risks in project in different phases of project life cycle. [8]

   b) Explain and justify that risk transfer and risk reduction are techniques of risk response planning in any project. [8]

5. a) Explain project control cycle and write the factors to be considered during quality control of a project. [8]

   b) Describe project finance. Capital structure of a firm consists of 500 ordinary share @ Rs 100/share and 300 preference share @ Rs 100/share at 15% interest per year. Firm has a loan of 30,000 @ 12% per year firms earning before interest and tax is 40,000. Determine earning per share and book value. Tax rate = 40% [8]

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05 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2074 Chaitra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BCE, BEL, BGE B. Agri.	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Project Engineering *(CE701)*

- ✓ 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 that the specified job/task is a project? Write the major activities carried out in the implementation phase of a project? [4+4]
   b) Explain in detail the project operates in dynamic environment. [8]
2. a) Write various analysis to be carried out for project appraisal. [8]
   b) Explain in details about the contents of writing a good project proposal. [8]
3. a) Draw CPM network diagram and compute EST, EFT, LST, LFT, TF, FF, Int.F and IF from the information given below. Compute project duration and mark the critical path. [12]

Activity	A	B	C	D	E	F	G	H	I
Duration (week)	3	2	0	4	7	5	8	6	1
Predecessor	-	-	A	A	B,C	B,C	D,E	F	G,H

   b) Explain total float and independent float. [4]
4. a) Explain project control cycle and write the factors that should be considered during the quality control of a project. [4+4]
   b) 50 units of plantation have to be done in 4 weeks period. Per unit cost of plantation is estimated as Rs. 200 of which progress monitoring was done 3 weeks after the work was started. Only 60% work was found completed and the account record showed that the actual expenditure for plantation per unit was Rs. 300. Perform EVA and comment on works. [8]
5. a) Define risk and its types. How could you manage risk in a project effectively? Justify with risk management cycle. [2+6+2]
   b) What are the sources of project finance? A firm has equity capital consisting of 5000 ordinary share@ Rs 100 per share and Rs. 3,00,000 preference share at 12% interest per year and Rs 2,00,000 loan at 10% interest per year. If firm's earning before interest and tax is Rs 3,50,000 and tax rate applicable is 25% determine earning per share and book value. [6]

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01 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2074 Ashwin

Exam.	Back		
Level	BE	Full Marks	80
Programme	BCE, BEL, BGE, B.Agri.	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Project Engineering *(CE701)*

- ✓ 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 Project. Describe Joint Venture Project and Possibility of Technology Transfer through it. [1+4]
   b) What is Project Environment? How does political environment affect project in Nepal? [1+4]
2. a) Describe the importance of project appraisal. Explain the difference between Economic Appraisal and Financial Appraisal. [2+4]
   b) Define Project Proposal. Differentiate between Technical Proposal and Financial proposal. How does client evaluate the proposal for awarding the contract of Construction and Consulting works? [1+2+3]
3. a) Define Project plan. Explain the advantages of planning Engineering Projects. [1+3]
   b) Define Total Float, Free Float and independent float. Draw a CPM network and Find EST, EFT, LST, LFT, TF, FF, IntF and IndF. Show critical path also. [16]

Activity	A	B	C	D	E	F	G	H	I	J
Successor	B, C, D	E	F, H, I	G	H	J	I	J	J	
Duration-Days	2	3	4	5	4	3	2	1	2	3

   c) Define resource schedule. Differentiate between resource levelling and resource smoothening. [4]
4. a) Define Monitoring and Evaluating. Explain project control cycle with suitable example. [1+5]
   b) Define quality. Differentiate between quality assurance and quality control. As a site engineer what steps would you follow to control quality? [1+2+3]
5. a) Define project risk. Differentiate between internal and external risks. What are the sources of internal risks in Nepal in the present context? Explain internal risks for the implementation of hydropower project in Nepal. [1+2+2+2]
   b) Define Risk Management. Describe the steps of risk management. [1+4]
6. a) Define Project Finance. What are the features of sound and appropriate capital structure? A company has total Capital of Rs 1500000 which consists of Rs. 400000 shares, Rs. 200,000 preference share issued at 12% interest per year and Remaining loan issued @ 8% interest. Calculate EPS if earnings before interest and tax in a year is Rs 300,000 and tax rate is 20%. [1+2+2]
   b) Define Capital Budgeting and explain its importance. What are the methodologies of evaluating projects financially and Which method is most reliable? [1+2+2]

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01 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2073 Chaitra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BCE, BEL, BGE, B.Agri.	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Project Engineering *(CE701)*

- ✓ 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 project. List out all characteristics of project. [2+3]
   b) Define project environment. Explain external environment with example. [1+4]
2. a) Why do we prepare project proposal? Explain the process of writing project proposal. [1+5]
   b) List out all techniques of project formulation. Briefly discuss the methods of feasibility analysis. [2+6]
3. a) Prepare a bar chart of any engineering project consisting of at least 6 activities. [5]
   b) Find all components of given CPM network. [13+2]

Activity	A	B	C	D	E	F	G	H	I	J	K	L
Durations	3	4	3	5	3	4	2	4	2	5	7	2
Predecessors	-	-	A	B	B	A,D	A,D	C	C	F,H,L	F,I	E,F,G,I
Successors	C,F,G	D,E	H,I	F,G	L	J,K,L	L	J	J,K,L	-	-	-

   What is significance of critical path analysis?
4. a) Most of the construction projects in Nepal have poor project implementation with time and cost overrun. Justify your answer highlighting the points on causes of project delay. [5]
   b) Define quality and Discuss on its control techniques. [1+3]
   c) Suppose you are making brick for construction work. Suppose the following are your plan.

   Project Plan:
   - 5 hours to make a total of 1000 bricks
   - Budgeted cost per brick is $ 0.05
   - Total budget is $ 50.00 for brick ingredients (or $ 10/hr)

   Progress report at end of 1st hour
   - 150 bricks have been made
   - Total actual cost of ingredients used for 150 bricks is $ 9.00

   Use earned value to examine progress and also comment on performances. [6]
5. Define Risk and Project Risk. Briefly explain the types of project risk. How could you manage the risk in a project effectively? Justify with risk management cycle. [2+2+6]

6. a) Define the term capital budgeting decision. A five years project has initial investment of Rs.1,00,000 with Rs.40,000 salvage value. The average gross income of five years is calculated as Rs.18000. Calculate ARR of project if tax applicable is 50%. Depreciation is straight line. [1+3]

b) List out features of sound capital structure. A firm has equity capital consisting of 3000 ordinary share @ Rs 100 per share, Rs.3,00,000 preference share at an interest of 12% per year and loan of Rs.9,00,000 borrowed at an interest rate of 10% per year. The firm wants to raise Rs.15,00,000 more to finance its investment and is considering two alternative methods of financing i.e.

(i) To issue 4,000 common shares @ Rs. 100 each, 5,00,000 preference share @ 12% and to borrow Rs.6,00,000 at 10% interest and

(ii) To issue 3000 common shares @ Rs.100; to issue 4,00,000 preference share at an interest rate of 12% and to borrow Rs.8,00,000 at 10% interest.

If the firm's earnings before interest and tax is Rs.5,00,000 and the tax rate applicable is 25%, determine earning per share to decide on the best alternatives. [2+5]

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01 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division

2073 Shrawan

Exam.	New Back (2066 & Later Batch)		
Level	BE	Full Marks	80
Programme	BCE, BEL, BGE, B. Agri	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Project Engineering *(CE701)*

- ✓ 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 project phases and life cycle giving examples of activities carried out in different phases and stages of life cycle. [10]

OR

Classify project and discuss its characteristics in detail including the importance of good project environment.

2. Define project proposal. A well prepared project proposal should give answer of what types of question, explain it. Discuss elaborately about different aspect to be considered in feasibility study of a road project. [2+2+5]

3. a) List down planning tools used in any project. Milestones chart is improved version of a bar chart, Justify it, with example. Explain WBS. [2+4+2]

   b) Draw a network diagram and find out EST, EFT, LST, LFT, TF, FF independent float, interfering float, project completion time of a building project having following details. What is the significance of critical path in the network analysis? [13]

Immediate Predecessor	-	-	-	A	A	B	C	C	D	E,F,G	H
Activity	A	B	C	D	E	F	G	H	I	J	K
Duration (Weeks)	10	12	9	8	5	13	6	4	15	7	9

4. a) What is the difference between evaluation and controlling? Discuss about elements of project control. [5]

   b) For a particular project budgeted cost of work schedule was Rs. 9,50,000 and budgeted value of the work performed was Rs.8,00,000 at a point of reporting date i.e at 20 weeks from starting date. But, the actual cost of work performed was Rs. 10,00,000 and the project completion time is 45 weeks. The project having estimated cost of Rs. 50,00,000. Based on above information, draw features of that project and comment on each parameter of earned value analysis. [7]

5. a) How risk can be identified and analyzed for a rural road project. Explain the procedure. [5]

   b) What are the methods that could be used in risk management after identifying major risk. Justify giving suitable example how risk transfer is taken as risk response planning. [5]

6. Define the term project finance and what are the sources of financing in any project? Write down and explain about the determinants of capital structure decision to be undertaken for investment proposal. [3+5]

7. Write short notes on: (any two) [5×2]

   i) Cost-benefit analysis
   ii) Resource leveling
   iii) PMIS
   iv) Project software

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01 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2072 Chaitra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BCE, BEL, BGE, B. Agri.	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Project Engineering *(CE701)*

- ✓ 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 project. Explain the characteristics of project with appropriate examples. [1+4]
   b) How project goal or objectives are set? Explain goal setting criteria. [5]
2. a) What are the objectives of project appraisal? Explain Financial and Technical Appraisal in detail. [2+4]
   b) Define project proposal. Discuss cost benefit analysis for a road project. [2+4]
3. a) Define planning and scheduling. Prepare a Linked Bar-chart for a construction project with at least 10 activities. [2+4]
   b) Define Critical Activities and Float. Draw a CPM network [AOA or AON] and find EST, EFT, LST, LFT, TF, FF, IntF and IndF. [2+5+6]

Activity	A	B	C	D	E	F	G	H	I	J	K	L
Predecessor	-	-	A	A,B	B	C,D	D	D	E,H	E,H	F,G,I	L
Duration Days	1	3	2	4	3	5	1	2	6	3	2	4

   c) What is WBS? Discuss importance of WBS. [4]
4. a) Define Monitoring and Control. Explain why project controlling is difficult in Nepal. [3+3]
   b) What is EVA? A construction work had to be completed in 10 days with 50 labour days at Rs 1000 per day i.e with total cost of Rs 50,000. At the end of third day, only 25% work was completed with the use of 18 labour days at Rs 800 per day. Perform earned value analysis and comment on the performances. [1+5]

OR

Define quality. Explain how quality can be controlled in construction of urban roads. [6]

5. a) Define Project Risk. How risk can be analysed? Explain with example of hydropower project. [1+4]
   b) How risk can be managed? Explain how you manage three risks in hydropower project you identified above. [5]
6. Define Capital Budgeting decision. Explain its importance. Calculate Explain ARR of a project with initial cost of Rs. 100000 and salvage value of Rs 20000 after 5 years. Stream of income in year 1 to year 5 are Rs. 15,000; 20,000; 25,000; and 20,000 Tax rate is 25%. Assume suitable method of depreciation. [1+2+2]
7. Write short notes on: (any two) [4×2]
   i) Project life cycle
   ii) Planning software MS project
   iii) Elements of project control
   iv) Environmental analysis for project formulation

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01 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2072 Kartik

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

Subject: - Project Engineering *(CE701)*

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

1. a) Explain Work Breakdown Structure as a tool of project planning and state the importance of project planning.

   b) Draw the CPM network diagram (or Precedence diagram) from the following activity relationships: Compute total minimum project time of completion, critical activities and ES, EF, LS, LF, TF, FF, IntF and IndF.

Activity	A	B	C	D	E	F	G	H	I
Duration	3	5	5	6	2	3	4	2	6
Predecessor	-	A	A	A	B,C	C	D,E,F	D	G,H
Successor	B,C,D	E	E,F	G	G	G	I	I	-

   Also mark the critical path in the network diagram.

2. a) Define project and explain it's characteristics in brief. What are the major differences between project management and traditional management? Explain about the external environment of the project.

   b) Define project formulation and project appraisal. Write the procedure for developing a project proposal. What are the drawbacks of cost-benefit analysis of project formulation?

3. a) Why project planning is necessary to operate any project in dynamic environment? Linked bar chart is one of planning tool in project scheduling, justify this statement with suitable example. Is there limitations of this chart?

   b) Find out the expected time of each contractor to complete a given project having following details. Also, find out which contractor you prefer for operation and why?

Contractor	t_o	t_l	t_p
A	5	7	13
B	6	11	12
C	3	5	7

4. a) Discuss "monitoring, evaluation and control" is a must to succeed in a project. Explain project management information system and justify "the right information at the right time reduces the risk of wrong decision".

   b) Explain the term 'project finance' and describe features of sound capital structures. Write down and explain with example what are the factors to be considered to take capital structure decision.

5. a) Define risk management planning. Explain in details about internal and external risks in project. Justify giving suitable example how risk reduction is taken as risk response planning.

   b) A project has total capacity of $1,000,000 which consists of 4,000 shares @ $100; $300,000 preference shares @ 18% interest; and remaining loan @15% interest. Earning before income and tax in a year is $200,000. Compute the Earning per Share (EPS) and Book Value of Share, if Tax Rate is 20%.

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01 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2071 Chaitra

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

Subject: - Project Engineering *(CE701)*

- ✓ 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 Project. Elaborate Labor intensive, Capital Intensive, Joint Venture and Multilateral projects. Explain various elements of task environment. [2+4+4]
2. a) What is project appraisal? Explain marketing, management and environmental appraisal. [2+6]
   b) Define project proposal. Explain in brief about procedure for developing a project proposal. [2+6]
3. a) Draw the network diagram of the given project having following activities. Obtain project duration, critical path, TF, FF and interfering float. Prepare the resource aggregation chart and allocate the mason using early start schedule. [8+5]

Activity	Duration (days)	Mason (per day)
1-2	3	1
2-3	3	2
2-4	4	4
2-5	2	2
3-10	3	2
4-6	2	3
4-7	4	3
5-9	4	4
6-8	2	2
7-9	4	1
8-9	3	2
9-11	3	4
10-11	2	2
11-12	2	1

   b) Discuss on Work Breakdown Structure. [3]
4. a) Define Monitoring and Evaluation. Explain project control cycle. [2+4]
   b) Why cost control is important? A contractor agreed to build 50 doghouses in 90 days at a price of $1000 per unit. 20 days later, the contractor has finished 10 doghouses with an actual cost of $8500. What is the status of the project? [2+4]
   c) What is PERT? Discuss with example. [4]
5. Define Risk. Explain various sources of project risks. Describe important steps of risk management. [2+5+5]
6. a) What is capital structure planning? Discuss with examples. [5]
   b) What is capital budgeting decision? Explain its importance. Discuss Net present value used in capital budgeting decision. [5]

OR

What are the sources of financing large projects?

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01 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2071 Shawan

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

Subject: - Project Engineering *(CE701)*

- ✓ 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 project. Explain any four characteristics of engineering projects. [1+4]
   b) What is Project Environment? Explain Task Environment in detail. [1+4]
2. a) Elaborate the statement "Technical Appraisal is most important in project". [6]
   b) Define Technical and Financial proposal. Explain the contents of Technical proposal. [2+4]
3. a) Draw a network diagram and find EST, EFT, LST, LFT, TF, FF independent float and interfering float of building project having following details. What is the significance of critical path in the network diagram. [12+2]

Predecessor	-	-	-	-	B	E	C	A,F	C,E	D,G
Activity	A	B	C	D	E	F	G	H	I	J
Duration (in weeks)	6	10	11	9	5	8	12	8	7	4

   b) What are the steps in project planning process? Write down work breakdown structure (WBS) for a building project and why it is necessary in construction project? [5+5]
4. a) Define project Monitoring and Evaluation. Explain project control cycle. [2+4]
   b) Define Quality. List various factors affecting quality of projects in Nepal. Differentiate between Quality Assurance and Quality Control. [2+2+2]
5. a) What is Risk? Explain various types of risks in project. [1+5]
   b) List different types of risks for the implementation of hydropower projects in Nepal and recommend appropriate risk response plan for those risks. [6]
6. Explain capital structure planning and features of sound capital structure. A project cost Rs.50,000 and has a scrap value of Rs.10,000. It stream of income before depreciation and taxes during first year through five years is Rs.10,000; Rs.12,000; Rs.14,000; Rs.16,000 and Rs 20,000. Assume 30% tax rate depreciation on straight line basis. Calculate ARR of the project. [4+6]

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01 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2070 Chaitra

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

12/19

Subject: - Project Engineering *(CE701)*

- ✓ 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. Differentiate between labour intensive and capital intensive projects with example? Explain project Goal setting critical with an aid of suitable example. [3+5]
2. Define project formulation and project appraisal. Describe procedure for developing a project proposal. [2+2+8]
3. a) Explain Bar chart with its advantages and limitations. [8]
   b) Define the term planning and explain the features of good project planning? Find all the components of CPM from the following information: [4+12]

S.N	Activity	Duration	Predecessor	Successor
1	A	3	-	D
2	B	6	-	E,G,I
3	C	2	-	F
4	D	2	A	G
5	E	1	B	H
6	F	3	C	I
7	G	7	B, D	-
8	H	3	E	-
9	I	4	B, F	-

4. a) Justify the statement "quality costs more, but lack of quality costs even more" giving examples of total quality cost included to achieve good quality. [6]
   b) A construction company is planned to fix 100 units of precast window in 20 days with a budget of 25 lakhs. The progress status was reviewed on 10 days from date of start of fixing and only 40 units were fixed with the expenses of 9 lakhs. Find out all the parameters of earned value analysis and comment on its performance. [6]
5. Define risk and risk management. Explain about internal risk of any construction project that is facing by a Nepalese construction company. Explain with suitable example risk transfer. [2+8+2]
6. a) Define Capital Structure. XYZ company has total capital of Rs.10,00,000 which consists of 40% share and 60% loan issued @ 12% interest. It requires Rs.20,00,000 more to invest in a project and is considering for following three options. [1+6]
      i) Rs.8,00,000 share and Rs.12,00,000 loan @14% interest
      ii) Rs.5,00,000 share; Rs.7,00,000 preference share @15% interest and Rs.8,00,000 loan @14% interest and
      iii) Rs.10,00,000 share and Rs.10,00,000 preference share @ 15% interest.
      Which is the best option based on Earning Per Share Calculation if the Earning before interest and tax in a year is Rs.5,00,000 and tax applicable is 30%
   b) Define Capital Budgeting decision. Explain ARR or return on Equity. Recommend appropriate measures that Government should take to attract private sector in Hydropower projects. [1+2+2]

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02 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2070 Ashad

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

Subject: - Project Engineering *(CE701)*

- ✓ 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. Differentiate between Bilateral, Multilateral and Joint Venture project with example? Discuss the external environment in which a project is operated. [4+6]
2. Define concept of project appraisal. Explain about contents of technical and financial proposal. Also explain input analysis of project formulation. [2+7+3]
3. a) Construct the CPM network for a project with following activities: [16]

Activities	A	B	C	D	E	F	G	H	I	J
Predecessor	-	-	A,B	B	A	C	E,F	D,F	G,H	I
Days	4	7	4	3	2	1	6	5	8	9

Find:

i) Critical path
ii) Project completion time
iii) EST, EFT, LST, LFT, Total float,
Free float (F_F), independent float (I_dF) and Interferring float (If)

b) Define the terms resource histogram, resource levelling limited resource allocation and work break structure. [2+2+2+2]

4. a) Write the concept of Monitoring, Evaluation and Controlling and also explain project control cycle. [3+4]

b) Why cost control is important in project? 15 houses were to be completed in three months with per unit cost of Rs 25,00,000/-. In one month 4 houses were completed with total expenditure of Rs 96,00,000/- use earn value analysis to find the status of the project. [3+4]

5. Define 'risk'. Explain various sources of project risk. Elaborate risk response planning. [1+5+4]
6. Define the term project financing. Explain features of capital structure planning. A project has total capital of Rs 5,00,000 which consists of 2000 shares @ Rs 100, 1,50,000 preference share 18% interest and remaining loan @ 14% interest. Earning before interest and tax in a year is Rs 1,00,000. Calculate EPS and book value of share if tax rate is 25%.[2+4+4]

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02 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING

Examination Control Division

2069 Chaitra

Exam.	Old Back (2065 & Earlier Batch)		
Level	BE	Full Marks	80
Programme	BCE, BEL, BEX,BCT,BME	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Project Engineering

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

1 a. 'Project is always unique and temporary' Explain. Describe"SMART"criteria of setting project objectives with suitable examples. 4+4.

b. List the planning and scheduling tools. Which one of them would you prefer for planning building construction project? Give reasons. Write **also** limitations of that tool 2+3+3

2 . Draw a CPM network. Find EST, EFT, LST, LFT, TF, FF. Independent Float and Interfering Floats. Explain dummy activity. 6+8+2

Activity	A	B	C	D	E	F	G	H	I	J	K	L
Predecessor	-	-	A	B	B	C, D	E	E	E, F	H	G, I	G, J
Duration (wks)	1	3	6	5	4	2	6	5	3	1	2	5

3 a. Define Optimistic time, most probable time and pessimistic time to be used in PERT analysis. Explain the differences between CPM and PERT . 3+5

b. What is project control? Explain project control cycle and feedback control system. 2+4+2

4a. Define BCWS, BCWP, ACWP, Sv, SPI, Cv, and CPI used in earned value analysis Support your example with S-curve. 6+2

.b. What is capital structure? A company wish to have Rs. 50,00,000 for a project to be implemented very soon. It is considering three options which are :

i) 50% share and 50% loan at 12% interest ii) 30% share, 40% preference share at 15% interest and remaining loan at 12% interest and iii) 40% share, 30% preference share at 15% interest and remaining loan at 12% interest.

Which is the best option considering earning per share criteria if the company expect earning before interest and tax of Rs. 7,50,000 in coming years and tax rate is 20% 2+6

5 a. Define Master budget. Explain the problems and dangers of budgeting. 2+3+3

b. Define EIA. Explain various types and categories of impacts. 2+3+3

6. Write short notes (any four) 4X4

a.Resource requirement in various phases of project lifecycle. b. Multi project scheduling

c. Capital budgeting decision d. Sources and cost of capital e. SCBA

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2080 Bhadra

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

Subject: - Organization and Management (*ME 708*)

- ✓ 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. Why is there a need for different levels of managements? List out the different models of management and write down short note on any two with proper example you are aware of. [4+4]
2. Explain Scientific Management theory with proper examples. Is it still applicable in modern-day management practices? [5+3]
3. What are the differences between single ownership and organization joint stock company? [8]
4. How would you define organization? How can you describe principles of organization? Elaborate the importance of organization. [1+4+3]
5. What is personal management? Elaborate the various factors of wage and salary structure with proper examples. [4+4]
6. Define the term outsourcing. Explain the process of recruitment and selection of manpower in an organization. [3+5]
7. According to Herzberg's motivation-hygiene theory, where does motivation at work come from? Vroom's Valency theory is known as type of process theory, justify it. [4+4]
8. What characteristics differentiate a Leader from regular employees? Explain Blakes and Mouton's Managerial Grid with proper examples. [4+4]
9. Discuss the major steps of case study with relevant examples related to your field of study. [8]
10. What are the role of MIS in any organization? Explain the four types of information systems. [3+5]

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2081 Baishakh

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

Subject: - Organization and Management (*ME 708*)

- ✓ 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 different functions of management. List out the major skill desired for successful manager. [4+4]
2. Explain the scientific management theory with its historical development. What are the major differences between the scientific management theory and behavioral mangement theory? [4+4]
3. How would you clarify the characteristics of Joint Stock Company? What are the major differences between Joint Stock Company and Public Corporation? [4+4]
4. What are the major function of marketing? Explain the importance of marketing in this modern digital era. [4+4]
5. What is the main idea of personal management? Explain steps of the HR planning process. What are the methods of scientific selection of manpower in organization? [1+4+3]
6. How can you compare Job evaluation with Merit Rating? How would you generate Job description and job specification of Lecture post in engineering college? [3+5]
7. What role does management play in motivating their employees? Explain McGregor's Theory X and Theory Y. [3+5]
8. What are the qualities of good leader? Why we need to promote entrepreneurship in the context of Nepal? [4+4]
9. What are the major objectives of case study? Discuss the different steps of conducting case study. [3+5]
10. What is the importance of MIS? Explain database information system with suitable example. [3+5]

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2080 Baishakh

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

Subject: - Organization and Management (*ME 708*)

- ✓ 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 functions of management? In your opinion which management theory is the most practical and fruitful in today's business scenario? [4+4]
2. Define personal management and explain the function of personal management. [8]
3. Explain the difference between administrative management approach and behavioral management approach. [8]
4. What is the process of formation of a joint-stock company in Nepal? What are the advantages and disadvantages of a joint-stock company? [4+4]
5. Explain about the personal policy and describe about the importance of manpower planning in an organization. [4+4]
6. Explain the vroom's expectancy theory of motivation. [8]
7. Which style you recommend as most effective leader in industrial organization? [8]
8. Explain about the case study and explain about the objectives of case study in detail. [4+4]
9. What are case studies? Why are case studies conducted? What are the different types of case studies? [4+2+2]
10. Explain how the management information system is used in different levels of management within an organization. [8]

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2079 Bhadra

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

Subject: - Organization and Management (*ME 708*)

- ✓ 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 the historical development of the organization. Distinguish between formal and informal organizations. [3+5]
2. Are Fayol's principles of management applicable in today's organization? How? [8]
3. What do you mean by co-operative societies and describe different types of co-operatives. [8]
4. Explain the advantages of line and staff organization over line and function organization and describe the committee and its types. [4+4]
5. Explain the policies of personnel mangement. How can you identify the training needs of manpower in an organization? [5+3]
6. Explain the following: [4×2]
   a) Job analysis
   b) Job evaluation
   c) Merit rating
   d) Recruitment
7. Describe about the motivational theory and explain about the Herzberg's hygiene maintenance theory. [4+4]
8. Explain about the entrepreneurship and describe the steps for establishing a small scale unit of entrepreneurship. [4+4]
9. What is case study? Explain the steps involves in case study. [8]
10. Write short notes on: (Any Two) [2×4]
    a) Organization Structure
    b) Marketing
    c) Entrepreneurial characteristics

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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	IV / I	Time	3 hrs.

Subject: - Organization and Management *(ME 708)*

- ✓ 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 organization as a system. Describe the concepts of organization in this respect. Is it possible to have an informal organization within the same family? [2+2+4]
2. Describe any two principal functions of a manager. Why do you think that these two functions are most important functions in an organization? What is the difference between organization and management? [4+2+2]
3. What is difference between Administrative Management Approach and Behavioral Management Approach? What is the rationale for Scientific Management Approach? [4+4]
4. Why joint stock company is better than partnership firm? Discuss the process of a private company registration in Nepal, including the types of documents required. [3+5]
5. How important is marketing in business? What are the different methods of purchasing? [4+4]
6. How would HR Manager tackle with the problem of talent poaching in the modern industries? Elaborate how HR manager would implement employee development program with short term plans. [4+4]
7. Define Intrinsic Motivation. Explain McGregor's Theory X and Theory Y of Motivation. [2+6]
8. Explain Blake's and Mounton's managerial grid. Describe different leadership approach. [4+4]
9. Why do we need MIS in addition to various softwares for specific tasks in an organization? What is the significance of Executive Information System (EIS) for top level managers? [4+4]
10. Entrepreneurship is not only the creativity of entrepreneur but also strongly need the conductive environment for entrepreneurship. Elaborate with your own logic. [8]

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2078/06/10

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	IV / I	Time	3 hrs.

Subject: - Organization and Management *(ME 708)*

- ✓ 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 organization. "Management is both a science and an art". Discuss this statement, giving suitable examples. What are the managerial skill a modern manager needs to be equipped with? [1+3+4]
2. What are the functions of Management? Explain different levels of management. What are the qualities of good manager? [3+2+3]
3. What advantage does behavioral management theory has over scientific management theory? Explain in brief. [8]
4. Define advertising and importance of marketing. Explain the Principle of purchasing. [1+3+4]
5. While ascending up the Maslow's pyramid some people fall from the grace (ie. they end up in cases like fraud, crime, rape, suicide, murder, jail terms, etc.) Describe this irony form your own perspective. [8]
6. Define term wages and merit ranking. Differentiate between recruitment and selection. Explain the scientific selection of manpower and methods of job analysis. [2+3+3]
7. Define Manpower Planning. Why is it important to discuss Personnel Policy with the employees at Hiring? [3+5]
8. Explain briefly about comparison of Alderfer and Herzberg's Theories. Explain the Vroom's expectancy of motivation theory. [3+5]
9. Define the term leadership. Which leadership style is appropriate in the modern engineering project. Explain in brief. [3+5]
10. Describe how data and information are used in an officer. What is the difference between Decision Support System (DSS) and Management Information System (MIS)? [4+4]

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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	IV / I	Time	3 hrs.

Subject: - Organization & Management *(ME 708)*

- ✓ 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 the importance of organization in the society. Define the term informal Organization. [5+3]
2. Explain behavioral management approach theory. What are the basic skills and function required for management? [3+5]
3. What advantages does joint stock organization has over partnership organization? Explain the features of line organization. [4+4]
4. Explain the role of purchasing and marketing department in the organization. [8]
5. Explain the role of personnel management in the organization. Why do we need manpower planning in the organization. [4+4]
6. What do you mean by incentives. Explain the different factors affecting the wage/salary structure. [4+4]
7. Define the term motivation and explain different technique of motivation. [4+4]
8. Describe Trait Approach of Leadership. Explain the Vroom's Expectancy theory of motivation. [4+4]
9. What are the qualities of a good leader? Explain the term entrepreneurship. [5+3]
10. Define the term MIS. Explain the value of MIS in the planning process. [3+5]

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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	IV / I	Time	3 hrs.

Subject: - Organization and Management *(ME 708)*

- ✓ 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 organization and management. What are the principles of organization? [2+6]
2. Describe various roles for a manager to play in an organization. Briefly mention the different models of management. [4+4]
3. What advantages does Joint stock Organization has over Partnership Organization? Explain the features of line Organization. [4+4]
4. Draw an outline of purchasing process for an organization. What are the challenges for marketing of software products in Nepal? [4+4]
5. Explain the role of Personnel Management in the organization. Why do we need manpower planning in the organization? [4+4]
6. How do you see the significance of Blake and Mouton's managerial grid for organization's growth? Explain. [8]
7. Define Motivation. Explain the features of Maslow's hierarchy of needs. [3+5]
8. Describe the role of entrepreneurship in the development of IT sector in Nepal. What are the risks and challenges for an aspiring entrepreneur in Nepalese IT sector? [5+3]
9. What is the relationship between computers and management information system? Explain how information systems can be organized in proper way? [2+6]
10. Define the term MIS. Explain the value of MIS in the planning process. [3+5]

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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	IV / I	Time	3 hrs.

Subject: - Organization and Management *(ME708)*

- ✓ 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 organization. What are the roles of an organization for professional growth and development of an employee? Do we need informal organization indeed? [2+4+2]
2. What are the function of Management? Briefly explain the features of scientific management theory. [4+4]
3. What is the significance of Human Resource Manager in modern organization? Elaborate how HR manager would implement Scientific Management Approach? [4+4]
4. Define the term Marketing. Explain the importance of Marketing in an Organization. [3+5]
5. What are the functions of personal management? How wages are calculated? [5+3]
6. What kind of salary and benefits do you expect when you join an organization? Explain interviewing process. [5+3]
7. What do you mean by motivation? Why is the theory proposed by Maslow on hierarchy of human needs called satisfaction progression process? Explain with examples. [3+5]
8. What is the difference between a leader and manager? How do you want to pursue your career in future? What are the challenges for a good leader in modern times? [4+2+2]
9. Describe Democratic Leadership style. Explain Behavioral approach of leadership. [4+4]
10. Write short notes on: (Any two) [4+4]
    a) Manpower planning
    b) Organizational structure
    c) Satisfaction progression Vs Frustration Regression Process

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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	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Organization and Management *(ME708)*

- ✓ 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 organization. Why do we need organization? Can we sustain without organization? [2+3+3]
2. What are the functions of management? Explain different levels of management? What are the qualities of good manager? [3+2+3]
3. What is difference between Administrative Management Approach and Behavioral Management Approach? What is the rationale for Scientific Management Approach? [4+4]
4. Discuss on different steps for formation of Joint Stock Company. Explain the merits and demerits of Committee organization. [4+4]
5. What is personnel management? What must a good personal policy include?
6. Differentiate between attitude, group and executive motivation. List the techniques of motivation. [8]
7. Explain Blake's and Mouton's managerial grid? Describe different leadership approach? [8]
8. What is entrepreneurship? Why is there need for promotion of entrepreneurship in developing nation? [8]
9. Describe how you envision yourself as a leader in the future professional career. What are the qualities of a good leader? [4+4]
10. Describe how data and information are used in an officer. What is the difference between Decision Support System (DSS) and Management Information System (MIS)? [4+4]

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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	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Organization and Management *(ME708)*

- ✓ 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 Formal and Informal organization. Discuss on principles of organization. [2+6]
2. Why is there a need for different levels of management? What are the managerial skill a modern manager needs to be equipped with? [4+4]
3. What are advantages of line and staff organization over line organization and functional organization? Explain committee organization and its types. [4+4]
4. Suppose you are chief executive officer (CEO) of a software company. Which type of ownership would you prefer? And why? Suggest suitable organizational structure for it with figure. [4+4]
5. What is the importance of Personnel Policy in an organization? Discuss pros and cons of referral approach for manpower recruitment this competitive world. [4+4]
6. Explain how Vroom insists on importance of reward through his VIE theory for motivation. [8]
7. What do you mean by human need? How is need used for motivation? Explain the Herzberg's hygiene theory of motivation. [2+2+4]
8. Describe why you would / or would not undertake a startup after graduation. What are the risks and challenges for an aspiring entrepreneur in Nepal society? [5+3]
9. Having spent more than 3 years in a particular college/campus of yours, what are the recommendations you wish to propose to the college management for the future improvement that would it turn boost up overall academic performance and image of the college? [8]
10. Briefly describe about the information support required in different functional areas of management. [8]

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12 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	IV / I	Time	3 hrs.

Subject: - Organization and Management *(ME708)*

- ✓ 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 term organization. What impact do different organizations have over our society? [3+5]
2. Which Management theory is best suited for the organizations in Nepal? [8]
3. Explain the features of Partnership Organization. What difficulties can a Partnership Organization possibly face? [3+5]
4. How important is Marketing in business? What are the different methods of Purchasing? [4+4]
5. Define Personnel Management. How important is discussing Personnel Policy/Employee Handbook to newly hired employee? [3+5]
6. What do you mean by incentives? Explain the different factors affecting the wage/salary structure. [3+5]
7. Define the term Motivation and explain Maslow's theory of motivation. [3+5]
8. Define the term leadership. Which leadership style is appropriate in the engineering project? Comment. [3+5]
9. Define the term Entrepreneurship. Explain entrepreneurship characteristic. [3+5]
10. Define the term MIS. What do you mean by website? Explain the role of computer for management information system. [2+2+4]

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12 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	IV / I	Time	3 hrs.

Subject: - Organization and Management *(ME708)*

- ✓ 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. Describe the role of organizations for human civilizations? What are the characteristics of an organization for business operations? [4+4]
2. State and define various levels of management. What are the various skills necessary to be an efficient manager? [4+4]
3. Which type of organizational structure is best suited for a temporary engineering project? Present your logic. [8]
4. Define the term marketing and why marketing is important in an organization? [8]
5. What is the role of interview in manpower hiring process? What is difference between wage and salary? What is an incentive and why is it needed? [3+3+2]
6. What do you understand by the term Motivation? Explain Herzberg's Hygiene Maintenance Theory. [3+5]
7. What is Leadership? In your opinion, which type of leadership is most efficient in Nepal? Present your views and logic. [3+5]
8. What is the importance of entrepreneurship for national economy in Nepali context? What is the significance of law enforcement for entrepreneurship? [4+4]
9. Differentiate between a Boss and Leader in terms of various Leadership styles you have studied. [8]
10. What are the Objectives of Case study? Explain the needs, function and importance of MIS in organizations of today's modern world. [4+4]

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12 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	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Organization and Management *(ME708)*

- ✓ 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 the term organization. Explain the difference between Formal and Informal organization. [3+5]
2. Define the term management and explain the function of management. [3+5]
3. What advantage does Behavioral Management theory has over Scientific Management Theory. Explain in detail. [8]
4. An organization may change its form of ownership. Explain this with some examples. [4+4]
5. Explain the importance of marketing in modern business. Salesmanship is an important ingredient of marketing. Do you agree with this statement? [4+4]
6. Why is personnel Policy necessary to be discussed? Discuss the importance of Manpower Planning. [5+3]
7. What is difference between appropriate and inappropriate human resources? List out some idea to elaborate them concerning with "Human Resources Management". [8]
8. Discuss the role of management in Motivation. Explain McGregor's theory X and theory Y. [3+5]
9. Entrepreneurship is not only the creativity of entrepreneur but also strongly need the conducive environment for entrepreneurship. Elaborate with your logic. [8]
10. Explain the importance of Management Information System (MIS). Explain information support for functional areas of Management. [4+4]

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12 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	IV / I	Time	3 hrs.

Subject: - Organization and Management *(ME708)*

- ✓ 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. Why do we need organizations? Describe the principles of an organization. [4+4]
2. State and explain the different levels of Management. What are the basic skills required for Management? [4+4]
3. What is the difference between Scientific Management and Management Science? How do Taylor's principles illustrate importance of Scientific Management for production processes? [3+5]
4. Which organization structure is more suitable to engineering project? Discuss with your logic. [8]
5. Explain the different methods of Purchasing. Why is advertising one of the best form of Marketing? [5+3]
6. What is the difference between recruitment and hiring? Why do we need incentives in an organization? [4+4]
7. What are the different factors that affect wage / salary structure? Explain different methods of Training Manpower. [4+4]
8. What is the difference between theory 'X' and theory 'Y'? Explain on the basis of different theory of motivation. [8]
9. Describe Autocratic Leadership Style. Explain the different characteristics of Entrepreneur. [3+5]
10. If you are asked to prepare the case study considering the planning horizon, leadership, motivation and human resource development for either Nepal Electricity Authority or Nepal Telecom to improve the existing performance of these institution. How do you prepare case study following its structure? [8]

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12 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	IV / I	Time	3 hrs.

Subject: - Organization and Management *(ME708)*

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

1. Define organization and explain the principle of organization.
2. What do you mean by management? Explain the function of management.
3. Explain Henry Fayol's 14th principle of management.
4. What do you mean by co-operative societies? Explain different types of co-operatives.
5. What do you mean by purchasing? Explain different function of purchasing department.
6. Define personal management and explain function of personal management.
7. What do you mean by incentive? Explain different factors of salary structure.
8. Define motivation and explain different technique of motivation.
9. Define leadership and explain different qualities of good leader.
10. How information system support for functional area of management.

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12 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2071 Chaitra

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

Subject: - Organization and Management *(ME 708)*

- ✓ 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. Why is an organization necessary? Explain the principles of an organization. [4+4]
2. What are the differences between the terms organization and management? Why do you need scientific approach of management to an organization? [2+2+4]
3. What do you mean by organizational structure? How is it defined for a particular enterprise? Write advantages and disadvantage of line organization. [2+2+4]
4. What do you mean by purchasing and procurement? Explain the functions of marketing. [3+5]
5. Explain the motive behind personnel management? Describe various functions of personnel management. How does Human Resources Management System differ from personnel management? [2+4+2]
6. Define the term job analysis and explain scientific selections of manpower. [5+3]
7. What do you mean by Human need? How is a need used for motivation? Explain Herz Berg's Hygine theory of motivation. [2+2+4]
8. A reader is leader. Elaborate it in terms of leadership styles. What are the differences between a leader and a manager? [5+3]
9. Define Management Information System (MIS). Describe briefly about different types of Information System and their support to managers in decision making. [5+3]
10. What are the objectives of a case-study? Explain the needs, functions and importance of MIS. [3+5]

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12 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2071 Shawan

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

Subject: - Organization and Management *(ME708)*

- ✓ 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 principles of organization? Explain formal and informal organization. [4+4]
2. What are the managerial skills? Explain the importance of management. [4+4]
3. What are the forms of ownership? Explain advantages and disadvantages of single ownership organization. [4+4]
4. What do you understand by behavioral management approach? Explain administrative management approach. [4+4]
5. What are the methods of purchasing? Explain the various functions of marketing. [4+4]
6. What is personnel management? Explain recruitment and selection of staff. [3+5]
7. What do you mean by Training and Development of Human resources? Explain various incentives used in organization. [5+3]
8. What is motivation? Explain the difference between Maslow's Heirarchical need theory and Alderfer's ERG theory. [3+5]
9. Define the term Entrepreneurship and write the steps for establishing a small scale unit of Entrepreneurship. [3+5]
10. Write short notes on: (any two) [4×2]
    i) Objective of Case Study
    ii) Organization structure and
    iii) Organizing Information systems

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12 / 23

12 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2070 Chaitra

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

Subject: - Organization and Management *(ME708)*

- ✓ 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. Describe why organization is considered as an open system. Explain the importance of organization. [4+4]
2. Name the different models of management. Explain any three of them in detail. [3+5]
3. State and describe H.Fayol's administrative management theory. [8]
4. What is meant by 'Joint Stock Company'? Describe the procedure for forming 'Joint Stock Company'. [3+5]
5. Define marketing, advertising. Explain the function of purchasing in detail. [3+5]
6. Define the term personnel management. Explain the function of personal management. [3+5]
7. Define merit rating. State and describe the various methods of merit rating. [2+6]
8. What do you mean by human needs? Describe A. Maslow's hierarchy of needs theory in detail. [3+5]
9. Define leadership and explain by Blakes and Mouton's Management Grid. [3+5]
10. Define Management Information System. Explain information support for functional areas of management. [2+6]

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12 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2070 Ashad

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

Subject: - Organization & Management *(ME708)*

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

1 What are the principles of Organization? Explain the Informal Organization. (4+4)
2 Explain the importance of Management and discuss the different function of Management. (3+5)
3 Explain Administrative Management Theory. (8)
4 What do you mean by organization structure? Explain Line Organization. (4+4)
5 Define the term purchasing. Explain different function of Purchasing department. (3+5)
6 Define the term Personnel management and explain its functions. (8)
7 What do you mean by incentives? Explain the different factors affecting the wage/salary structure. (3+5)
8 Define the term Motivation and explain different technique of motivation. (3+5)
9 Define the term leadership and Explain the different qualities of good leader. (3+5)
10 a. Define the term Entrepreneurship. (3)
b. Explain the Vroom's Expectancy theory of Motivation. (5)
11 What do you mean by Case study? Explain the objective of case study. (4+4)
12 Define term MIS. How information support for functional areas of management? (3+5)

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12 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2069 Chaitra

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

Subject: - Organization and management *(ME708)*

- ✓ 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 Organization. Explain the importance of Organization in society. [3+5]
2. Define the term Management and explain different levels of Management. [3+5]
3. What do you mean by Joint Stock Company? Explain the advantages and limitations of a Joint Stock Company. [2+6]
4. What do you mean by motivation? Describe Maslow's hierarchy of needs briefly. Can Maslow's theory explain tireless quest of Laxmi Prasad Devkota for excellent literary works? [2+3+3]
5. Explain the process of recruitment and selection of man power in an organization. What do you mean by outsourcing in this context? [6+2]
6. a) Explain different Techniques of Motivation. [4]
   b) Define term contingency approach of Leadership. [4]
7. Define the term Entrepreneurship and explain the characteristics of Entrepreneurship. [3+5]
8. Define Management Information System. Describe briefly various types of Management Information System. [2+6]
9. Silicon Valley is the best example of successful entrepreneurship. Elaborate with your thoughts. [8]
10. Write short notes on: (any two) [2×4]
    a) Computer aided Advertising
    b) Objectives of case study
    c) Satisfaction progression Vs. Frustration Regression Process

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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	IV / I	Time	3 hrs.

Subject: - Power Plant Equipment (*EE 703*)

- ✓ 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.*

Group A
(Electrical Part)

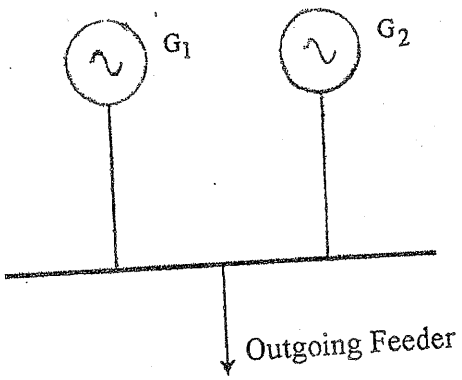
1. a) Explain about the steady state operation of hydropower plant with neat diagram. [4]
   b) Write down the control strategies for preventing water hammer. [4]
2. Two generating units has following rating and droop characteristics

   Unit – 1 600 MVA R1 = 4%
   Unit – 2 500 MVA R2 = 6%

   These two units are operating in parallel and sharing a total load of 900 MW at nominal frequency of 60 Hz. Unit – 1 supplies 500 MW and unit – 2 supplies 400 MW. If the load increases by 90 MW, calculate the new frequency and new generation of each generator. [10]
3. Write about the firefighting system used in hydropower plant. [6]
4. Explain the excitation control system of a 3 phase alternator and derive the overall transfer function. What is function of stabilizing transformer? [8]
5. For the power system network given below, calculate the fault level in MVA at the outgoing feeder for a 3 phase to ground fault on the feeder. Calculate the value of reactance to be connected in the feeder in order to reduce the fault level by 50%. [8]

   Ratings of the generators are:

   $G_1 = 50$ MVA, 11 kV, $X_{g1} = 0.15$ p.u.
   $G_2 = 50$ MVA, 11 kV, $X_{g2} = 0.3$ p.u.



Group B
(Mechanical Part)

1. What are the methods for cooling the engine in a diesel power plant? What are the function of the lubricating system? [8]

2. A 4-cylinder, 4-stroke cycle engine having cylinder diameter 100 mm and stroke 120 mm was tested at 1600 rpm and the following readings were obtained. Fuel consumption = 0.2 kg/min, B.P. = 31.4 kW, Mechanical efficiency = 80%, Calorific value of fuel = 44000 kJ/kg. Determine: [8]

   i) BSFC (Brake Specific Fuel Consumption)
   ii) IMEP, (Indicated Mean Effective Pressure), and
   iii) Brake thermal efficiency.

3. Air is drawn in a gas turbine unit at 15°C and 100 kPa and pressure ratio is 7:1. The compressor is driven by HP turbine and LP turbine drives a separate power shaft. The isentropic efficiencies of the compressor and the HP and LP turbine are 0.82,0.85 and 0.85 respectively. If the maximum temperature of the cycle is 610°C, calculate

   i) The pressure and the temperature of the gas entering LP turbine.
   ii) The net power developed by the unit per kg/s mass flow.
   iii) The thermal efficiency of the unit. [Take for compression process Cpa = 1.005 kJ/kgK and γ = 1.4 and for combustion and expansion process Cpg = 1.15 kJ/kgK and γ = 1.333]. [10]

4. What are the advantages of thermal power plant? Explain superheating and reheating with T-S diagram. [8]

5. Enumerate the advantage of a combined cycle power plant. With the help of a neat diagram, explain the principle of working of a combined cycle power plant to enhance the efficiency of electricity generation. [2+4]

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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	IV / I	Time	3 hrs.

Subject: - Power Plant Equipment (*EE 703*)

- ✓ 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.*

Part A(Electrical Part)

1. a) Explain the transient response of turbine generator coupled system with speed Governor for a step change in load. [5]

   b) What is isochronous governor? Explain with its closed loop control system. Why it is not suitable for two gerating units operating in parallel? [5]

2. a) Two generators of capacities 600MW and 300MW are connected in parallel to supply a common load of 600 MW. Their droop regulations are 3% and 6% respectively w.r.t. their respective ratings. At no-load, they operates at a common frequency of 51 Hz. How they will share the common load of 600MW? When the load is increased by 200 MW, at which frequency they will operate and calculate the power supplied by each generator? [10]

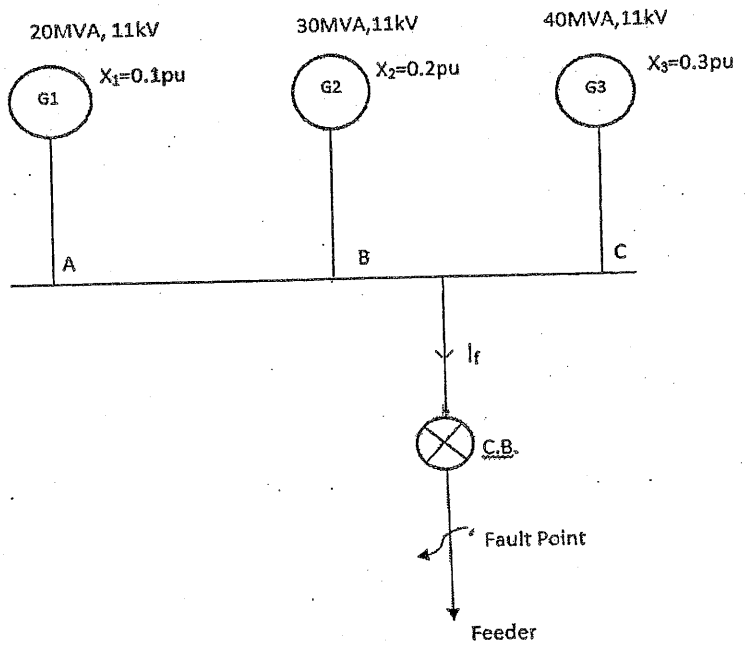
3. a) Describe the excitation system of a synchronous generator with stabilizing transformer. Derive mathematical model of system in terms of transfer function of each component in the system. [6]

   b) Describe fire fighting system used in power station. [4]

4. a) Explain the function following parts of a power transformer. [4]

   i) Conservator tank (ii) explosion vent (iii) breather

   b) The given figure shows three generators operating in parallel. Find the fault current and fault level if three phase to ground fault occurs in the outgoing feeder. What should be the value of feeder reactor to be added to reduce the fault level by 40%? [6]



Part B (Mechanical Part)

1. Sketch the main components of diesel power plant. Explain fuel supply system in Diesel power plant. [8]
2. A diesel power plant operated by a two-stroke diesel engine was motored when the meter readings was 5 kW. Then the test on the engine was carried out for one hour run and the following observations were recorded: Brake Torque = 300 N.m, Speed = 1200 rpm, Fuel consumed = 6.5 kg, Calorific value of fuel = 40 MJ/kg. Determine: [8]
   i) Mechanical efficiency
   ii) Indicated thermal efficiency
   iii) Brake thermal efficiency
3. In a gas turbine, the compressor takes in air at a temperature of 15°C and compresses it to four times the initial pressure with an isentropic efficiency of 82%. The temperature at the inlet of the turbine is 600°C and the isentropic efficiency of the turbine is 70%. A regenerator having an effectiveness of 78% is also incorporated in the cycle. Determine the thermal efficiency of the cycle. Take cp = 1.005 kJ/kg K and $\gamma = 1.4$. [10]
4. List the common method used for performance improvement of a steam turbine power plant. Explain how reheating increases the efficiency of the plant. [8]
5. Explain the working of combined power plant. How can we determine the performance of a combined power plant? [6]

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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	IV / I	Time	3 hrs.

Subject: - Power Plant Equipment (*EE 703*)

- ✓ 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.*

Part A (Electrical Part)

1. a) What is pumped storage power plant? In which situation it will be economically feasible? [5]

   b) Explain the special characteristics of a hydraulic turbine and what is water starting time? [5]

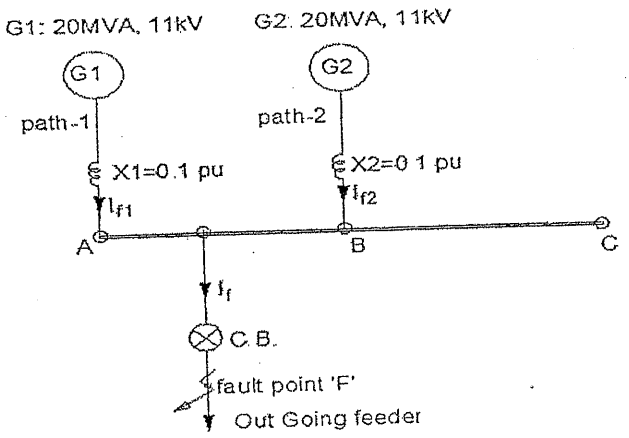
2. Two generators of 500 MW 11kV, 4% and 250 MW 11kV, 2% are supplying to a common load. When each generator is fully loaded, they operate at common frequency of 50 Hz. If the system load of 100 MW is reduced, what will be frequency deviation and find load shared by each unit? [10]

3. a) Describe the excitation system of a synchronous generator with stabilizing transformer. Derive mathematical model of the system in term of transfer function of each components. [6]

   b) Explain the SCADA system implemented in a power system. [4]

4. a) Describe the operation of an isochronous governor and explain why this type of governor is not suitable for parallel operation of two generating units. [4]

   b) Following figure shows two generators operating parallel [6]



   i) If a 3-phase to ground fault occurs on the outgoing feeder, calculate the fault current and fault level on the feeder.

   ii) If a 3rd generator (G3: 10MVA, 11kV, X3=0.2 pu) is added at point 'C', calculate the value of reactor to be added on the outgoing feeder so that the fault level remains same as before.

Part B (Mechanical Part)

1. What is diesel cycle and how the system is cooled during operation? Discuss the advantages and disadvantages of diesel power plant. [8]

2. During a 20 minutes trial of a single cylinder four stroke engine the following observations were recorded:

   Bore = 0.2 m, Stroke = 0.28 m, Fuel consumption = 1.52 kg, Calorific value of fuel = 43900 kJ/kg, Indicated mean effective pressure = 3.1 bar, Net load on brakes = 640 N, r.p.m. = 350, brake drum diameter = 1 m [8]

   Calculate: (i) Indicated power; (ii) Brake power; (iii) Mechanical efficiency; (iv) Indicated thermal efficiency.

3. Draw a sketch of a simple open cycle constant pressure gas turbine power plant with intercooling and describe the method to improve its thermal efficiency considering intercooling and T-s diagram. [8]

4. What are the ways by which efficiency of the Rankine cycle can be increased? Differentiate between impulse and reaction steam turbine. [4+4]

5. Draw the three popular designs of the combined steam and gas turbine cycle. Explain one of them with T-s diagram. [4+4]

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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	IV / I	Time	3 hrs.

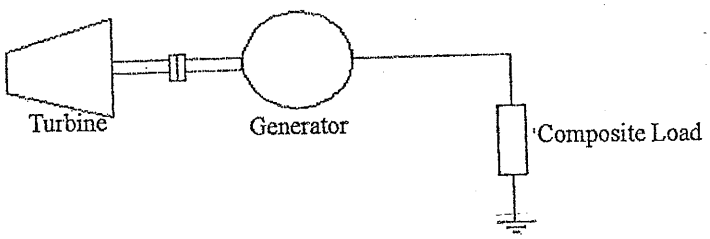
Subject: - Power Plant Equipment (*EE 703*)

- ✓ 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.*

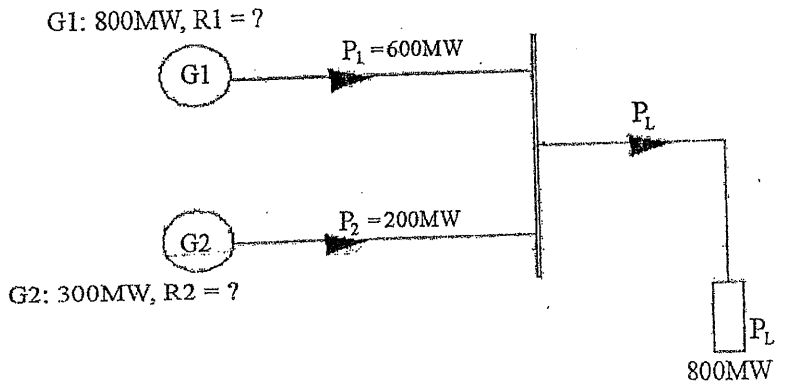
Part A (Electrical Part)

1. a) What do you mean by hammer effect in hydro power plant? Explain how it can be reduced. [5]

   b) Shows below figure the block diagram of water turbine driving an electric generator without speed governor. Explain how the inertia and load damping constant can control the speed of the system against small change in load. Derive the transfer function showing the effect of inertia and load damping constant. [5]



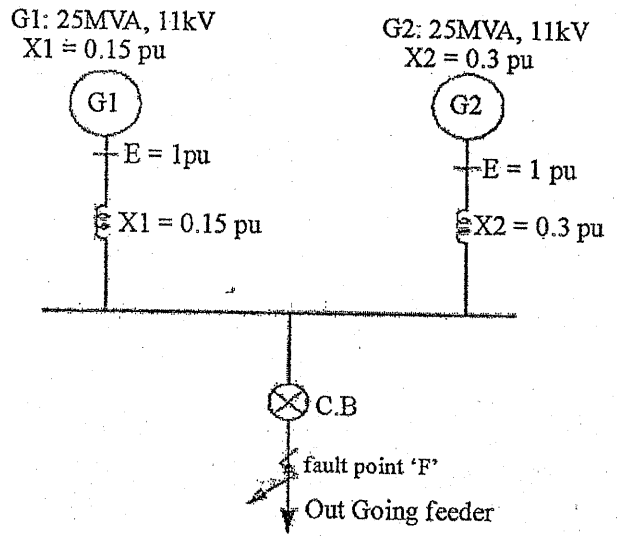
2. Shows figure below two generators operating in parallel and supplying a load of 800 MW. G1 is rated as 800 MW and G2 is rated as 300 MW. G1 supplies 600 MW and G2 supplies 200 MW and system frequency is 50 Hz. At no-load, they operate at a common frequency of 51 Hz. Calculate droop regulations R_1 an R_2 of G_1 and G_2 with respect their ratings. Assume base power = 1000 MW. When the load is decreased below 800 MW, the frequency increases to 50.2 Hz. Calculate the power supplied by each generator at reduced load. [10]



3. Describe the excitation system of a synchronous generator with stabilizing transformer. Derive mathematical model of the system in term of transfer function of each component of the system. [10]

4. a) What is the function of rector in Power system network? Explain the ring type bus bar rector scheme. [5]

b) For the system shown in figure below, calculate the fault level in MVA at out going feeder for a three phase to ground fault on this feeder. Calculate the value of reactance to be connected in the feeder in order to reduce the fault level by 50%. [5]



Part B (Mechanical Part)

1. Draw a complete sketch of a diesel power plant and mention its different systems. [8]
2. A diesel engine consumes fuel at the rate of 5.5 gm/sec and develops a power of 75 kW. The mechanical efficiency is 85%. The lower heating value of the fuel is 44 MJ.kg. Determine:
   a) Brake specific fuel consumption
   b) Indicated specific fuel consumption
   c) Brake thermal efficiency and
   d) Indicated thermal efficiency [4+4]
3. Explain how regenerator increases the output of the gas turbine power plant along with the neat sketch and show the cycle in p-v and T-s diagram. [6+2]
4. Steam at a pressure of 14 bar and temperature 300°C is expanded through a HP turbine to a pressure of 5 bar, it is then reheated at constant pressure to a temperature of 300°C and then it completes expansion through the LP turbine to an exhaust pressure of 0.2 bar. Calculate the ideal efficiency of the plant and work done: [8]
   a) Taking the reheating into account
   b) Without reheating
5. A gas turbine unit has a pressure ratio of 6:1 and maximum cycle temperature of 610°C. The isentropic efficiencies of the compressor and turbine are 80% and 82% respectively. Calculate the power output in kilowatts of an electric generator geared to the turbine when the air enters the compressor at 15°C at the rate of 16 kg/s. Find the thermal efficiency of the plant as well. Take Cp = 1.005 kJ/kg K and $\gamma = 1.4$ for the compression process, Cp = 1.11 kJ/kg and $\gamma = 1.333$ for the expression process and Cp = 1.11 kJ/kg K for the combustion process. [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	IV / I	Time	3 hrs.

Subject: - Power Plant Equipment *(EE 703)*

- ✓ 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.*

Electrical Part

1. Explain the operation of pump storage hydropower plant with suitable scheme to reduce peak generation loss of steam power plant. [8]
2. a) Explain with proper diagram of P-f and Q-V loop in hydro generating system. [8]
   b) Two generators of 1000 MW, 2% and 500 MW, 4% are supplying to a common load. When each generator is fully loaded, they operate at common frequency of 49.5 Hz. Calculate the system load shared by each unit when frequency increased to 50 Hz. [6]
3. For an excitation system with a stabilizing transformer, derive the transfer function. [8]
4. a) A 100 MVA generator with 10% reactance and a 200 MVA generator with 8% reactance are connected to a common bus. The fault level on bus 1 is to be restricted to 1500 MVA. If a reactor is added in between these two generators in the bus bar, then on 100 MVA base Calculate the value of reactance added. [6]
   b) What are different parts of Power Transformer? Explain in brief. [4]

Mechanical Part

5. Draw a neat sketch of general layout of Diesel Power Plant with all major components. Explain the starting system and fuel supply system as well. [4+2+2]
6. List the common method used for the performance improvement of the steam turbine power plant. Explain how reheating increases efficiency of the plant. Draw the layout and show the cycle in T-S diagram. [2+4+2]
7. The gas turbine has an overall pressure ratio of 5:1 and the maximum cycle temperature of 550°C. The turbine drives the compressor and an electric generator. The mechanical efficiency of the drive being 0.97. The ambient temperature is 20° C and the isentropic efficiencies of the compressor and turbine are 0.8 and 0.83 respectively. Calculate the power output is kW for an air flow of 15 kg/s. Calculate also thermal efficiency and the work ratio. Neglect changes in kinetic energy and the loss of pressure in combustion chamber. [8]
8. Air is drawn in a gas turbine unit at 15°C, 100 kPa and pressure ratio is 7:1. The compressor is driven by the H.P turbine and L.P turbine drives a separate power shaft. The isentropic efficiencies of compressor and the H.P and L.P turbines are 0.82, 0.85 and 0.85 respectively. If the maximum cycle temperature is 610°C, Calculate
   a) The pressure and temperature of the gases entering the low pressure turbine.
   b) The net power developed by the unit per kg/sec mass flow.
   c) The thermal efficiency of the unit.
   (For compression process c_p = 1.005 kJ/kg.K and γ = 1.4 and for combustion and expansion process c_p = 1.15 kJ/kg.K and γ = 1.333) [12]
9. What are the possible combinations of combined cycle power plants? Point out the advantages of combined cycles. [2+2]

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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	IV / I	Time	3 hrs.

Subject: - Power Plant Equipment *(EE 703)*

- ✓ 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.*

Part A (Electrical Part)

1. a) Explain the operation of pump storage hydropower plant and suggest the suitable scheme to reduce peak generation loss of power plant. [5]

   b) For change in load, explain how inertia and load damping constant can help to keep the speed constant which acceptable raise even in the absence of governor. [5]

2. a) What do you mean by isochronous governor? What will be the problem if two hydropower plants with isochronous governor are operated in parallel to supply a common load? [4]

   b) Derive the transfer function of a water turbine and explain the response against unit step change in gate opening. [6]

3. a) What is excitation system? Draw a functional block diagram of a typical excitation control system and explain the role of each block and derive the complete transfer function of the system. [8]

   b) What is function reactor in power system. [2]

4. a) Two generators of capacities 40MVA, 11kV and 30MVA, 11kV having their sub transient reactance of 5% and 4% respectively operating in parallel and supplying to a common load by single feeder of reactance 2Ω. Calculate the value of reactor to be connected in series with feeder so as to reduce the fault label at the end of the feeder by 50%. [5]

   b) Three generators of 500MW, 2% drop, 250MW, 4% drop and 200MW, 3% drop are supplying to a common load. When each generator is fully loaded, they operate at common frequency of 49Hz. Calculate the system load shared by each unit when frequency increased to 50Hz. [5]

Part B (Mechanical Part)

5. Sketch the main components of diesel power plant. Write down the main function of lubricating system and cooling system in diesel engine power plant. [4+2+2]

6. In a diesel power plant engine is coupled with an alternator. The engine has compression ratio 15:1. The compression begins at 0.1MPa and 40°C. The heat added at the end of compression is 1675MJ/kg. Consider air constant, R = 287 kJ/kgK and Find: [8]

   (i) The maximum temperature and pressure in the cycle
   (ii) The cut off ratio of the engine
   (iii)Net work done per kg of air
   (iv)Thermal efficiency of the engine
   (v) Mean effective pressure of the cycle.

7. Explain the methods of efficiency improvement in gas turbine power plant. [6]

8. In a test for four-cylinders, four stroke engine has a engine has a diameter of 100mm, stroke = 120mm, speed of engine = 1800 rpm, fuel consumption of 0.2 kg/min, calorific value of fuel is 44000 kJ/Kg. Difference in tension on either side of brake pulley = 40 kg, Brake circumference is 300cm and the radius of the pulley rope is 25mm. If the mechanical efficiency is 90%. Determine :

   (i) Brake-thermal efficiency,
   (ii) Indicated thermal efficiency,
   (iii)Indicated mean effective pressure, and
   (iv)Brake specific fuel consumption. [10]

9. What is combined Power plant? Sketch the layout with necessary labels, for various types of combined power plant. Discuss the performance and economics of combined power plants. [2+4+2]

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2076 Ashwin

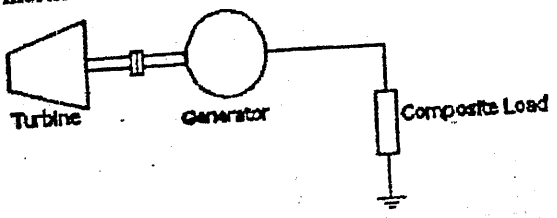
Exam.	Back		
Level	BE	Full Marks	80
Programme	BEL	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Power Plant Equipment (EE 703)

- ✓ 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.*

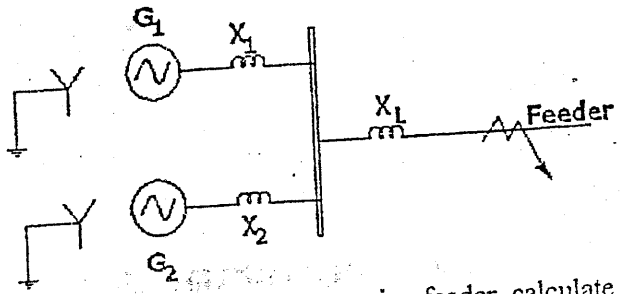
Electrical Part

1. Explain the operation of pump storage type hydro power plant with neat diagram. [8]
2. Below figure shows the block diagram of water turbine driving an electric generator without speed governor. Explain how the inertia and load damping constant can control the speed of the system against small change in load. Derive the transfer function showing the effect of inertia and load damping constant. [8]



3. Two generating units of 500MW and 250MW capacities respectively are operating in parallel and supplying power to a common load. When each generator is half loaded, they operate at a common frequency of 50Hz. The droop regulations are 5% and 6% respectively based on their respective ratings. If the load is increased by 100 MW, Calculate: [8]
   a) New frequency at which they operates
   b) Power supplied by each generator
4. Describe the excitation system of a synchronous generator with stabilizing transformer. Derive mathematical model of the system in term of transfer function of each component of the system. [8]
5. Below figure show the single line diagram of parallel operated generators. Their ratings are: [8]

   G_1: capacity = 50 MW, 11kV, X_1 = 0.16 pu based on its rating
   G_2: capacity = 40 MW, 11kV, X_2 = 0.12 pu based on its rating
   XL = 2 ohms



   a) If a three-phase to ground fault occurs at outgoing feeder, calculate the fault current and fault power at the outgoing feeder and fault current supplied by each generator.
   b) Calculate the value of inductor (in mH) of the reactor to be connected in series with X_2 so that both generators delivers equal amp of fault current during 3 phase to ground fault on the feeder.

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Mechanical Part

6. Explain the working of combined gas-steam power plant with neat figure and also show the process on T-S diagram. [10]
7. Explain the different types of water cooling system with their advantages and disadvantages. [6]
8. Explain the closed and open Brayton cycle. [6]
9. Steam is generated in a boiler at 50 bar and 450°C. For the purpose of governing, the steam is throttle to 30 bar before it enters the high pressure state of turbine. after expansion in high pressure stage, the steam emerges just dry saturated and then reheated at the same pressure to 300°C before it expanded in the low pressure stage to a pressure of 0.06 bar, when it emerges again just dry and saturated. If the intermediate pressure is 3 bar, what are the states efficiencies? Also calculate the overall cycle efficiency and work ratio shared by HP stage to that of work shared by LP stage. [10]
10. A 4-stroke diesel engine develops 5 kW at 2000 RPM when its mean effective pressure is 7.5 bar. If for engine, L = 1.25 D, find their dimensions. [8]

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Superheated steam table

P kPa	T °C	v m³/kg	u kJ/kg	h kJ/kg	s kJ/kg.K
300	(133.56)	(0.6059)	(2543.5)	(2725.3)	(6.9921)
	150	0.6339	2570.7	2760.9	7.0779
	200	0.7163	2650.2	2865.1	7.3108
	250	0.7963	2728.2	2967.1	7.5157
	300	0.8753	2806.3	3068.9	7.7015
	350	0.9536	2885.3	3171.3	7.8729
	400	1.0315	2965.4	3274.9	8.0327
	450	1.1092	3047.0	3379.7	8.1830
	500	1.1867	3130.1	3486.1	8.3252
	550	1.2641	3214.7	3594.0	8.4604
	600	1.3414	3301.1	3703.5	8.5895
	650	1.4186	3389.1	3814.7	8.7134
	700	1.4958	3478.9	3927.7	8.8325
	750	1.5729	3570.5	4042.3	8.9475

P kPa	T °C	v m³/kg	u kJ/kg	h kJ/kg	s kJ/kg.K
5000	(263.98)	(0.03944)	(2596.5)	(2793.7)	(5.9725)
	300	0.04530	2697.0	2923.5	6.2067
	350	0.05193	2808.0	3067.7	6.4482
	400	0.05781	2906.5	3195.5	6.6456
	450	0.06330	2999.8	3316.3	6.8187
	500	0.06856	3091.1	3433.9	6.9760
	550	0.07367	3181.8	3550.2	7.1218
	600	0.07869	3272.8	3666.2	7.2586
	650	0.08362	3364.5	3782.6	7.3882
	700	0.08850	3457.1	3899.7	7.5117
	750	0.09334	3551.0	4017.7	7.6300
	800	0.09815	3646.3	4137.0	7.7438
	850	0.1029	3742.9	4257.5	7.8536

Table A2.1: Properties of SATURATED WATER – Pressure Table

P kPa	T °C	v_f m³/kg	v_{fg} m³/kg	v_g m³/kg	u_f kJ/kg	u_{fg} kJ/kg	u_g kJ/kg	h_f kJ/kg	h_{fg} kJ/kg	h_g kJ/kg	s_f kJ/kg.K	s_{fg} kJ/kg.K	s_g kJ/kg.K
6.0	36.167	0.001006	23.737	23.738	151.46	2272.5	2424.0	151.47	2415.0	2566.5	0.5208	7.8075	8.3283
300	133.56	0.001073	0.6048	0.6059	561.29	1982.2	2543.5	561.61	2163.7	2725.3	1.6721	5.3200	6.9921

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INSTITUTE OF ENGINEERING
Examination Control Division
2075 Ashwin

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

Subject: - Power Plant Equipment *(EE 703)*

- ✓ 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.*

Group A

(Electrical Part)

1. Figure below shows the block diagram of water turbine controlled by an isochronous governor. Derive the expression for closed loop transfer function the system considering the inertia of the rotating system and the composite load. [8]

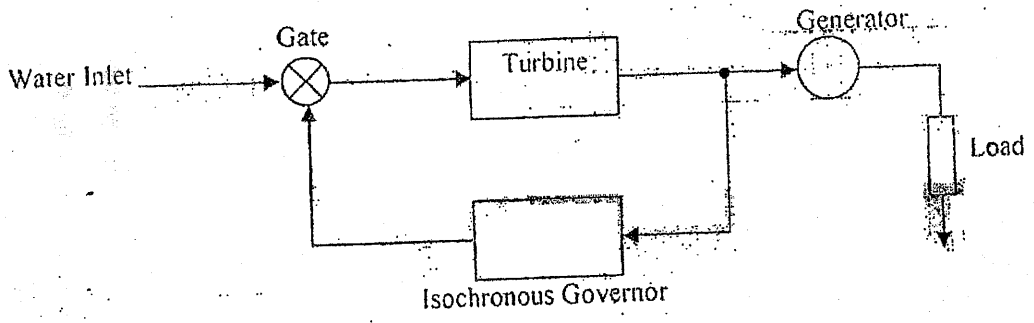

Fig.1

2. Two generators of 250MW and 500MW capacities respectively are operating in parallel and connected to a common bus. When each generator is half loaded, they operates at a common frequency of 50 Hz. Their droops characteristics are 4% and 2% respectively based on their respective capacities. When the system load is increased, the frequency decreases to 49.5 Hz. calculate the increases in system load and load shared by each generator. [8]
3. Describe the operation of brushless excitation system of a synchronous generator with a neat diagram. [8]
4. Explain the fire fighting system for a power station with fixed piping system of CO2 integrated with smoke detectors. [8]

5. Figure below shows a bus-bar reactor scheme. If a 3 phase to ground fault occurs on the outgoing feeder, calculate the fault current (in kA) supplied by each generator and fault MVA required for the circuit breaker (CB) on the feeder. Ratings of generators are given as follows: [8]

G1: 30MVA, 11kV, $Xg_1'' = 0.1$ pu

G2: 50MVA, 11kV, $Xg_2'' = 0.1$ pu

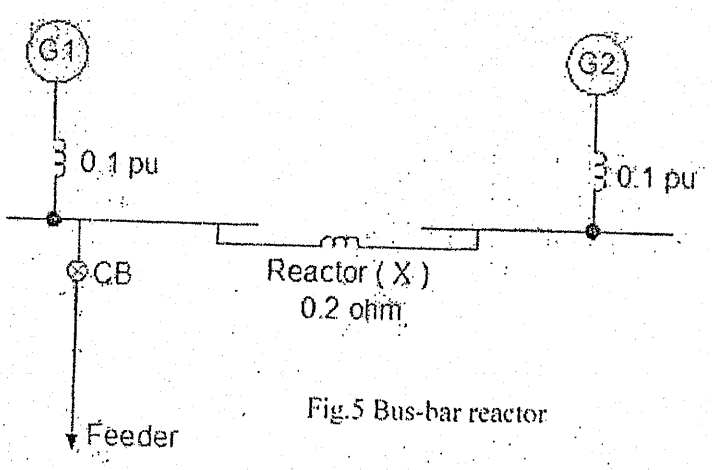

Fig.5 Bus-bar reactor

Group B

(Mechanical Part)

- ✓ *Attempt All questions.*
- ✓ *The figures in the margin indicate Full Marks.*

1. What are the advantages and disadvantages of diesel power plants? List the essential components of a diesel power plant and explain them briefly. [10]
2. Give the description of a simple gas turbine plant. What are the major applications of Gas Turbine Plants? [10]
3. a) Sketch a stream power plant with essential components and discuss briefly the functions of the major components. [5]
   b) What is the fundamental difference between the operation of impulse and reaction turbines? [5]
4. What are the benefits and demerits of gas and stream combined power plant? Explain any one of the popular designs of the combination cycles. [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	IV / I	Time	3 hrs.

Subject: - Power Plant Equipment *(EE 703)*

- ✓ 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.*

Electrical Part

1. Explain the use of Fransis turbine in pumped storage plant. Is this type of power plant feasible to install in Nepal's power system? Give reasons. [8]
2. a) Explain the speed response of turbine generator coupled system with change in load as determined by inertia and damping constant. [6]
   b) Two generators of 600MW, 2% and 300 MW, 4% are supplying to a common load. When each generator is fully loaded, they operate at common frequency of 49 Hz. Calculate the system load shared by each unit when frequency increased to 50Hz. [8]
3. Obtain the transfer function of excitation system with stabilizing transferred. [8]
4. Two generators each of capacities 40Mva, 11kv having their sub transient reactance of 5% and 4% respectively operating in parallel and supplying to a common load by single feeder of reactance 2 ohm. Calculate the fault level when there is 3-phase to ground fault on the outgoing feeder. Also calculate the value of reactor to be connected in series with 2 ohm reactor to reduce the fault level by 40%. [5+5]

Mechanical Part

5. Make a layout of a diesel power plant showing the following systems and briefly discuss about them:
   (i) Air intake system
   (ii) Cooling system
   (iii)Fuel supply system
   (iv)Lubrication system
   (v) Exhaust system
   [10]
6. A gas turbine unit has a pressure ratio of 6:1 and maximum cycle temperature of 610°C. The isentropic efficiencies of the compressor and turbine are 0.80 and 0.82 respectively. Calculate the power output in kilowatts of an electric generator geared to the turbine when the air enters the compressor at 15°C at the rate of 16 kg/s.
   Take c_p = 1.005kJ/kgK and γ = 1.4 for the compression process, and take cp=1.11kJ/kg K and γ = 1.333 for the expansion process. [10]
7. a) Differentiate between the operation of impulse and reaction turbines? [5]
   b) What are the essential requirements of steam power station design? [5]
8. What are the advantages and disadvantages of gas and steam combined cycle? Briefly discuss the popular designs of the combination cycles. [10]

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17 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2074 Chaitra

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

Subject: - Power Plant Equipment *(EE703)*

- ✓ 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.*

Group A
(Electrical Part)

1. Explain with example how pump storage hydropower plant can be installed together with base load plant for efficient operation and to reduce peak generation loss. [10]
2. a) What do you mean by Isochroanous generator? Describe its transient response for a step increase in load. [4]
   b) A power system consist of two generators operating in parallel and supplying a load of 1200 MW. Generator G_1 is rated as 900 MW with 2% drop regulation and generator G2 is related as 450MW with 3% drop regulation. G1 supplied 750 MW and G2 supplies 450 MW and frequency is 60 Hz. When the load is increased by 150 MW, Calculate the new operating frequency and additional power generated by each generator. [8]
3. Explain the dynamic response of excitation system with suitable mathematical deduction. [8]
4. a) Two generators of capacities 40Mva, 11kv and 30 Mva, 11kv having their sub transient reactance of 5% and 4% respectively operating in parallel and supplying to a common load by single feeder of reactance 2 ohm. Calculate the value of reactor to be connected in series with feeder so as to reduce the fault label at the end of the feeder by 40%. [6]
   b) Describe how a SCADA can be implemented in a power system. [4]

Group B
(Mechanical Part)

5. a) Briefly illustrate the main components of a diesel power plant. [6]
   b) A single cylinder engine running at 1800 rpm develops a torque of 8 Nm. The indicated power of the engine 1.8 kW. Find the loss due to friction power as the percentage of indicated power. [4]
6. Discuss the methods to improve thermal efficiency of Gas Turbine Plant. [10]
7. a) What is the fundamental difference between the operation of impluse and reaction turbines? [5]
   b) What are the advantages and disadvantages of steam power plant? [5]
8. What are the advantgaes of gas and stream combined cycle? Briefly explain the three popular designs of the combination cycles. [10]

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16 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	IV / I	Time	3 hrs.

Subject: - Power Plant Equipment *(EE703)*

- ✓ 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.*

Group A
(Electrical Part)

1. a) Describe the steady state and transient behavior of a turbine generator coupled system with governor. [6]

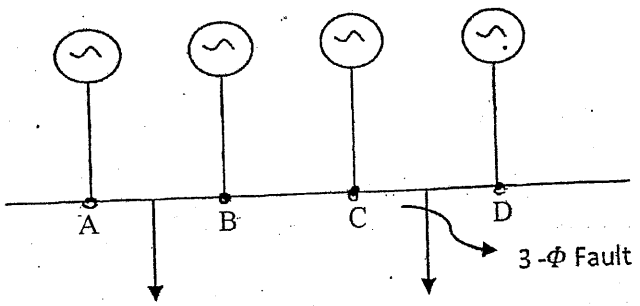
   b) Draw and explain the P-F and Q-V control loop of a hydrogenating system. [4]

2. a) Two generators are supplying power to a system. Their rating are 250 MW and 500 MW respectively. Each generator is half loaded and operating at a frequency of 60 Hz. If the system load is increased by 100 MW, the frequency drops to 59.5 Hz. What must be the individual droop of these generators so that they share the load according to their capacity? [5]

   b) What do you mean by isochronous governor? Write down its disadvantages when operated in parallel to supply a common load. [3]

3. a) Derive the transfer function of an excitation system with stabilizing transformer. [7]

   b) The figure below shows four identical generators, each rated 11 kV, 25 MVA and each having sub-transient reactance of 16% on its own rating. Find 3-ϕ fault level at one of the outgoing feeder. Also calculate the value of reactance to be connected in the bus bar between "B" and "C" so that fault level reduces by 40%. [5]



4. a) Why is rector used in power system? Explain different types of reactor. [5]

   b) Describe the fire fighting system used in power station with necessary diagram. [5]

Group B
(Mechanical Part)

1. Explain fuel storage and supply system of a diesel power plant with a neat sketch. Also write down application of diesel power plants. [8]
2. The following observations were recorded during a trial of a four stroke engine with rope dynamometer. Engine speed = 650 rpm, Dia. of brake drum = 600 mm, Dia. of rope = 50 mm, Dead load on the brake drum = 32 kg, spring balance reading = 4.75 kg, Mechanical efficiency = 80%. Calculate the brake power and indicated power. [8]
3. An open cycle gas turbine plant uses heavy oil as fuel. The maximum pressure and temperature in the cycle are 500kPa and 650°C. The pressure and temperature of air entering into the compressor are 10^5Pa and 27°C. The exit pressure of the turbine is also 10^5Pa. Assuming isentropic efficiencies of compressor and turbine to be 80% and 85% respectively, find the thermal efficiency of the cycle. Take C_p (for air and gas) = 1kJ/kg°C and γ (for air and gases) = 1.4. If the plant consumes 5 kg of fuel per sec, find the power generating capacity of the plant. [10]
4. Explain how reheater increases the output of the stream turbine power plant along with neat sketch. Draw the layout and show the cycle in T-S diagram. [8]
5. Enumerate the advantages of a combined cycle plant. With the help of a neat diagram, explain the principle of working of a combined cycle plant to enhance the efficiency of electricity generation. [6]

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17 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2072 Chaitra

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

Subject: - Power Plant Equipment *(EE703)*

- ✓ 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.*

Group A
(Electrical Part)

1. a) What is water hammer effect and surge tank? [4]
   b) Explain the basic principle of pump storage hydro power with a suitable example. [4]
2. a) Derive transfer function for speed response for load change in turbine generator set in the absence of governor. Also explain how isochronous governor can be incorporated together with turbine and generator with block diagram. [6]
   b) Derive the transfer function of a water turbine and explain the response against unit stop change in gate opening. [6]
3. What is the role of excitation system? Derive transfer function of an excitation system with stabilizing transformer. [6]
4. a) Two generating units each rated as 250 MW and 500 MW have speed drop regulation of 20% and 10% respectively based on their rating. They are operated in parallel and each is half loaded at a common frequency of 50 HZ. If the load is increased by 60 MW, Calculate the new frequency at which operates all load shared by each generator. [8]
   b) Explain the function of various parts of a power transformer with a neat sketch. [6]

Group B
(Mechanical Part)

1. Why do we need cooling system in diesel power plant? Explain different types of cooling system used in diesel power plant. [8]
2. In a test for four cylinders, four stroke diesel engine has a diameter of 120 mm, stroke = 140 mm, speed of engine = 2000 rpm, fuel consumption rate 15 kg/hour, calorific value of fuel = 42 MJ/kg. Difference in tension on either side of brake pulley = 40 kgf, brake circumference = 3.0m. If the mechanical efficiency is 80% then determine: [8]
   i) Indicated horse power
   ii) Brake thermal efficiency
   iii) Indicated mean effective pressure
   iv) Brake specification fuel consumption

3. In an open cycle regenerative gas turbine plant, the air enters the compressor at 1 bar and leaves at 6.9 bar. The temperature at the end of combustion chamber is 816°C. The isentropic efficiencies of compressor and turbine are 0.84 and 0.85 respectively. The regenerator effectiveness is 60%, determine (a) Thermal efficiency (b) Air rate (c) Work ratio [Take C_P = 1005 J/kg.K and γ = 1.4] [10]

4. List the common methods used for performance of a steam turbine power plant. Sketch layout for a regenerative scheme with an open feed water heater. Explain its working with corresponding processes on T-S diagram. [8]

5. Sketch the layout for a combined power plant in which waste heat of gas turbine outlet is used to heat feed water. Explain its working with processes on T-S diagram. [6]

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14 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	IV / I	Time	3 hrs.

Subject: - Power Plant Equipment *(EE703)*

- ✓ 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.*
- ✓ *Use separate answer book for each group.*

Group A
(Electrical Part)

1. Explain the operation of pump storage plant with neat diagram. For hydro dominated integrated system like Nepal is it economical? Justify your answer. [8]

2. a) Derive the Transfer Function of a hydraulic turbine given by $\frac{\Delta\bar{P}_m}{\Delta\bar{G}} = \frac{1-T_w s}{1+0.5T_w s}$; where the given symbol has usual meaning. Also state its special characteristics. [8]

   b) Two generating units have following ratings and dicop
   $Unit_1$: 600MVA $R_1 = 6\%$
   $Unit_2$: 500MVA $R_2 = 4\%$
   The units are operating in parallel sharing a load of 900 MW at the normal frequency of 60Hz. Unit 1 supplies 500 MW and unit 2 supplies 400MW. If the load is increased by 90MW calculate the steady state frequency deviation and new generation on each unit. [8]

3. Draw schematic diagram of excitation system also include stabilizing transformer for improving dynamic response and determine block diagram of the excitation system by modeling each components. [8]

4. Explain reactors used in generating stations and substations with diagram. Also discuss their merits and demerits along with field of application. [8]

Group B
(Mechanical part)

1. What are the different methods used for cooling diesel engines? Explain the function of cooling tower. [6]

2. A diesel engine power plant operated by a two stroke diesel engine was motored when the meter reading was 4.5kW. Then the test on the engine was carried out for one hour run and the following observations were recorded: (i) Brake torque = 250 Nm; (ii) Speed = 1500rpm; (iii) Fuel consumed = 5kg/hr and (iv) Calorific value of fuel = 40MJ/kg. Determine: [10]
   i) Mechanical efficiency
   ii) Indicated thermal efficiency
   iii) Brake thermal efficiency
   iv) Indicated specific fuel consumption and
   v) Brake specific fuel consumption

3. List the common method used for the performance improvement of the steam turbine power plant. Explain how reheating increases efficiency of the plant. [8]

4. On a reheat cycle, steam leaves the boiler and enters the turbine at 4 MPa, 400°C. After expansion in the turbine to 400 kPa, the steam is reheated to 400°C and then expanded in the low-pressure turbine to 10 kPa. Determine the cycle efficiency. [Refer the attached table for the properties of steam]. [10]

5. In a combined gas and steam turbine power plant, exhaust gases of regenerative gas turbine is used to heat feed water for the boiler of a steam power plant. According to this concept draw a complete circuit of a combined power plant showing "Heating feed water with exhaust gases". What are the reasons that inspire you to construct a combined cycle power plant? [6]

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17 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2071 Chaitra

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

Subject: - Power Plant Equipment *(EE703)*

- ✓ 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.*
- ✓ *Use separate answer book for each group.*

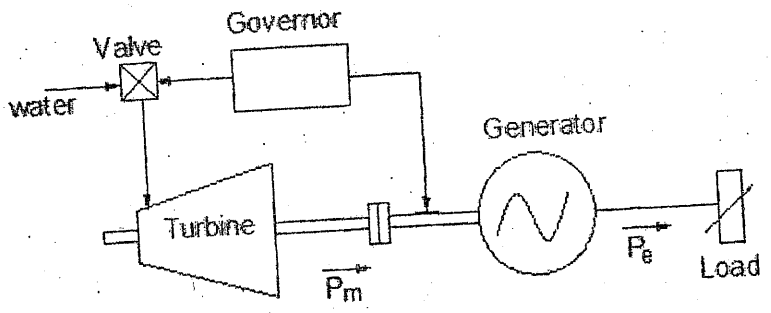
Group A
(Electrical Part)

1. a) Describe the operation of pump storage hydro power plant. Is this type of plant suitable for Nepal Power system? Justify by your answer. [4]

   b) Describe how communication between two electric sub-stations can be made with Power Line Carrier Communication system. [3]

   c) What do you mean by water hammer in context of hydro power plant? [3]

2. a) In figure below shown a turbine-generator coupled system with speed governor. Excluding the action of governor, derive the transfer function relating the speed deviation ($\Delta\omega$) as the function of change in load, considering only inertia and load damping. [6]

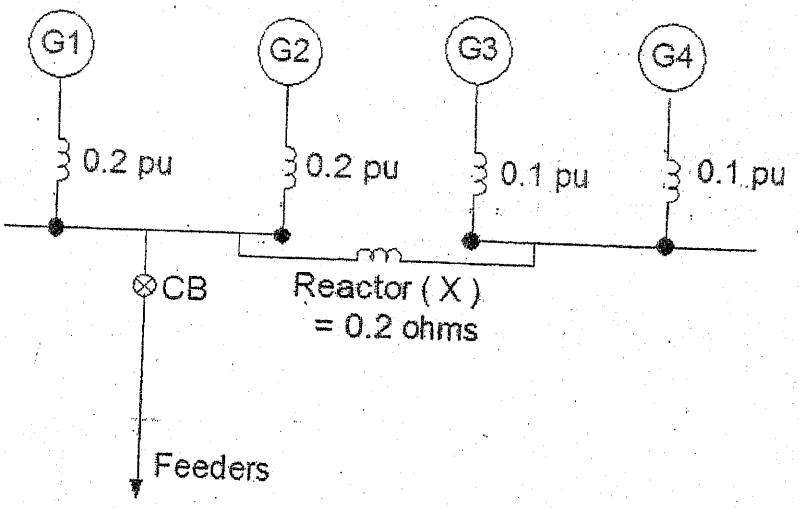


   b) What do you mean by Isochronous Governor? What will be problem if two hydropower plants with isochronous governor are operated in parallel in to supply a common load? [4]

3. a) Two generators of 250 MW and 500 MW capacities respectively are operating in parallel and connected to a common bus. When each generator is half loaded, they operate at a common frequency of 50 Hz. Their droops characteristics are 4% and 2% respectively based on their respective capacities. When the system load is increased, the frequency decreases to 49.5 Hz. Calculate the increase in system load and load shared by each generator. [5]

b) In figure below a bus-bar reactor scheme with four generators. If a 3 phase to ground fault occurs on the outgoing feeder, calculate the fault current (in kA) supplied by each generator and fault MVA required for the circuit breaker (CB) on the feeder. Rating of generators are given as follow: [5]

G1/G2 : 50MVA, 11kV, $Xg_1" = 0.2$ pu
G3/G4: 100MVA, 11kV, $Xg_2" = 0.1$ pu



Bus-bar reactor

4. a) Describe static excitation system with necessary diagrams. [5]
   b) Derive the transfer function of excitation system with stabilizing transformer. [5]

Group B
(Mechanical Part)

1. Sketch the layout diagram of diesel power plant. Explain it in brief. [4+4]
2. A 4-cylinder, 4-stroke cycle engine having cylinder diameter 100 mm and stroke 120 mm was tested at 1600 rpm and the following readings were obtained. Fuel consumption = 0.27 liter/minute, Specific gravity of fuel = 0.74, B.P = 31.4 kW, Mechanical efficiency = 80%, Calorific value of fuel = 44000 kJ/kg. Determine: [8]
   i) bsfc
   ii) imep. and
   iii) Brake thermal efficiency
3. List the common methods used for the performance improvement of the gas turbine power plants. Explain how re-heater increases network output of the plant. [8]
4. A gas turbine plant of 800 KW capacity takes the air at 100 KPa and 288 K with a mass flow rate of 6 kg/s. The pressure ratio of the cycle is 6 and the maximum temperature is limited to 900 K. A regenerator of 80% effectiveness is added in the plant to increase the overall efficiency. Assuming the isentropic efficiency of the compressor and turbine as 85%, determine the plant thermal efficiency and the net power developed. Take $C_p = 1.005$ KJ/KgK and $\gamma = 1.4$. [10]
5. Draw the basic component of a gas and steam turbine combined cycle. Explain how the waste heat is utilized in this cycle. [6]

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16 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2071 Shawan

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

Subject: - Power Plant Equipment *(EE703)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Assume suitable data if necessary.*
- ✓ *Candidates use separate answer book for each group.*

Group A
(Electrical Part)

- ✓ *Attempt <u>All</u> questions.*
- ✓ *The figures in the margin indicate <u>Full Marks</u>.*

1. Explain the water hammer effect in penstock pipe and advantages of surge tank of hydropower plant. [8]
2. Explain with neat diagram, the P-F loop and Q-V loop in hydro generating system. [8]
3. What do you mean by isochronous governor? Explain with schematic diagram. [8]
4. What is excitation system? Explain the brush excitation system with neat diagram. [8]
5. Figure below shows a bus-bar reactor scheme. If a 3 phase to ground fault occurs on the outgoing feeder, calculate the fault current (in kA) supplied by each generator and fault MVA required for the circuit breaker (CB) on the feeder. Rating of generators are given as follow: [8]

   G1 : 30MVA, 11kV, Xg1" = 0.1 pu

   G2: 50MVA, 11kV, Xg2" = 0.1 pu

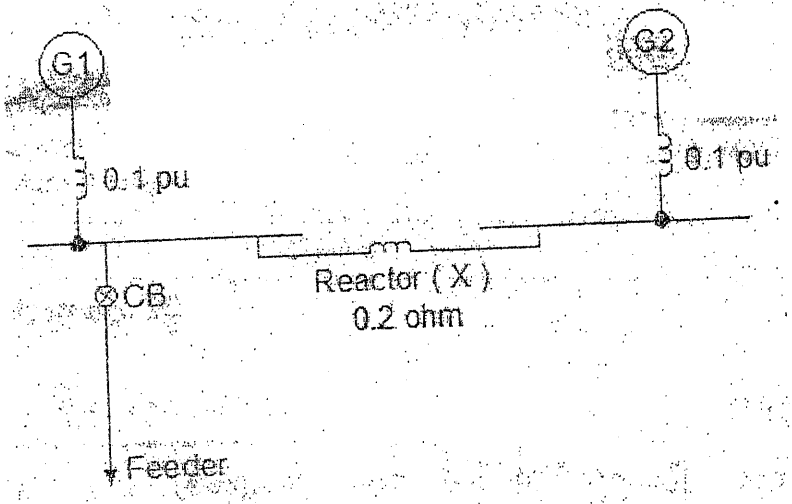

Fig.4 Bus-bar reactor

Group B
(Mechanical Part)

- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ ***Necessary tables are attached herewith.***

1. Explain the fuel supply system of a diesel power plant with a sketch. [6]
2. What methods are there to reduce noise and vibrations of diesel engine of diesel power plant? Describe the cooling system of diesel power plant. [10]
3. List the common methods used for the performance improvement of the gas turbine power plants. Explain how regeneration increases efficiency of the plant. [8]
4. A steam power plant running on Rankine cycle has steam entering HP turbine at 20 MPa, 500°C and leaving LP turbine at 89.6 % dryness. Considering condenser pressure of 0.005 MPa and reheating occurring upto the temperature of 500°C determine:
   a) the pressure at which steam leaves HP turbine
   b) the thermal efficiency. [*Refer the attached table for the properties of steam*] [12]
5. List the common methods employed to utilize waste heat in combined power plants. [4]

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16RE TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2070 Chaitra

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

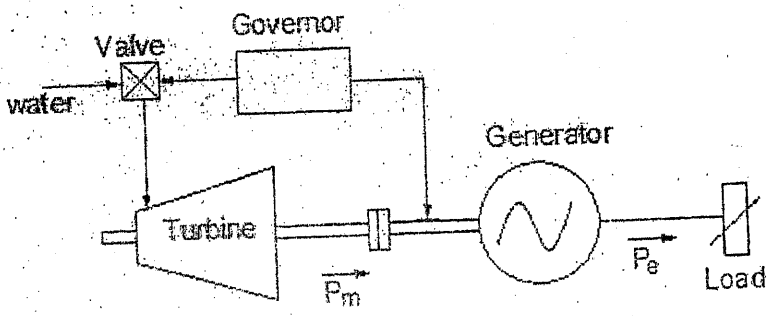
Subject: - Power Plant Equipment *(EE703)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Assume suitable data if necessary.*
- ✓ ***Candidates use separate answer book for each group.***

Group A
(Electrical Part)

- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*

1. Explain with neat diagram, how the delivery of the water to turbine is controlled in hydro generating station. [8]
2. a) The figure below shows a turbine-generator coupled system with speed governor. Explain the transient responses of electrical power output (P_e), mechanical power input (P_m) and speed due to sudden increase in electrical load by an amount of ΔP_L. [10]



   b) Describe the excitation system of a synchronous generator with stabilizing transformer. [6]
3. Two generators of 250 MW and 500 MW capacities respectively are operating in parallel and connected to a common bus. When Each generator is half loaded, they operates at a common frequency of 50 Hz. Their droops characteristics are 4% and 2% respectively based on their respective capacities. When the system load is increased, the frequency decreases to 49.5 Hz. Calculate the increase in system load and load shared by each generator. [8]
4. Explain different reactor schemes used in generating station and substations. [8]

Group B
(Mechanical Part)

✓ *Attempt **All** questions.*
✓ *The figures in the margin indicate **Full Marks**.*

1. Sketch the main components of a diesel power plant. Write down the function of starting air supply system. [6]

2. A two stroke diesel engine was motored when the meter reading was 1.5 kW. Then the test on the engine was carried out for one hour and the following observations were recorded: Brake torque = 120 Nm; Speed = 600 rpm; Fuel used = 2.5 kg; calorific value of fuel = 40.3 MJ/kg; Determine:
   (a) Brake power,
   (b) Indicated power,
   (c) Mechanical efficiency and
   (d) Indicated thermal efficiency. [10]

3. Air enters the compressor at 100 kPa, 300 K and is compressed to 1000 kPa. The temperature at the inlet to the first turbine stage is 1400 K. The expansion takes place isentropically in two stages, with reheat to 1400 K between the stages at a constant pressure of 300 kPa. A regenerator having an effectiveness of 90% is also incorporated in the cycle. Determine the thermal efficiency. Take $c_p = 1.005$ kJ/kg K and $\gamma = 1.4$. [12]

4. List the common methods used for the performance improvement of the steam turbine power plants. Explain how reheating increases efficiency of the plant. [8]

5. Sketch the basic components of a combine power plant. Also sketch the corresponding processes on T-s diagram. [4]

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16 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2070 Ashad

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

Subject: - Power Plant Equipment *(EE702)*

- ✓ 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.***
- ✓ *Use separate answer books for each part.*
- ✓ *Assume suitable data if necessary.*

Group A
(Electrical Part)

1. What do you mean by steady state operation of turbine (with governor) generator coupled system. Describe the transient response of such system with sudden increase in generator load. [8]

2. a) Fig.2 shows the block diagram of water turbine driving an electric generator without speed governor. Explain how the inertia and load damping constant can control the speed of the system against small change in load. Derive the transfer function showing the effect of inertia and load damping constant. [8]

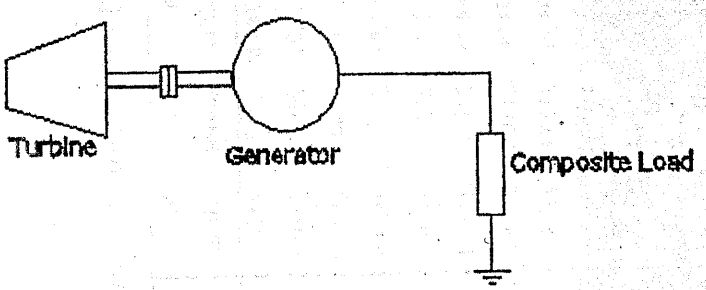

Fig.2

b) Two generating units of 500MW and 250 MW capacities respectively are operating in parallel and supplying power to a common load. When each generator is half loaded, they operate at a common frequency of 50 Hz. If the droop regulation of 500MW generating set is 5% based on its rating, what must be the droop regulation of 250 MW generating unit based on its own rating show that they share the change in load according to their capacities. [8]

3. Describe the excitation system of a synchronous generator with stabilizing transformer. Derive mathematical model of the system in term of transfer function of each component of the system. [8]

4. Describe how a SCADA system can be implemented in a power system. [8]

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Group B
(Mechanical part)

5. Write down the functions of lubricating oil in diesel engine. Sketch lubricating system of a diesel power plant and explain its working. [8]

6. A two stroke diesel engine was motored when the meter reading was 2 kW. Then the test on the engine was carried out for one hour and the following observations were recorded: Brake torque = 150 Nm; Speed = 900 rpm; Fuel used = 3 kg; calorific value of fuel = 40 MJ/kg; Determine:
   (a) Brake power,
   (b) Indicated power,
   (c) Mechanical efficiency and
   (d) Indicated thermal efficiency. [8]

7. List the common methods used for the performance improvement of the gas turbine power plants. Explain how inter-cooling increases efficiency of the plant. [8]

8. On a regenerative cycle, steam leaves the boiler and enters the turbine at 4 MPa, 400^0C. After expansion to 400 kPa, some of the steam is extracted from the turbine to heat the feedwater in an open feedwater heater. The pressure in the feedwater heater is 400 kPa, and the water leaving it is saturated liquid at 400 kPa. The steam not extracted expands to 10 kPa. Determine the cycle efficiency. [*Refer the attached table for the properties of steam*] [12]

9. List the common methods employed to utilize waste heat in combined power plants. [4]

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16 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2069 Chaitra

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

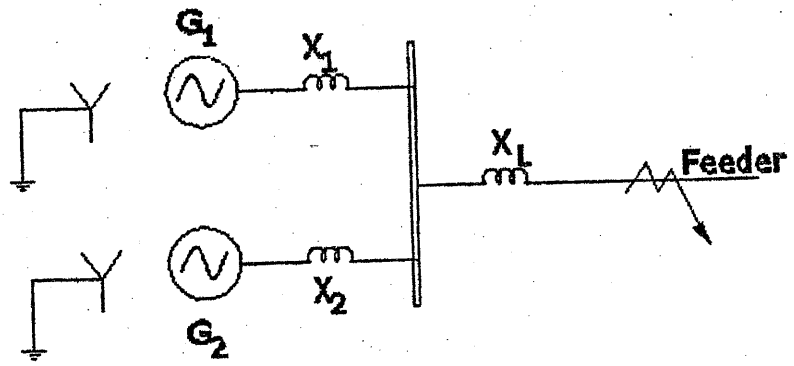
Subject: - Power Plant Equipment *(EE703)*

- ✓ 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.*

Group A
(Electrical part)

1. Explain the operation of pump storage type hydro power plant with a neat diagram. Is this type of power plant feasible to install in Nepal's power system in the current scenario? Support your answer with appropriate reasons. [8]
2. What do you mean by isochronous governor and explain its operation? Why it is not suitable for multiple number of generating units operating in parallel. Derive the mathematical model of governor with speed droop characteristics. [8]
3. Two generators of 250 MW and 500 MW capacities respectively are operating in parallel and supplying power to a common load. When each generator is fully loaded, they operate at a common frequency of 49 Hz. Their droop characteristics are 2% and 4% respectively based on their respective ratings. When the system load is decreased, the frequency increases to 50Hz. calculate the decrease in system load shared by each generator. [8]
4. What is excitation system? Explain the various types of excitation system employed in power plant on the basis of their performance with suitable connection diagram. [8]
5. Figure below shows the single line diagram of parallel operated generators. Their ratings are: [8]

   G_1: capacity = 50 MW, 11kV, X_1 = 0.16 pu based on its rating
   G_2: capacity = 50MW, 11kV, X_2 = 0.16 pu based on its rating
   X_l = 2 ohms



Calculate the fault current in the feeder during 3 phases to ground fault on the feeder. Calculate the value of inductance (in mH) of the reactor to be connected in series with X_1 so that the fault current decreases by 40%.

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Group B
(Mechanical part)

6. Why cooling system is necessary in a diesel engine? Explain different cooling system used in diesel engine power plant with neat sketches. [8]

7. In a test for four-cylinders, four-stroke engine has a diameter of 120 mm, stroke = 150 mm, speed of engine = 1800 rpm, fuel consumption of 0.25 kg/min, calorific value of fuel is 44000 kJ/kg. Difference in tension on either side of brake pulley = 40 kg, Brake circumference is 300 cm. If the mechanical efficiency is 85 %. Determine
   (a) Brake-thermal efficiency,
   (b) Indicated thermal efficiency,
   (c) Indicated mean effective pressure and
   (d) Brake specific fuel consumption. [8]

8. A regenerative gas turbine with intercooling and reheat operates at steady state. Air enters the compressor at 100 kPa, 300 K with a mass flow rate of 5.807 kg/s. The pressure ratio across the two-stage compressor is 10. The pressure ratio across the two-stage turbine is also 10. The intercooler and reheater each operate at 300 kPa. At the inlets to the turbine stages, the temperature is 1400 K. The temperature at the inlet to the second compressor stage is 300 K. The isentropic efficiency of each compressor and turbine stage is 80%. The regenerator effectiveness is 80%. Determine:
   (a) the thermal efficiency,
   (b) the back work ratio,
   (c) the net power developed, in kW. Take cp = 1.005 kJ/kg K and $\gamma = 1.4$. [12]

9. List the common methods used for the performance improvement of the steam turbine power plants. Explain how regeneration increases efficiency of the plant. [8]

10. Sketch the basic components of a combine power plant. Also sketch the corresponding processes on T-s diagram. [4]

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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	IV / I	Time	3 hrs.

Subject: - Utilization of Electrical Energy (*EE 702*)

- ✓ 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 about the electric power supply system structure in industries with neat and clean system configuration diagram. Discuss the possibilities of industrialization in Nepal for the development as per present scenario. [4+4]

   b) A 5.5kW, 220V, and 1-ϕ resistance oven is to have nichrome wire heating elements. If the wire temperature is to be 1100° C and that of the charges 500° C. Estimate the diameter and length of the wire. The resistivity of the nichrome alloy is 42.5$\mu\Omega$-m. Assume the radiating efficiency and the emissivity of the element as 1.0 and 0.9 respectively. [8]

2. a) Differentiate between group drive and multimotor drive. Discuss the merits and demerits. [4]

   b) What is meant by four quadrant operation in D.C. motor control? Explain how this concept enables a D.C. motor to operate in both motoring and braking modes. [4]

   c) A 220V, DC shunt motor having an efficiency of 85% drives a hoist having an efficiency of 80%. Calculate the current drawn from the supply to raise a load of 400 kg at 2.5 m/s. What resistance must be added in the armature circuit in order to lower the load at 2.5 m/s using rheostatic braking, assuming that the efficiency of the motor and the load will remain the same? [8]

3. a) A 200V, 875-rpm, 150A separately excited dc motor has an armature resistance of 0.06Ω. It is fed from a single phase fully-controlled rectifier with an AC source voltage of 220V, 50Hz. Assuming continuous conduction, calculate: [8]

      i) Firing angle for rated motor torque and 750rpm.
      ii) Firing angle for rated motor torque and (-500)rpm.
      iii) Motor speed for $\alpha = 160°$ and rated torque.

   b) Explain Ward-Leonard System of speed control with diagram. Also state the advantages and disadvantages of this method. [8]

4. a) Compare and contrast D.C. and A.C. electric traction systems. Discuss the advantages and disadvantages of each system in terms of efficiency, control and compatibility with different application. [8]

   b) An electric train weighing 400 tonnes runs a 1% up-gradient with the following speed-time curve:

      i) Uniform acceleration of 1.6 kmphps for 35 seconds
      ii) Constant speed for 45 seconds
      iii) Coasting for 30 seconds
      iv) Braking at 2.4 kmphps

      Calculate the specific energy consumption if the tractive resistance is 50N/tonne, rotational inertia effect 10%, and overall efficiency of transmission and motor 75%. [8]

5. a) Discuss the benefits of demand response programme for both consumers and utility companies, highlighting how they can help avoid blackouts and reduce electricity costs. [8]

b) The load on a certain installation may be considered constant at 1200 KVA, 0.75 lagging power factor for 3000 hr per annum. The tariff is 1300 per KVA maximum demand plus 80 paisa per KWh. Determine:

i) Determine the annual charge of energy.
ii) Power factor improving apparatus is installed to improve the PF to 0.95 lagging.

Determine the KVAr required and annual new charge of energy if PF correcting apparatus cost to Rs 1200 per KVAr, annual interest and deprecation charge are 10% of capital cost. [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	IV / I	Time	3 hrs.

Subject: - Utilization of Electrical Energy (*EE 702*)

- ✓ 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 benefits of electrical energy in comparison with other sources of energy? Describe the Electrical power utilization of Nepal with respect to various consumer and voltage level. [8]

   b) The following data relate to a 3-phase electric arc Furnace:

   Current drawn = 4000 A
   Arc Voltage = 60 V
   Resistance of transformer referred to Secondary = 0.0025 Ω
   Reactance of transformer referred to Secondary = 0.0050 Ω
   i) Calculate the power factor and kW drawn from the supply.
   ii) If the overall efficiency of the furnace is 70%, find the time required to melt 2.5 tonnes of Steel if

   Latent heat of Steel = 37.2kJ/kg,
   Specific heat of Steel = 0.5 kJ/Kg-K,
   Melting Point of Steel = 1370°C
   Initial temperature of Steel = 15°C [8]

   [4+4]

2. a) Differentiate between

   i) Group drive and individual drive.
   ii) Constant torque drive and constant power drive. [8]

   b) A motor is used to drive a hoist. Motor characteristics are given by

   Quadrants I, II and IV: T = 200-0.2N, N-m
   Quadrants II, III and IV: T = -200-0.2N, N-m

   Where N is the speed in rpm. When hoist is loaded, the net load torque T1 = 100, N-m and when it is unloaded, net load torque T1 = -80, N-m. Obtain the equilibrium speeds for operation in all the four quadrants.

3. a) Derive an expression for motor speed in terms of supply voltage, firing angle and motor constants of a single-phase fully controlled. Separately excited dc motor. Draw waveform of supply voltage, armature voltage and current at a fixed speed under continuous conduction. [8]

   b) A 400 V, star connected, 3-phase, 6 pole, 50 Hz induction motor with parameters referred to the stator are given below: $r_1 = r_2^1 = 1\ \Omega$ and $x_1 = x_2^1 = 2\Omega$. This motor is to be braked by plugging from initial full load speed of 950 rpm. Stator to rotor turn ratio is 2:3. Find:

   i) Calculate the initial braking current and torque as the ratio of their full load values.

   ii) What resistance must be inserted in the rotor circuit to reduce the maximum braking current to 1.5 times full load current? What will be the initial braking torque now? [4+4]

4. a) Explain the importance of the Electric Traction in Nepal. Discuss about the Self-contained vehicles and explain its transmission systems. [8]

   b) An electric train has quadrilateral speed-time curve as follows: [8]

      i) Uniform acceleration from rest at 2 kmphps for 10 seconds.
      ii) Coasting for 50 seconds.
      iii) Braking period of 15 seconds.

      The train is moving a uniform down gradient of 1% tractive resistance 40 newtons per tonne, rotational inertia effect 10% of dead weight, duration of stop 15 seconds and overall efficiency of transmission gear and motor as 75%. Calculate its schedule speed and specific energy consumption of run.

5. a) Why different consumer class have different tariff structure? [4]

   b) What is the importance of Demand Side Management in Nepalese power system? [4]

   c) An industry consumes 50000 units of electricity in a year at average power factor of 0.7 lag. The recorded max. demand is 400 kVA. The tariff is Rs. 120/kVA plus Rs. 5.50 per kWhr. Calculate the annual cost of supply and find out annual saving in cost by installing power factor improving device costing Rs. 1000 per kVAR which raises the power factor from 0.7 to 0.9 lagging. Allow 10% per year on the cost of the improving device to cover all additional cost. [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	IV / I	Time	3 hrs.

Subject: - Utilization of Electrical Energy (*EE 702*)

- ✓ 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 present area's of utilization of electrical energy in the context of Nepal. How consumption of electrical energy in these area's can be increased or improved for the development of our country? [8]

   b) A 40 kW, 3-phase, 400 V resistance oven is to employ nickel-chrome strip 0.0025 cm thick for the three phase star connected heating elements. If the wire temperature is to be 1, 100°c and that of charge is to be 700°c, estimate a suitable width for the strip. Assume radiating efficiency as 0.6 and emissivity as 0.9. The specific resistance of the nichrome-alloy is 1.03×10^{-6} Ω-m. [8]

2. a) For the selection of various types of motor, what are the classes duties to be performed by the motor on the basis of load variations? List out some examples of the driver/machine applicable to various classes of duties. [8]

   b) A 220 V, 20 kW dc shut motor running at its rated speed of 1200 rpm is to be braked by reverse current braking. The armature resistance is 0.1 Ω and the rated efficiency of the motor is 88%. Calculate:

      i) The resistance to be connected in series with the armature to limit the initial braking current to twice the rated current.
      ii) The initial braking torque.
      iii) The torque when motor falls to 400 rpm. [8]

3. a) Draw the torque speed-characteristics of induction motor with constant V/f control for speed variation from very low up to the base speed. Describe an open loop control scheme for induction motor with constant V/f control. [8]

   b) A 3 phase fully controlled Thyristor Bridge with 400 V, 3 phase, 50 Hz supply is feeding a separately excited DC motor. Armature resistance is 0.2 Ω, armature rated current is 100 A and back emf constant is 0.25 V/rpm. Determine no-load speed if no-load armature current is 5 A and firing angle is 45°. Also determine firing angle to obtain a speed of 1500 rpm at rated current. [8]

4. a) What are the advantages of electric traction system? Explain about the traction system fed from separate distribution line. [4+4]

   b) A train is required to run between two stations 2 Km apart at an average speed of 40 km/hr. The run is to be made to a simplified quadrilateral speed time curve. If the maximum speed is to be limited to 60 km/hr, acceleration to 2 km/hr/sec, Coasting retardation to 0.15 km/hr/sec and braking retardation to 3 km/hr/sec. Determine the duration of acceleration, coasting and braking periods. [8]

5. a) Define Tariff. Explain different types of tariff used in Industry billing by Nepal Electricity Authority. [1+3]
   b) Explain demand side management techniques used for controlling peak demand. [4]
   c) A 340 kW, 50 Hz, 3- phase star connected induction motor has full load efficiency of 85% and p.f of 0.8 lagging. It is desired to improve the power factor to 0.96 lagging by using bank of three capacitors. Calculate:

      i) The kVAR rating of the capacitor bank.
      ii) The capacitance of each limbs of the condenser bank connected in delta.
      iii) The capacitance of each capacitor, if each one of the limb of the delta-connected condenser bank is formed by using 6 similar 3300 V capacitors. [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	IV / I	Time	3 hrs.

Subject: - Utilization of Electrical Energy (*EE 702*)

- ✓ 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) Elaborate the role of electrical energy in the sustainable development of the country. Describe on the basis of the utilization of the electrical energy. [8]

   b) With example, write about the characteristics of heating element? A 25 kW, 240 V, 50 Hz, single phase resistance heater is to have nichrome wire as a heating element. If the wire temperature is to be 1400°C and that of the charge is 500°C. Estimate the diameter and length of the wire. The resistivity of nichrome is 42.5 μΩ-m. Assume the radiating efficiency and the emissivity of the element as 0.9 and 0.85 respectively. [3+5]

2. a) Explain the block diagram of an electric drive. Why describe motors and shunt motors are started on load and no-load respectively. [8]

   b) A horizontal conveyer belt moving at uniform speed of 2.2 m/s transport material at the rate of 200 tones/hour. Belt is 100 m long and driven by a motor at 1500 rpm.

      i) Determine load inertia referred to motor shaft.
      ii) Calculate torque that motor should develop to accelerate the belt from standstill to fill speed in 8 second. Moment of inertia of motor is 0.1 kg-m^2. [4+4]

3. a) What is Slip Power Recovery Scheme? Describe in detail about Slip Power Recovery Scheme using Static Kramer drive. Can supersynchronous speed be achieved through it? Explain. [8]

   b) A single phase, 220 V, 50 Hz supply feeds a separately excited dc motor through two single phase semi-converters, one for the field and another for armature. The firing angle for the field semi- converter is zero. The field resistance is 250 Ω and armature resistance is 0.2 Ω. The load torque is 50 N-m at 1000 rpm. The voltage constant is 0.8 V/A-rad/s and the torque constant is 0.8 N/A^2. Assuming the armature and field currents to be continuous and neglecting losses, Determine: [8]

      i) Field current.
      ii) Firing angle of the converter in the armature circuit.
      iii) Power factor of the converter of armature.

4. a) What do you mean by electric traction? Discuss compare various arrangement of current collection used in electric traction. [8]

   b) An electric train is to have acceleration and breaking retardation of 0.8 km/h/s and 3.2 km/h/s respectively. If the ratio of maximum to average speed is 1.3 and time for stops 26 seconds, find the schedule speed for a run of 1.5 km. Assume simplified trapezoidal speed- time curve. [8]

5. a) What are the factors affecting to determine the tariff? Explain about the two-part and time of day tariff. [2+2]

   b) Write some effective techniques implemented by Nepal Government for Demand Side Management. [4]

c) A consumer requires on induction motor of 35 kW. He is offered two motors of the following specifications.
Motor A: Efficiency = 85%; power factor 0.9
Motor B: Efficiency = 90%; power factor 0.8
The consumer is being charged on a two-part tariff of Rs. 250 per kVA of the maximum demand plus Rs. 8 per unit. The power factor of the motor B is to be raised to 0.85 by installing condensers. The motor costs Rs. 1500 less than motor A.
The cost of condenser is Rs. 400 per kVAR. Determine which motor is more economical. Assume rate of interest and depreciation as 10% and working hours of motors as 3000 hours in a year. [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	IV / I	Time	3 hrs.

Subject: - Utilization of Electrical Energy *(EE 702)*

- ✓ 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 do you mean by electrical energy? Explain the different class of electrical consumers and their demand. [8]
2. A laminated wooden board 30 cm × 25 cm thick is to be heated from 20°C to 170°C in 10 min by dielectric heating using 30 MHz supply source. Specific heat of wood is 0.35 calorie per gram per °C and density 0.55 gm/cc, relative permittivity = 5, pf = 0.05. Determine the voltage across the work piece and current during heating. Assume loss of energy by conduction, convection and radiation is 15%. [5]
3. What are the requirements of good heating elements? Explain. [3]
4. What are the different classes of motor duty? Explain with waveform and area of applications. [8]
5. A drive has following parameters:

   $J = 10$ kg-m^2, $T = 100-0.1N$, N-m, Passive load torque $T1 = 0.05N$, N-m, where N is the speed in rpm.
   Initially the drive is operating in steady-state. Now it is to be reversed. For this motor characteristic is changed to $T = -100 - 0.1N$, N-m. Calculate the time of reversal. [8]
6. Discuss the four quadrant operation of a hoisting mechanism assuming constant load torque. [8]
7. A DC chopper fed from 400V supply runs a separately excited motor. The armature resistance $Ra = 0.1\ \Omega$. The motor voltage constant is 4 Vsec/radian, the average armature current Ia = 150 A. the armature current is continuous and has negligible ripple. Determine

   a) The input power
   b) The motor speed and
   c) The developed torque for a duty cycle of 60%

   Neglect the losses in chopper
   If the duty cycle of chopper varies between 10% and 90%, find maximum and minimum speed. [8]
8. Justify the statements

   a) Power drawn from supply mains varies as the square root of the load torque in case of dc series motors.
   b) Shunt motor is not suitable for traction purposes. [8]

9. The schedule speed with a 200 tone train on an electric railway with stations 777 metres apart is 27.2 km per hour and the maximum speed is 20 percent higher than the average running speed. The braking rate is 3.22 km p.h.p.s. and the duration of stop is 20 seconds. Find the acceleration required. Assume a simplified speed-time curve with free running at the maximum speed. [8]

10. What are the causes and disadvantages of low power factor? Mention the methods of power factor enhancement. [8]

11. A factory works for 16 hours a day for 300 days in a year. The following two systems of tariff are available:

    - High voltage supply at Rs. 1 per unit plus Rs. 50 per month per kVA of maximum demand.
    - Low voltage supply at Rs. 60 per month per kVA of maximum demand plus Rs. 1.1 per unit.

    The factory has an average load of 250 kW at 0.8 power factor and a maximum demand of 300 kW at the same power factor. The high voltage equipment costs Rs. 500 per kVA and losses can be taken as 5% Interest and depreciation charges are 12%. Calculate the difference in the annual cost between the two systems. [8]

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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	IV /I	Time	3 hrs.

Subject: - Utilization of Electrical Energy *(EE 702)*

- ✓ 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 common uses of electrical energy on basis of consumers and their demand. [8]

   b) A single phase electric furnace rated at 20kW and 220V is to be designed using Nichrome wire as resistance element. Determine its length and diameter if the wire temperature is not to exceed 1170°C and the temperature of the charge is to be 500°C. Take k = 0.57, e = 0.95 and $\rho = 10\mu\Omega$-cm. [8]

2. a) Describe the open loop control and close loop control of electric drive. [6]

   b) A horizontal conveyer belt moving at uniform velocity of 1m/s, transports load of 500kg and the belt is driven by motor of inertia of 0.8kg-m^2 at 1000 rpm. [6]

   (i) Determine equivalent rotational inertia at the motor shaft
   (ii) Calculate the equivalent torque at the motor shaft to stop the belt at a uniform rate in 10s.

   c) What do you understand by constant torque drive and constant power drive? Give typical example for each. [4]

3. a) A single phase 220V, 50Hz supply feeds a separately excited dc motor through two single phase semiconverters, one for field and another for armature. The firing angle of the field semiconverter is zero, the field resistance is 250Ω and armature resistance is 0.2Ω. The load torque is 150N-m at 1500 rpm. The voltage constant is 0.8 V/A-rad/s and torque constant is 0.8 Nm/A^2. Assuming armature and field current to be continuous and neglecting losses. Determine: [8]

   (i) Field current
   (ii) Firing of the converter in the armature circuit
   (iii)Power factor of the converter of the armature circuit.

   b) Draw the torque speed-characteristics of an induction motor with constant V/f control for speed variation from very low up to the base speed. Describe an open loop control scheme for induction motor with constant V/f control. [8]

4. a) A 150 tonne electric train has a rotational inertia of 10%. This train while running between two stations which are 4km apart has an average speed of 60km/h. The acceleration and retardation during braking are respectively 1.5km/h/s and 2km/h/s. The percentage gradient between these two stations is 1.5% and the train move up the incline. The track resistance is 40N/t. If the combined efficiency of the electric train is 65%, determine (i) Total energy output at the driving axles (ii) Total energy consumption (iii) specific energy consumption. Assume that journey estimation is being made in simplified trapezoidal speed time curve. [8]

b) What is the tractive effort of a train and what are its functions? Derive an expression for the tractive effort developed by a train unit. [8]

5. a) What are the different demand side management (DSM) techniques? Write how DSM benefits utilities as well as consumers? [8]

b) A 850kW, 50Hz, 3 phase load has a power factor of 0.8 lagging. It is desired to improve the P.F. to 0.95 lagging by using delta connected bank of 2200V capacitors. Find:

(i) Capacitance of reach of each capacitor
(ii) kVA rating of capacitor bank and transformer
(iii) ratio of capacitance of 2200V capacitors to the capacitance of 400V capacitors for the same P.F. improvement. [8]

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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	IV / I	Time	3 hrs.

Subject: - Utilization of Electrical Energy *(EE 702)*

- ✓ 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) Elaborate the role of electrical energy in the sustainable development of the country. Describe on the basis of the utilization of the electrical energy. [8]

   b) A household water tank having cubical structure has the surface area of $6m^2$ and if filled to 90% capacity six times daily. The water is heated from 20°C to 65°C. The losses per square meter of tank surface is 6.3 W/°C. Find the loading in kW and the efficiency of the tank. Assume specific heat of water = 4,200 J/kg/°C and 1kWh = 3.6MJ, $1m^3$ of water = 1000 kg. [8]

2. a) A horizontal belt conveyor moving at a uniform speed of 0.9 m/s transports material at 95 tons/hour. Belt is 180 m long and is driven by motor at 1500 rpm.
   (i) Find load inertial to motor shaft,
   (ii) Find the torque of motor to accelerate the belt from stand still to fall speed in 6 seconds. Moment of inertia of motor is 0.15 Kg/m^2. [8]

   b) A 25 H.P., 220 V DC shunt motor with a full load speed of 600 rpm is to be braked by plugging. Estimate the value of resistance which should be placed in series with it to limit the current to 130 A. what should be the initial value of the electrical breaking torque and value when speed has fallen to half of its full load value? Armature resistance- 0.1 Ω. Full load armature current = 95A. [8]

3. a) The speed of the separately excited dc motor is controlled by a single phase full controlled bridge rectifier with the field also being controlled by the full converter. The field current is set to maximum possible value. The supply voltage to the armature and field converters are 220 V, 50 Hz. the armature resistance and field resistance are 0.2 Ω and 150 Ω respectively. The motor voltage constant, $K' = 1.1$(V/A). (rad/s). The armature current corresponding to the load demand is 25 A. Assume that the armature and field currents are continuous and ripple free and no-load losses are negligible. If the delay angle of the armature converter is $\alpha = 45°$ and armature current is 25 A. Determine:
   (i) The torque developed by the motor
   (ii) The speed of the motor and [8]
   (iii)The power factor of the drive

   b) How can slip power loss to be recovered by Kramer's System and Scherbius System? [8]

4. a) Explain the requirements of the Ideal Traction System. Explain Self Contained Vehicle with its various transmission systems. [6]

   b) Draw speed time curves for urban, sub-urban and main line services. Compare their characteristics. [4]

   c) An electric train is to have acceleration and braking retardation of 0.7 km/h/s and 3.2 km/h/s respectively. If the ratio of maximum to average speed is 1.4 and time for stops is 25 seconds, find the schedule speed for a run of 1.5km. Assume simplified trapezoidal speed-time curve. [6]

5. a) What do you mean by electrical tariff? What are different types of electrical tariff used in our country? Also write why NEA (Nepal Electricity Authority) impose such tariffs to its consumers? [8]

b) A 340 kW, 50 Hz, 3- phase star connected induction motor has full load efficiency of 85% and p.f of 0.8 lagging. It is desired to improve the power factor to 0.96 lagging by using bank of three capacitors. Calculate:

(i) The kVAR rating of the capacitor bank.

(ii) The capacitance of each limbs of the condenser bank connected in delta.

(iii) The capacitance of each capacitor, if each one of the limb of the delta – connected condenser bank is formed by using 6 similar 3300 V capacitors. [8]

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2076 Chaitra

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

Subject: - Utilization of Electrical Energy *(EE 702)*

- ✓ 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 advantages of electrical energy over other forms of energy? Also write how electrical energy needs to be utilized in order to achieve development in our country? [8]

   b) What are the advantages of electric heating? Discuss the methods of temperature control of resistance ovens. [8]

2. a) A motor drives two loads, one has a rotational motion. It is coupled to a motor through a reduction gear with a=0.1 and efficiency of 92%. The load has moment of inertia of 10 kgm^2 and torque of 12N-m. The other load has a translational motion and consists of thousand kilograms to be lifted up at a uniform speed of 1.5 m/s. Coupling between this load and motor has an efficiency of 80%. Motor has inertia of 0.2 kgm^2 and runs at a constant speed of 1420 rpm. Determine equivalent inertia referred to the motor shaft and power developed by the motor. [6]

   b) What are the various components of friction torque? Show how the friction torque components vary with speed with the help of speed-torque graph. [6]

   c) Explain the classes of motor duty with respect to continuous duty, short time duty and intermittent duty. [4]

3. a) A 220V dc shunt motor takes 22A at rated voltage and runs at 1000 rpm. Its field resistance is 100 ohm and armature circuit resistance is 0.1 ohm. Compare the value of additional resistance required in the armature circuit to reduce the speed to 800 rpm when
   (i) the load torque is proportional to speed,
   (ii) the load torque varies as the square of the speed. [8]

   b) What is slip power recovery scheme? Describe in detail about slip power recovery scheme using static Scherbius drive and static Kramer drive. [8]

4. a) What type of train service correspond to trapezoidal and quadrilateral speed time curve? [5]

   b) What are the main requirements of an ideal traction system? [5]

   c) An electric locomotive is accelerated and retarded at 0.8 kmphs and 3.2 kmphs respectively. If the ratio of maximum to average speed is 2 and time of stop is 30 seconds. Find scheduled speed for the run of 3 km assuming trapezoidal speed time curve. [6]

5. a) Why is customer acceptance important in implementation of demand side management? How can it be achieved? [8]

   b) A 3ϕ induction motor has pf 0.9 and efficiency of 0.9 at full load, power factor 0.5 and efficiency 0.8 at half full load. At no load the current is 25% of full load current and power factor 0.1. Capacitors are supplied to make the line power factor 0.8 at half full load. With those capcitors connected find line power factor at full load and no load. Also find the cost of electricity use for a month at no load assuming the machine operates for 80% of time. Tarrif: Rs. 200 of max kVA per month plus 50 paisa per kWh. [8]

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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	IV / I	Time	3 hrs.

Subject: - Utilization of Electrical Energy *(EE 702)*

- ✓ 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 electrical consumers are classified, discuss about their demand characteristics. Also state how these classification differs according to countries? [8]

   b) What are the characteristics of heating element? Explain the design of heating element in resistance heating. [8]

2. a) State the methods of power transfer. Compare flat belt drive and V belt drive. [4]

   b) What are the classes duties to be performed by the motor on the basis of load variations? Give examples of each. [4]

   c) A 230V, 25kW d.c. shunt motor running at its rated speed of 1500 rpm is to be braked by reverse current braking. The armature resistance is 0.1 ohm and the rated efficiency of the motor is 88 percent. Calculate

   (i) the resistance to be connected in series with the armature to limit the initial braking current to twice the rated current,
   (ii) the initial braking torque and
   (iii)the torque when the speed of the motor falls to 600 rpm. [8]

3. a) Explain ward-Leonard system of speed control with diagram. Also state the advantages and disadvantages of this method. [8]

   b) A star-connected induction motor has the following data:
   440V, 50 Hz, 4-pole, 1460 rpm, Rs = 2 ohm, $R_r' = 2$ ohm, $X_s = X_r' = 3$ ohm
   Calculate the starting torque and the starting current of this motor at 50 Hz and 10 Hz for v/f control. [8]

4. a) What do you mean by electrical traction system? Compare the features of at least three electrical traction locomotives. [6]

   b) Define average speed, crest speed and schedule speed and discuss the factor affecting schedule speed of train. [4]

   c) The schedule speed of an electric train with stations 777m apart is 27.3 km per hour and the maximum speed is 20% higher than average running speed. The braking rate is 3.22 kmphps and the duration of stop is 20s. Find the acceleration required. Assume simplified speed time curve with free running at the maximum speed. [6]

5. a) What is importance of Load Management? What are the technique to manage demand side in an effective way? Explain in detail. [8]

   b) The load on a certain industrial premises is about 1200 kVA @ 0.75 lagging power factor for 3,000 hours per annum. The Tariff is Rs 1,300 per kVA maximum demand plus 80 paisa per kWh. Determine annual charge of energy. also if a power factor improving apparatus is installed to improve the power factor to 0.95 lagging. Determine the kvar required and the new annual charge of energy if the power factor improving apparatus costs Rs 1200 per kvar, annual interest and depreciation charges are 10% of the capital cost. [8]

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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	IV / I	Time	3 hrs.

Subject: - Utilization of Electrical Energy *(EE 702)*

- ✓ 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.*

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   b) What are the characteristics of heating element? Explain the design of heating element in resistance heating. [8]

2. a) State the methods of power transfer. Compare flat belt drive and V belt drive. [4]

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   c) A 230V, 25kW d.c. shunt motor running at its rated speed of 1500 rpm is to be braked by reverse current braking. The armature resistance is 0.1 ohm and the rated efficiency of the motor is 88 percent. Calculate

   (i) the resistance to be connected in series with the armature to limit the initial braking current to twice the rated current,
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   (iii)the torque when the speed of the motor falls to 600 rpm. [8]

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   b) Define average speed, crest speed and schedule speed and discuss the factor affecting schedule speed of train. [4]

   c) The schedule speed of an electric train with stations 777m apart is 27.3 km per hour and the maximum speed is 20% higher than average running speed. The braking rate is 3.22 kmphps and the duration of stop is 20s. Find the acceleration required. Assume simplified speed time curve with free running at the maximum speed. [6]

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   b) The load on a certain industrial premises is about 1200 kVA @ 0.75 lagging power factor for 3,000 hours per annum. The Tariff is Rs 1,300 per kVA maximum demand plus 80 paisa per kWh. Determine annual charge of energy. also if a power factor improving apparatus is installed to improve the power factor to 0.95 lagging. Determine the kvar required and the new annual charge of energy if the power factor improving apparatus costs Rs 1200 per kvar, annual interest and depreciation charges are 10% of the capital cost. [8]

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13 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2075 Ashwin

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

Subject: - Utilization of Electrical Energy *(EE702)*

- ✓ 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 electrical energy over other forms of energy? Also discuss different types of electrical consumer on basis application and end use. [8]

   b) What are the factors which limit the choice of high frequency in induction and dielectric heating? Calculate KVA and KW drawn from supply, its p.f. and electrical efficiency with the following data pertaining to an electric arc furnace three phase. Current drawn = 4500 A, arc voltage = 50 V, resistance of transformer referred to secondary = 0.002 ohms and reactance of transformer referred to secondary = 0.004 ohms. [4+4]

2. a) Explain 4-quadrant operation of a dc motor with help of loaded and unloaded cage. [8]

   b) A 550 V, 45kW, 600 rpm dc shunt motor has a full load efficiency of 90%. The field resistance is 200 Ω and armature resistance is 0.2 Ω. Find the speed under each of the following conditions at which will develop an electromagnetic torque equal to the related value: [8]

      i) Regenerative braking with no limiting resistance
      ii) Plugging with external limiting resistance of 5.5 Ω inserted.
      iii) Dynamic braking with external limiting resistance of 2.6 Ω inserted. The field current is maintained constant and armature reaction and brush drop may be neglected.

3. a) A 500 V, 1500 rpm, 100 A separately excited motor is fed from a 350 V, 3-phase supply through a 3-phase. Semi-controlled bridge converter. Armature resistance is 1.1 ohm. If firing angle is 45° find rms source current, rms thyristor current, and average thyristor current and power factor at input terminals. Assume constant armature current and speed of 1200 rpm. [8]

   b) What do you mean by slip power recovery system? Explain in detail the different methods of slip power recovery. [8]

4. a) Why tramways are losing ground to other system of traction? And what is the scope of application of battery drive? [4]

   b) A train runs between two stations 2 KM apart at an average speed of 40km/hr. The run is to be made according to simplified quadrilateral speed-time curve. If the maximum speed to be limited to 80 km/hr, acceleration to 2 km/hr/s, coasting retardation to 0.15 km/hr/s and braking retardation 3 km/hr/s. Determine the duration of acceleration, coasting and branking periods. [8]

   c) Explain how actual speed-time curve for an electric train service can be replaced by a curve having a simple geometric shape. What type of train services corresponds to trapezoidal and quadrilateral speed time curves? [2+2]

5. a) What are the importance of demand side management? Explain its objectives for effective demand side management. [4]

b) What is two part tariff? Compare it with power factor tariff. [4]

c) A 35 kW induction motor has p.f.0.9 and efficiency 0.9 at full load, power factor 0.6 and efficiency 0.7 at half load. At no-load the current is 25% of full-load current and power factor 0.1. Capacitor are supplied to make the line power factor 0.8 at half full-load. With these capacitor in the circuit, find the power factor at (i) full load and (ii) no load. [8]

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13 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2074 Chaitra

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

Subject: - Utilization of Electrical Energy *(EE702)*

- ✓ 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) "Proper utilization of electrical energy can lead to sustainable development of country". Justify with reference to present and past scenario of Nepal. [4]

   b) According to energy utility in your area, classify and explain different types of electrical consumer. [4]

   c) A 2.5 kW, 240 V, single phase resistance oven is to have nichrome wire heating elements. If the wire temperature is to be 1500°C and that of the charge 450°C, estimate the diameter and length of the wire. The resistivity of nichrome alloy is 42.5 μΩ-cm. Assume radiating efficiency and the emissivity of the element 1.0 and 0.9 respectively. [8]

2. a) A motor drives the loads, one through gear and the second through belt. The inertia of the motor is 0.3 kg-m^2, inertia of gear driven load is 15 kg-m^2, gear speed reduction ratio is 0.1, inertia of belt driven load is 0.6 kg-m^2, diameter of driver pulley is 10 cm and diameter of driven pulley is 30cm. The motor speed is 1440 rpm. Find the equivalent inertia, referred to motor shaft and torque and power of motor. Torque of loads are 100 N-m and 35 N-m. Neglect loss. [8]

   b) Explain with necessary diagram the difference between plugging, dynamic breaking and regenerative braking with d.s shunt motor. [8]

3. a) Explain with help of diagram how the speed of a single phase separately excited d.c drive is controlled using a full converter. [8]

   b) A 400 V 4 pole 50 Hz3 phase star connected induction motor has the following parameters: number of stator turns/phase is twice the number of rotor turns/phase. $R_1 = 0.64\ \Omega$, $X_1 = 1.1\ \Omega$, $R_2 = 0.08\ \Omega$ and $X_2 = 0.12\ \Omega$. The load torque is proportional to the square of speed and is 40N-m at 1440 rpm. If the motor speed is 1300 rpm, find (a) load torque (b) rotor current (c) stator applied voltage. Neglect no load current. [8]

4. a) What is electric traction? What are their types? Explain self-contained electric vehicle with its transmission systems and mechanical systems. [6]

   b) Discuss and compare various arrangement of current collection used in electric traction. [4]

   c) Find the schedule speed of an electric train for a run of 1.5 km if the ratio of its maximum to average speed is 1.25. It has a braking retardation of 3.6 km/h/s, acceleration of 1.8 km/h/s and stop time of 21 second. Assume trapezoidal speed/time curve. [6]

5. a) Explain about the current tariff structure of Nepal Electricity Authority for domestic load. [4]

b) What is Demand Side Management (DSM)? Explain about different types of load priority techniques in DSM. [1+3]

c) A 600kW, 50Hz, 400V, 3-phase load has power factor of 0.8 lagging. It is desired to improve the power factor to 0.95 lagging by using a delta-connected bank of 2200V capacitors. Calculate: [8]

i) Capacitance of each capacitor

ii) kVA rating of capacitor bank and transfomer

iii) Percentage reduction in the line losses.

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13 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2074 Ashwin

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

Subject: - Utilization of Electrical Energy *(EE702)*

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

1. a) Classify and explain different types of electrical consumers on the basis of voltage level.
   b) What are the factors to be considered for electric heating in building design?
2. a) What do you mean by electric drive? Compare between individual, group and multi-motor drives with applications.
   b) A horizontal conveyer belt moving at uniform speed of 2.2 m/s transports material at the rate of 200 tones/hour. Belt is 100m long and driven by a motor at 1500 rpm.
      (i) Determine load inertia referred to motor shaft.
      (ii) Calculate torque that motor should develop to accelerate the belt from standstill to full speed in 8 sec. Moment of Inertia of motor is 0.1 kg-m^2.
3. a) Explain Ward-Leonard type variable speed drives enlisting its major benefits and dis benefits.
   b) A 8-pole 25 Hz 3 phase induction motor is running at 4% slip when delivering full load torque. It has standstill rotor resistance of 0.1 Ω and reactance 0.6 / phase. Calculate the speed of motor if additional resistance of 0.5 Ω / phase is used.
4. a) What do you mean by electric traction? Draw the speed-time curve for urban, sub-urban and main line services explaining the following terms: Free run period, Coasting Period.
   b) A train runs between 2 stations 2 km apart at an average speed of 40 km/hr. The run is to be made according to simplified quadrilateral speed-time curve. If the maximum speed is to be limited to 60 km/hour, acceleration to 2 km/h/sec, coasting retardation to 0.15 km/h/sec and braking retardation 3 km/h/sec, determine the duration of acceleration, coasting and braking periods.
5. a) What are the causes and disadvantages of low power factor? Briefly describe the differences between static capacitors and synchronous capacitors used for improving power factor of a machine.
   b) The load on an installation is 600 kW, 0.8 lagging which works for 2000 hours per annum. The tariff is Rs 80 per kVA plus 20 paisa per kWh. If the power factor is to be improved to 0.9 lagging by the means of capacitors costing Rs.50 per kVAR, find the annual saving. Allow 10% per annum for interest and depreciation on capacitors.

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13 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2073 Chaitra

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

Subject: - Utilization of Electrical Energy *(EE702)*

- ✓ 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 role of electrical energy in modern society? [8]

   b) State the various advantages of induction heating. Explain with the help of neat sketch the working of an induction furnace. What is its field of application? [8]

2. a) Draw and explain the control circuit for a multimotor drive. [6]

   b) What factors govern the selection of a motor for particular application? [4]

   c) A separately excited dc motor with the following parameters: R_a = 0.5 Ω, L_a = 0.003H, and K_b = 0.8 V/rad/sec, is driving a load of J = 0.0167kg-m^2, B_1 = 0.01 N-m/rad/sec with a load torque of 100 N-m. Its armature is connected to a dc supply voltage of 220 V and is given the rated field current. Find the speed of the motor. [6]

3. a) Explain static Ward-Leonard control scheme for four quadrant control of separately excited motor. Discuss non circulating and circulating current schemes. Mention its merits over conventional Ward-Leonard control. [8]

   b) A 400 V 4 pole 50 Hz 3-phase star connected induction motor has the following parameters: number of stator turns/phase is twice the number of rotor turns/phase, R_1 = 0.64 Ω, X_1 = 1.1 Ω, R_2 = 0.8 Ω, X_2 = 0.12 Ω. The load torque is proportional to square of speed and is 40 N-, at 1440 rpm. If the motor speed is 1300 rpm, find (i) load torque, (ii) rotor current, (iii) stator applied voltage. Neglect no load current. [8]

4. a) What are the merits and demerits of d.c. system of track electrification? [6]

   b) What types of train service correspond to trapezoidal and quadrilateral speed time curves? [4]

   c) A train runs an average speed of 50 km/hr between stations situated 2.5 km apart. Train accelerates at 2 km/hr and retards at 3 km/hr. Find its maximum speed assuming simplified trapezoidal speed time curve. Draw the speed time curve for the run and calculate also the distance travelled by it before the brakes applied. [6]

5. a) Discuss the benefits of Demand Side Management. How does energy efficiency differ from demand side management? [8]

   b) A factory works for 2 shift (8 hours per shift) a day for 285 days in a year. The following two system of tariff are available. (i) Medium voltage supply at Rs 12 per unit plus Rs 1300 per month per kVA of maximum demand. (ii) Low voltage supply at Rs.650 per month per kVA of maximum demand plus Rs.13 per unit. The factory has an average load of 250 kW at 0.8 power factor and a maximum demand of 300 kW at the same power factor. The high voltage equipment costs Rs. 700 per kVA and losses can be taken as 5%. Interest and depreciation charges are 10%. Calculate the difference in the annual cost between the two systems. [8]

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15 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	IV / I	Time	3 hrs.

Subject: - Utilization of Electrical Energy *(EE702)*

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

1. a) What do you mean by electrical energy? Explain the different class of electrical consumers and their demand.

   b) A low frequency induction furnace operating at 10V in the secondary circuit takes 500kW at 0.5 p.f when the hearth is full. If the secondary voltage be maintained at 10V, estimate the power absorbed and the p.f when the hearth is half full. Assume the resistance of the secondary circuit to be thereby halved and the reactance to remain the same.

2. a) A 30 kW, 220V, dc shunt motor with a full load speed of 535 rev/min is to be braked by plugging. Estimate the value of resistance which should be placed in series with it to limit the initial braking current to 200A. What would be the initial value of the electric braking torque and the value when the speed has fallen to half its full load value? (Given: armature resistance of motor = 0.086 Ω, Full load armature current = 150A)

   b) For the selection of various types of motor, what are the classes of duties to be performed by the motor on the basis of load variations? List out some examples of driver/machine applicable to various classes of duties.

3. a) How three phase induction motor has controlled by variable frequency method? Explain with necessary mathematical relation and figures.

   b) A separately excited dc motor is fed from a three phase six pulse fully controlled bridge converter. The motor develops its full load torque at a rated speed of 1800 rpm taking a current of 60 A from a 400 V supply. Determine the rms value of supply voltage if the motor runs at its rated conditions for $\alpha = 0$. What is the range of firing angles for a speed control of 1800 rpm to 900 rpm. The armature resistance is 0.5 ohm. The supply and thyristors are ideal.

4. a) An electric train is to have accleration and braking retardation of 1.2 km/h/s and 3.8km/h/s respectively. If the ratio of maximum to average speed is 1.6 and time for stop 45 seconds, find the schedule speed from a run of 2.5 km. Assume simplified trapezoidal speed time curve.

   b) What is self-contained electric vehicle? What are transmission system employed in these types of electric vehicle? Explain.

5. a) What is demand side management? Explain the effective techniques for effective demand side management.

   b) A 50 Hz HP induction motor has power factor 0.9 and efficiency 90% at full load, power factor 0.6 and efficiency 70% at half load. At no-load the current is 25% of the full-load current and power factor 0.1. Capacitors are supplied to make the line power factor 0.8 at half load. With these capacitors in circuit, find the line power factor at (i) full-load and (ii) no-load

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12/24

13 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2072 Chaitra

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

Subject: - Utilization of Electrical Energy *(EE702)*

- ✓ 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 micro and macro factors hindering possible generation of electricity in Nepal. [8]
   b) A laminated wooden board 0.3 m long by 0.15 m wide and 0.025 m thick is to be heated to 160°C in 10 minutes by dielectric heating employing a frequency of 30MHz. The wood has a specific heat of 1465 $Jkg^{-1}°C^{-1}$, a weight of 575 kg m^{-3}, a permittivity of 5 and power factor of 0.05. Determine the power required, voltage across the work and the current through it during heating process. (Assume process efficiency between 85 and 90%) [8]
2. a) What is an electric drive? Explain the major parts of an electric drives, also state the advantages and disadvantages of electric drives. [6]
   b) Write the difference between group drive and individual drive. [4]
   c) A 200 V, 1000 rpm, 50 A seperately excited dc motor is to be stopped to zero speed by plugging. Armature resistance is 0.2 ohm. Find (i) additional resistance to be connected is series with armature to limit braking current to twice the rated current (ii) braking torque (iii) torque when speed has decreased to zero. Assume that initial speed is 1000 rpm. [6]
3. a) Draw the torque speed-characteristics of an induction motor with constant V/f control for speed variation from very low up to the base speed. Describe an open loop control scheme for induction motor with constant V/f control. [8]
   b) A three phase half controlled thyristor bridge with 400V, 3-phase, 50Hz supply is feeding a separately excited dc motor. Armature resistance is 0.2Ω, armature rated current is 100 A and back emf constant is 0.25 V/rpm. Determine no load speed if no load armature current is 5A and firing angle is 45°. Also determine firing angle to obtain a speed of 1500 rpm at rated current. [8]
4. a) Draw the speed-time curves for urban and suburban and main line service. Also explain the following terms: (i) Notching period (ii) Accelerating period (iii) Free run period (iv) Coasting period (v) Retardation period. [8]
   b) An electric train has a schedule speed of 25kmph between stations 800 m apart. The duration of station stop is 20 seconds, the maximum speed is 20% higher than average running speed and the braking retardation is 3 kmphps. Calculate the rate of acceleration required to operate this service. [8]
5. a) Explain the concept of demand side management. Discuss the steps involved in DSM planning and implementation. [8]
   b) The load on a certain installation may be considered constant at 1200kVA, 0.75 lagging power factor for 3000 hours per annum. The tariff is Rs 65 per kVA of maximum demand plus 2 paisa per kWH. [8]
      i) Determine the annual charge for electrical energy
      ii) Power factor improving apparatus is installed to improve the power factor to 0.95 lagging. Determine the kVAR required and the new annual charge if the power factor improving apparatus costs Rs 60 per kVAR, annual interest and depreciation charges are 10% of the capital cost and the losses in the apparatus are 5% of the kVAR rating.

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13 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	IV / I	Time	3 hrs.

Subject: - Utilization of Electrical Energy *(EE702)*

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

1. a) Explain the common uses of electrical energy on the basis of domestic, commercial and industrial use. Provide features of electric drives with them.

   b) What do you mean by crest speed, average speed and schedule speed? An electric train has an average speed of 42Kmph on a level track between stops 1400m apart. It is accelerated at 1.7Kmphps and braked at 3.3Kmphps. Draw speed time curve for the run.

2. a) Write the electrical and mechanical characteristics to be considered for selection of motor. Explain Rheostatic braking and Regenerative braking.

   b) A motor running at speed N rpm driving a rotational load L_1 directly coupled to its shaft and another load L_2 through a gear to reduce its speed by a factor K. The inertia of motor, loads L_1, loads L_2 are Jm, J_1, J_2 respectively. The load torque of L_1, and L_2 are T_1 and T_2. Find the expression for total inertia and T reflected to motor. If "T_e" is the electrical torque, what will be the dynamic equation for the motor speed?

3. a) A single phase, 220 V, 50 Hz supply feeds a separately excited dc motor through two single phase semi-converters, one for the field and another for armature. The firing angle of the field semi-converter is zero, the field resistance is 250 Ω and armature resistance is 0.2 Ω. The load torque is 50 N-m at 1000 rpm. The voltage constant is 0.8 V/A-rad/s and the torque constant is 0.8 Nm/A^2. Assuming armature and field currents to be continuous and neglecting losses. Determine:

      i) Field current
      ii) Firing of the converter in the armature circuit
      iii) Power factor of the converter of the armature circuit

   b) Discuss the operation of open loop V/F control of inverter fed induction machine drive. What are problem with it? How do you overcome this effect by closed loop operation, explain it with closed loop block diagram.

4. a) Explain the common methods of electric braking employed in ac and dc drives for traction.

   b) What is demand side management? Explain the effective techniques for effective demand side management.

5. a) A 340kW, 3300V, 50Hz, 3-Phase star connected induction motor has full load efficiency of 85% and power factor of 0.8 lagging. It is desired to improve the power factor to 0.96 lagging by using a bank of three capacitors. Calculate:

      i) The KVA rating of the condenser bank
      ii) The capacitance of each limb of the condenser bank connected in delta
      iii) The capacitance of each capacitor, if each one of the limbs of the delta connected condenser bank is formed by using 6 similar 3300V capacitors

   b) What are the advantages of electric heating? Explain the building design consideration foe electric heating.

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13 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2071 Chaitra

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

Subject: - Utilization of Electrical Energy *(EE702)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt <u>All</u> questions.*
- ✓ *<u>All</u> questions carry equal marks.*
- ✓ *Assume suitable data if necessary.*

1. a) What are the roles of electrical energy to develop a country? Explain the benefits of electrical energy over other form of energy.

   b) The following data related to a 3 phase arc furnace:

Quantity of steel to be melted in one hour = 4.3 tonnes
Specific heat of steel = 0.5 kJ / kg
Latent heat of steel = 37.2 kJ/ kg
Melting point of steel = 1370°C
Initial temperature of steel = 19.1°C
Overall efficiency of steel = 50%
Input Current = 5700 A
Resistance of temperature referred to secondary = 0.008 Ω
Reactance of temperature referred to secondary = 0.014 Ω
Determine the following: (i) Average kW input to the furnace, (ii)Arc voltage (iii) Arc resistance (iv) power factor of the current drawn from the supply, and (v) Average kVA input to the furnace.

2. a)

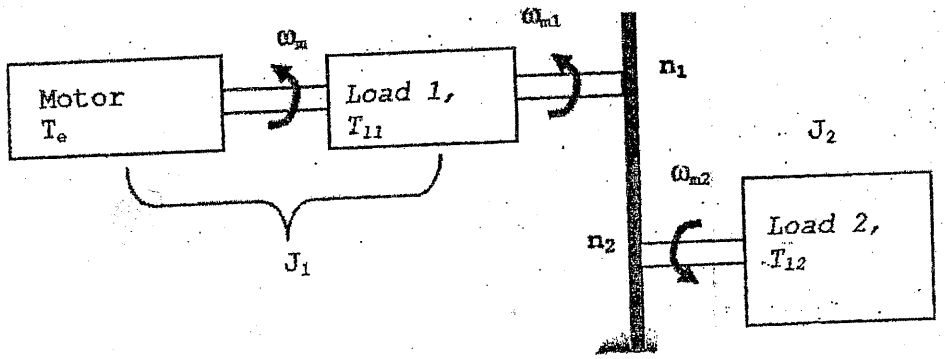

Fig.1a

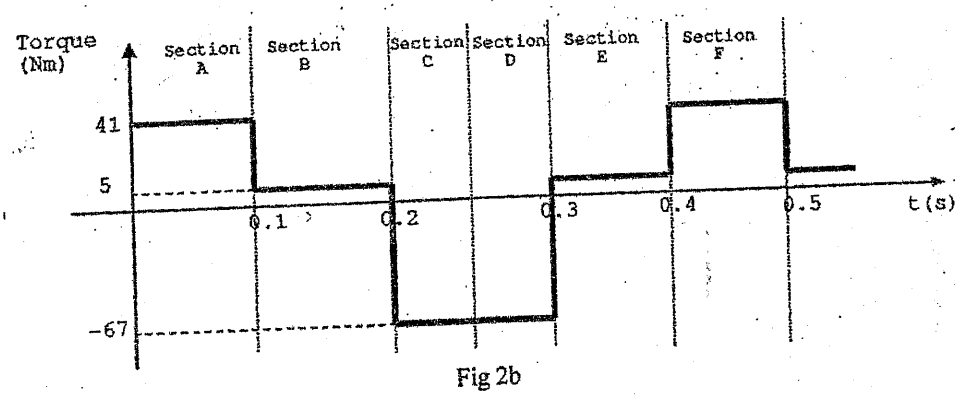

Fig 2b

Consider a dc motor driving system (Figure 1a) with following parameter; J_2=0.01 kg/m^2, n1/n2=2, ; J_1=0.08. Determine the equivalent 'J_{eq}' of the system. If electric torque profile of figure 2b is applied to motor, construct the profile of the speed (Assume Load torque T_L=5 NM). Using the plots (T vs. t and ω vs. t), discuss the quadrant of operation in each section A to F as shown.

b) A 220 V separately excited motor running at 1000 rpm draws 100 A from the source. The motor is braked by plugging. Calculate (i) Resistance to be inserted in the armture circuit to limit the braking current to twice the full load current, (ii) Initial braking torque, (iii) The braking torque when speed has reduced to 500 rpm.

3.a) Discuss the operation principle of two quadrant operation of armature controlled dc motor drive in open loop made. What are the limitation of open loop operation? Draw a closed loop control scheme that over comes the limitations.

b) A 400 V, 50 Hz, 4 pole, 1350 rpm, star connected induction motor is driving a load whose torque varies as square of speed. The motor is controlled by controlling stater voltage. Find the torque and the applied voltage at speed 900 rpm. [Use R_s = 1.5 Ω, R'_r = 4 Ω, X_s = 4 Ω, rotor stand still reactance X'_r = 4 Ω]

4. a) A train runs between the two stations 2 KM apart at an average speed of 40 km/h. The run is to be made according to simplified quadrilateral speed-time curve. If the maximum speed to be limited to 60 km/h, acceleration to 2 km/h/s, coasting retardation to 0.15 km/h/s and braking retardation 3 km/h/s. Determine the duration of acceleration, coasting and braking periods.

b) Describe Speed-time curve for the traction system with suitable example describing all its parts. Describe speed-time curve of urban and sub-urban services.

5. a) What is the role of load management in demand side management? Discuss each of the steps to implement demand side management.

b) A factory takes a load of 200kW at 0.85 pf lagging for 2500 hrs per annum. The tariff is Rs. 150 per KVA plus 5 paisa per KWH consumed. If the pf is improved to 0.9 lagging by means of capacitors costing Rs 420 per KVAR and having a power loss of 100W per KVA, Calculate the annual saving effected by their use. Allow 10% per annum for interest and depreciation.

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15 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2071 Shawan

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

Subject: - Utilization of Electrical Energy *(EE702)*

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

1. a) Discuss the roles and advantages of electrical energy over other forms of energy on different applications.
   b) Discuss the various factors to be considered for electric heating in building design.
2. a) For the selection of various types of motor, what are the classes duties to be performed by the motor on the basis of load variations? List out some examples of driver/machine applicable to various classes of duties.
   b) A motor is used to drive a hoist. Motor characteristics are given by:

   Quadrants I, II and IV : T = 200 - 0.2 N N-m

   Quadrants II, III and IV : T = -200 - 0.2N N-m

   Where N is the speed in rpm

   When hoist is the loaded the net load torque T_l = 100 N-m and when it is unloaded, net load torque T_l = -80 Nm obtain the equilibrium speeds for operation in all the four quadrants.
3. a) With the help of mathematical expression and block diagrams discuss the PID control of speed and torque of electric motor?
   b) Discuss the slip power recovery system for slip ring induction motor.
4. a) The schedule speed with a 200 tonne train on an electric railway with stations 777 meters apart is 27.2 km per hour and the maximum speed is 20% higher than the average running speed. The braking rate is 3.22 km p.h.p.s and the duration of stop is 20 seconds. Find the acceleration required. Assume a simplified speed-time curve with free running at the maximum speed.
   b) Discuss the applications of different types of motor used in electric fraction with their characteristics.
5. a) What is demand side management? Discuss the effective demand side management technique.
   b) What is tariff? Explain the various forces of tariff with their merit and demerits.

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15 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2070 Chaitra

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

Subject: - Utilization of Electrical Energy *(EE702)*

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

1. a) Explain the classification of electrical consumers and their demand.
   b) Compare dielectric heating, infrared heating and microwave heating.
2. a) Compare individual group and multi-motor drive system.
   b) A horizontal conveyer belt moving at a uniform speed of 1.2 m/s transports material at the rate of 100 tonnes/hrs. Belt is 200 m long and driven by a motor at 1200 rpm.
      i) Determine the load inertia referred to the motor shaft
      ii) Calculate the torque that motor should develop to accelerate the belt from standstill to full speed in 8 sec. Moment of inertia of the motor is 0.1 kg-m^2.
3. a) A dc chopper fed from 400 v supply runs a separately excited motor. The armature resistance is 0.1Ω. The motor voltage constant is 4 V-s/rad, the average armature current Ia = 150 A. The armature current is continuous and has negligible ripple. Determine (i) the input power (ii) the motor speed (iii) the developed torque for a duty cycle of 60%, Neglect the losses in chopper. If the duty cycle of the chopper varies between 10% and 90%, find the minimum and maximum speeds.
   b) What happen if an induction motor is started with variable frequency? What is the technique to overcome the problems associated with variable frequency? Justify your answer with suitable mathematical expression.
4. a) What is self contained electric vehicle? What are the transmission systems employed in these types of electric vehicle? Explain.
   b) Compare the characteristics of various system of electrification for traction purpose.
5. a) Why demand side management is necessary? What are the techniques to manage demand side in an effective way? Explain in detail.
   b) A 35 KW induction motor has power factor 0.9 and efficiency 0.9 at full load, power factor 0.6 and efficiency 0.7 at half load. At no load the current is 25% of full load current and power factor 0.1. Capacitors are supplied to make the line power factor 0.8 at half load with these capacitors in circuit, find the line power factor at (i) full load and (ii) no load.

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15 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2070 Ashad

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

Subject: - Utilization of Electrical Energy *(EE702)*

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

1. a) Discuss the advantages of electrical energy over other forms of energy on different applications.

   b) A 30 KW, 3 phase, 400 V resistance oven is to employ nickel- chrome strip 0.025 cm thick for a 3 phase star connected heating elements. If the wire temperature is to be 1100°C and that of charge is to be 700°C, estimate a suitable width for the strip. Assume radiating efficiency as 0.6 and emissivity as 0.9. The specific resistance of the nichrome- alloy is 10.3×10-6 Ωm. State any assumption made.

2. a) Discuss the various components of load torque that has to be considered for the mechanical characteristics matching. Also mention some examples of these load torques based on particular applications.

   b) A weight of 500 kg is being lifted up at a uniform speed of 1.5 m/s by a winch which is driven with the help of motor running at a speed of 1000 rpm. The moment of inertia of the motor and winch are 0.5 and 0.3 kg-m^2 respectively. Calculate the motor torque and the equivalent moment of inertia referred to the motor shaft. In the absence of weight, motor develops a torque of 100 N-m when running at 1000 rpm.

3. a) Developing the over all block diagram of dc motor, discuss the PID control for speed and torque control of DC motor.

   b) Starting from Volt/Hz control of three phase induction motors. Discuss their frequency control schemes.

4. a) What is the schedule speed of a traction system? Discuss the various factors affecting this speed.

   b) A train has schedule speed of 60 km per hour between the stops which are 6 km apart. Determine the crest speed over the run assuming trapezoidal speed curve. The train accelerates at 2 km per hour per sec and retards at 3 km per hour per sec. Duration of stops in 60 second.

5. a) What is demand side management? Explain the various schemes adopted for the demand side management.

   b) The load on an installation is 800 KW, 0.8 lagging which works for 3000 hours per annum. The tariff is Rs 100 per KVA plus 20 paisa per kwh. If the power factor is improved to 0.9 lagging the means of loss free capacitors costing Rs 60 per KVAR, calculate the annual saving. Allow 10% per annum for interest and depreciation on capacitors.

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15 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2069 Chaitra

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

Subject: - Utilization of Electrical Energy *(EE702)*

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

1. a) Discuss the common use of electrical energy based on domestic, commercial and industrial with suitable examples and their voltage level.
   b) Explain in brief the various methods of electric heating used in industrial and domestic purpose.
2. a) What is electric drive? Discuss the various types of electric drives with their merits and demerits.
   b) Obtain the equilibrium points and determine their steady-state stability when motor and load torque are $T_m = -(1+2w_m)$ and $T_L = -3\sqrt{w_m}$ respectively.
3. a) A three phase half controlled thysistor bridge with 400V, 3-phase, and 50Hz supply is feeding armature terminal of a separately excited dc motor with field terminal fed by constant voltage. Armature resistance is 0.2Ω, armature rated current is 100 A and back emf constant is 0.25V/rpm. Determine no-load speed if no load armature current is 5A and firing angle is 45°. Also determine firing angle to obtain a speed of 1500 rpm at rated current.
   b) Explain the slip power recovery system for slip ring induction motor.
4. a) What is electric traction? Explain the types of electric traction system based on the types of supply source. Also discuss their advantages and disadvantages.
   b) Define speed time curve for traction system. Discuss speed time curve of urban service, sub-urban service and main line service.
5. a) The annual working cost of a power station is represented by the formula Rs (a+b×kw+c×kwh) where the various terms have their usual meaning. Determine the values of a, b and c for a 60 MW station operating at annual load factor of 50% from the following data:
      i) Capital cost of building and equipment is Rs. 5×10^6
      ii) The annual cost of fuel, oil, taxation and wages of operating staff is Rs. 9,00,000.
      iii) The interest and depreciation on building and equipments are 10% per annum
      iv) Annual cost of organization and interest on cost of site etc is Rs.5,00,000.
   b) What are the causes and disadvantages of low power factor? Explain the various techniques to improve power factor.

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