Civil

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Question BanK

TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2079 Bhadra

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

Subject: - Engineering Geology I *(CE 503)*

- ✓ 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 engineers carry out engineering geological studies in Nepal? [3]
2. Describe an internal structure of the earth with a diagram. [2]
3. Define tenacity and hardness of minerals. List out the symmetry elements of crystal. [2+1]
4. a) Define petrography and petrogenesis. Describe the concordant and discordant body of igneous rock. [1+3]
   b) Describe texture, structure, mineral composition and engineering properties of Quartzite, Granite, phyllite and conglomerate. [4]
5. a) Describe deformations in rock with suitable example. [3]
   b) A quartzite bed is directed towards S20°W with an dip angle of 45°. Find out the strike of quartzite bed. [2]
   c) Write the field identification criteria for fault and fold. [4]
   d) Outline the engineering significance of joints. [2]
6. a) Mention the name of geological agents. Describe an erosional feature develop by running water and wind. [2+4]
   b) What is the difference between weathering and erosion? [2]
7. Describe a lithological characteristics of the Lesser and Tethys Himalayan zone. Highlights a major lithological difference between Siwalik and higher Himalaya. [3+2]

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2080 Baishakh

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

Subject: - Engineering Geology I *(CE 503)*

- ✓ 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 scope, objective and importance of geology in civil engineering. [3]
2. How is Himalaya formed? Mention the evidence of plate tectonics. [1+2]
3. Describe a Moh's Hardness Scale? Illustrate Isometric System with Symmetry Elements. [1+2]
4. a) What is Petrology? Describe an engineering Significance of Metamorphic and Sedimentary rock classes. [4]
   b) How do you identify a metamorphic rock in field? Describe the physical properties of the Sandstone and Granite. [4]
5. a) What are the field evidence of fault? Describe engineering significance of fold. [2+2]
   b) What is rock attitude? A quartzite bedrock dip angle at 80° towards N10°E;Find out strike of bed rock with illustration. [1.5+1.5]
   c) What is unconformity? Describe different types of unconformity with figure. [1+2]
6. a) Differentiate between weathering and erosion. List out the erosional and depositional landform by glaciers. [2+2]
   b) What is flood? Describe different type of river channel with figure. [1+3]
7. Mention physiographic division of Nepal Himalaya. Describe the major discontinuity system of Nepal Himalaya. [2+3]

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2079 Baishakh

Exam.	Back		
Level	BE	Full Marks	40
Programme	BCE	Pass Marks	16
Year / Part	II / I	Time	1½ hrs.

Subject: - Engineering Geology I (*CE 503*)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
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1. Define petrology. Write down the scope and importance of engineering geology in the field of engineering geology. [1+2.5]

2. Differentiate between constructive and destructive plate boundary. Write briefly on internal structure of the earth. [2+1.5]

3. List out physical properties of minerals. Describe crystal system with sketch. [1+3]

4. a) Describe rock cleavage. "One rock is raw materials for another rock" Prove it. [2+4]
   b) Describe texture, structure, mineral composition and engineering properties of Marble, Granite, Slate and conglomerate. [4]

5. a) Describe criteria for identification of fault and fold in field. [3]
   b) What is rock attitude? A sandstone bedrock dip angle at 35° towards N45°W; Find out strike of bed rock with illustration. [1+2]
   c) What is unconformity? Describe different types of unconformity with figure. [1+2]

6. a) What do you understand by geological agent? Enumerate erosional landform of glacier and depositional land form of wind. [1+1.5+1.5]
   b) Different between chemical and physical weathering. What are the factors of weathering of rocks? [1.5+1.5]

7. a) What are the rock types found at the higher and Siwalik zones of Nepal Himalaya? Differentiate Midland zone and Dune valley. 1.5+1]
   b) List out the physiographic division of Himalaya. [1.5]

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2078 Kartik

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

Subject: - Engineering Geology I *(CE 503)*

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

1. What is the importance of geology? What are different branches of geology? [2+1]
2. How is Himalaya formed? Describe internal structure of earth brief. [1+2]
3. Define Moh's Hardness Scale. Describe element of crystals. [1.5+1.5]
4. a) Distinguish between concordant and discordant bodies of igneous rocks. [2]
   b) Write down the physical and engineering properties of marble, slate and granite. [3+4]
5. a) Define attitude. The limestone bed is inclined towards east with an inclination angle of 45°. Find the strike. [2+2]
   b) Describe the classification of Fold on the basis of convexity. [2]
   c) Write down the engineering significance of fault. [3]
6. a) Write the difference between weathering and erosion. Describe the type of volcano. [2+2]
   b) Describe erosional and depositional features of river and glacier. [4]
7. a) Describe physiographic division of Nepal Himalaya. [3]
   b) Describe Siwalik zone in detail. [2]

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2078 Bhadra

Exam.	Regular		
Level	BE	Full Marks	40
Programme	BCE	Pass Marks	16
Year / Part	II / I	Time	1 ½ shrs.

Subject: - Engineering Geology I *(CE 503)*

- ✓ 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 scope and objectives of geology in the field of civil engineering. [2]
2. Mention the physical features of the earth surface. [2]
3. Describe the symmetry elements of crystals. Describe hardness of minerals. [1.5+1.5]
4. Describe Petrogenesis. How do you identify igneous rocks in the field? Describe civil engineering significance of Granite, Phyllite and Sandstone. [2+2+3]
5. How do you differentiate primary geological structures and secondary geological structures? Describe relationship of strike and dip of geological planes. Describe with illustrations; how do you find out strike line when dip direction is measured? [2+2+2]
6. a) What is geological cycle? What do you mean by geological work? [1+1]
   b) Distinguish between weathering and erosion. [2]
   c) Give a full account of geological work of running water. [3]
7. Describe briefly the tectonic sub-division of the Nepal Himalaya and describe Siwalik in details. [3+2]
8. Write notes on: (Any Two) [2×4]
   a) Rock cleavage
   b) Field identification criteria of fault
   c) Physical weathering

TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2076 Chaitra

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

Subject: - Engineering Geology I *(CE 503)*

- ✓ 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 structural geology. Describe scope and importance of geology in civil engineering practice in the context of Nepal. [0.5+2.5]
2. What is plate boundaries? How Himalaya formed? Describe stepwise in detail. [2+1.5]
3. How do you differentiate carbonate and silicate minerals? Describe Moh's Scale of Hardness. Describe symmetry elements of crystals. [0.5+1+1.5]
4. a) How do you identify sedimentary rocks in the field? Give a brief account of the classification of sedimentary rocks. [1+3]
   b) Enumerate the various agents of metamorphism and explain their role. Describe important engineering significance of three rock type. [2+4]
5. a) Define attitude of geological structures. Distinguish between primary geological structures and secondary geological structures. [1+2]
   b) Describe the classification of fold on basis of position of axial plane. [2]
   c) Write the engineering significance of fault joint. [2.5]
6. a) What do you understand by epigene geological agent? Point out erosional landforms of wind and depositional landforms of glacier. [1+1.5+1.5]
   b) Describe factors of weathering. Describe Chemical weathering of rock. [1.5+1.5]
7. a) What are the soil types and rock types found in the Higher Himalaya zone, Midland zone and Dun Valleys? Differentiate Elluvial soil and lacustrine soil. [1.5+1]
   b) List out the physiographic division of Himalaya. [1.5]
8. Write short notes on: (Any one) [2]
   a) Rock cleavage
   b) Erosion

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2076 Ashwin

Exam.	Back		
Level	BE	Full Marks	40
Programme	BCE	Pass Marks	16
Year / Part	II / I	Time	1½ hrs.

Subject: - Engineering Geology I *(CE 503)*

- ✓ 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 scope and objectives of geology in the field of civil engineering. [2]
2. Describe crystal symmetry? Define Moh's hardness scale. [2+1]
3. a) Mention the factors of metamorphism. Describe metamorphic structures. [1+3]
   b) Describe civil engineering significance of Marble, Granite Sandstone. [3]
4. a) How can you Identify fold? Describe effects of faulting in civil engineering works. [1.5+3.5]
   b) Define Altitude. Determine the strike of bedding plane of limestone bedrock, which have dip direction N40°W and dip amount 64°. [1+4]
5. Mention geological works of different geological agents. Describe erosional features developed by wind and underground water. [1.5+2.5+2]
6. Discuss the tectonic division of Nepal Himalaya. [4]
7. Write short notes on: **(Any Two)** [2×4]
   i) Rock cleavage
   ii) Field identification criteria of fault
   iii) Physical weathering
   iv) Lutite

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2075 Chaitra

Exam.	Regular / Back		
Level	BE	Full Marks	40
Programme	BCE	Pass Marks	16
Year / Part	II / I	Time	1½ hrs.

Subject: - Engineering Geology I *(CE 503)*

- ✓ 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. Highlight the importance of engineering geology in civil engineering works. [2]
2. Define engineering geology according to IAEG. Differentiate convergent plate boundary and divergent plate boundary. [1+2]
3. Describe symmetry elements of crystals. Describe hardness of minerals. [1.5+1.5]
4. a) Describe Petrogenesis. How do you identify rocks in the field? Describe civil engineering significance of Granite, Phyllite and Sandstone. [2+3]
   b) Distinguish between concordant and discordant bodies of igneous rocks. [2]
5. How do you differentiate primary geological structures and secondary geological structure? Describe relationship of strike and dip of geological planes. Describe with illustration; how do you find out strike line when dip direction is measured? [2+2+3]
6. What is weathering? Describe in brief the factors that affect in weathering. [1+3]
7. What are the geological works of running water? Mention the features developed due to geological works of running water. [1+2]
8. Write short notes on following (any three) [3x2]
   a) Types of volcanoes
   b) Stalagmite and stalactite
   c) Mantle
   d) Isometric system
9. How do you differentiate physiographic division and tectonic division of Nepal? Describe. [2.5+2.5]

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05 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2075 Ashwin

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

Subject: - Engineering Geology I *(CE503)*

- ✓ 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 engineering geology and discuss the importance in civil engineering. [1+2]
2. Define plate tectonics and discuss the evolution of Himalaya. [3]
3. What is Mohs scale of Hardness? Describe the symmetry of crystal in detail. [1+2]
4. a) How do you differentiate Igneous rock and Sedimentary rocks in the field? [4]
   b) Write down the physical and engineering properties of Marble, Slate and amphibolite. [6]
5. a) Define fault with neat diagram and discuss its importance in civil engineering. [4]
   b) What is unconformity? Why unconformity is important in geological structure in civil engineering. [4]
6. a) What are geological agents? Describe the erosional landform developed by glaciers. [2+4]
   b) Differentiate between Conglomerate and Agglomerate. [2]
7. Mention the geomorphic sub-division of Nepal Himalaya and describe lesser Himalaya in detail. [2+3]

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03 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2074 Chaitra

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

Subject: - Engineering Geology I *(CE503)*

- ✓ 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 scope and objective of engineering geology in the field of civil engineering. [2]
2. What do you mean by Plate Tectonics? Differentiate between transform and divergent plate boundary. [2+2]
3. Write down the optical properties of minerals in Handspecimens. [3]
4. a) How do you differentiate three rock types in the field? [4]
   b) Write down the physical and engineering properties of phyllite, Granite and Limestone. [6]
5. a) Define joint and discuss the geometric classification of joint with its engineering importance. [4]
   b) Determine the dip direction of a bedding plane of limestone bed which has strike N55°E and dip amount 30°. [4]
6. a) What is geological cycle? Describe the depositional landform by wind. [2+4]
   b) What is Volcano? Discuss the positive topography developed by volcano. [2]
7. Classify the Nepal Himalaya based on lithology and describe higher Himalaya in detail. [2+3]

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03 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2074 Ashwin

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

Subject: - Engineering Geology I *(CE503)*

- ✓ 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 engineering geology as per IAEG. Describe scope of petrology and structural geology in the field of civil engineering in brief. [1.5+1.5]
2. Describe internal structure of the earth with suitable diagram. What are the basis of the study of internal structures? [2+1]
3. How do you classify minerals? Describe Isometric system with symmetry elements. [1.5+1.5]
4. a) Define and describe texture of sedimentary rocks. Describe rock cleavage. [3]
   b) What are the basis of rock identification in the field? [3]
   c) Describe physical and engineering properties of Limestone, phyllite and Granite. [3]
5. a) How is rock deformed? Describe type and stage deformation of rock. [3]
   b) How do you classify Joint? [3]
   c) What is relationship between strike and dip? How do you calculate apparent dip amount from measured true dip amount? [3]
6. a) Describe landform developed by erosion and deposition by running water and glacier. [5]
   b) What is volcanism? Describe chemical weathering. [3]
7. a) Describe physiographic division of Nepal Himalaya. [3]
   b) Describe classification of Terai zone with lithology. [2]

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03 TRIBHUVAN UNIV..RSITY
INSTITUTE OF ENGINEERIN
Examination Control Divi ion
2073 Chaitra

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

Subject: - Engineering Geology I *(CE503)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
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1. Define geology. Explain scope and importance in the context of Nepal. [0.5+1.5+1]
2. Describe plate tectonics. What are the plate boundaries? Describe mountain building process w.r.t. Himalaya. [0.5+1+1.5]
3. Describe Hardness of mineral with scale. What are the elements of crystals? [1.5+1.5]
4. a) Describe rock cycle with suitable diagram. How metamorphic rock formed? [3]
   b) Describe texture of igneous rock. [3]
   c) Describe physical and engineering properties of Quartile, Dolomite and Granite. [3]
5. a) How Fold and Joint formed? Describe parts of fault with suitable diagrams. [3]
   b) Describe classification of faults. [3]
   c) Define attitude of bedrock. A sandstone bedrock dips at 32°towards N 60°W; Find out strike of bedrock with illustration. [3]
6. a) Describe geological works of river and wind, with landform developed in brief. [5]
   b) What is weathering? Describe volcanic products. [3]
7. a) Describe geological division of Nepal Himalayas. [3]
   b) Describe lithology and altitude of Dun valley and Higher Himalaya. [2]

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03 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2073 Shrawan

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

Subject: - Engineering Geology I *(CE503)*

- ✓ 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. Mention relationship between civil engineering and Geology. [2]
2. Describe plate boundary. How is mountain formed? [3]
3. Describe physical properties of minerals. What are the elements of symmetry of orthorhombic system? [2]
4. a) How do you differentiate petrography and petrogenesis? Describe classification of sedimentary rocks. [1+3]
   b) Describe engineering properties, texture and structure of schist, sandstone and Phyllite. [6]
5. a) Describe criteria for identification of fault in the field. [2]
   b) How do you classify fault and joint genetically? Describe. [4]
   c) How do you calculate apparent dip amount, when true dip amount is measured? [4]
6. a) Describe factors for weathering. Mention erosional and depositional landform of wind. [1+4]
   b) Describe classification of volcano. [3]
7. Describe lithological characteristics of Higher Himalaya and Tethys zone. Describe altitude and lithology of churiya range, fore Himalaya and Trans Himalaya. [2+3]

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03 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2072 Chaitra

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

Subject: - Engineering Geology I *(CE503)*

- ✓ 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. Mention the importance of geology in civil engineering. [2]
2. How is Himalaya formed? Describe internal structure of the earth in brief. [1+2]
3. How do you define Hardness of mineral? Describe isometric system of crystal. [1+2]
4. a) How do you identify three rock types in field? Describe texture of sedimentary rock. [2+2]
   b) Describe texture, structure, mineral composition and engineering properties of quartzite, limestone and Granite. [6]
5. a) How do you differentiate fault and thrust? What are field evidences of fold? [2+2]
   b) Determine the strike direction of bedding plane when dipdirection in N40°W. [4]
   c) Describe deformations in rock strata. [1]
6. Define weathering. Describe depositional
   a) Features developed by river [2+3]
   b) Mention erosional features of glacier and underground water. [3]
7. Explain geological division of Terai and siwalik zone. Describe lithology and altitude range of Dun valley and midland. [3+2]

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03 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2071 Chaitra

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

Subject: - Engineering Geology I *(CE503)*

- ✓ 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 the mutual relationship between the two disciplines geology and engineering in the context of Nepal. [2]
2. Briefly describe the process of Himalayan evolution. Mention different types of plate boundaries. [1+1]
3. Define minerals. How do you differentiate silicate minerals and carbonate minerals in the field. [1+2]
4. a) How igneous rocks are formed? Describe the texture of sedimentary rocks. [2+2]
   b) Describe the physical and engineering properties of following rocks: [2×3]
      i) Granite
      ii) Schist
      iii) Dolomite
5. a) Define altitude of bed. Find out the strike of an inclined plane if the dip direction of the bed is N20°E with neat sketch? [2+4]
   b) Mention different types of primary sedimentary structures. Describe parts of fold with neat diagram. [1.5+2.5]
6. a) Differentiate between weathering and erosion. Describe the different types of landform produced by wind. [2+2]
   b) What is volcano? Mention different types of volcano? [1+3]
7. Mention the physiographic sub-division of Nepal Himalaya. Describe Indo-gangetic plain in detail. [2+3]

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03 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2072 Kartik

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

Subject: - Engineering Geology I *(CE503)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
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1. How IAEG defines engineering geology? [2]
2. What is mountain? Mention different types of plate boundaries with neat sketch. [0.5+1.5]
3. Define crystals. Describe hardness and tenacity of minerals. [1+2]
4. a) Describe characteristics of igneous, sedimentary and metamorphic rocks. [1+2+3]
   b) Describe physical and engineering properties of phyllite and limestone. [2+2]
5. a) Describe criteria for identification of fault and fold in the field. [4+2]
   b) Dip direction of gneiss bedrock is S 17°E. Find out strike of such rock with neat and suitable diagram. [4]
6. a) Mention the name of geological agents. What geological agents do? Describe erosional features developed by air and underground water. [0.5+0.5+4]
   b) Describe the causative factors for rock weathering. [3]
7. Describe tectonic division of Nepal Himalaya with suitable cross-section. Describe lithological and elevation characteristics of Mahabharat Range. [3+2]

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03 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2071 Shawan

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

Subject: - Engineering Geology I *(CE503)*

- ✓ 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 do you differentiate between Geology and Engineering Geology? [1+1]
2. What is plate tectonics? Mention different types of plate boundaries. [1+1]
3. Define Moh's Hardness Scale. Describe elements of crystals. [1.5+1.5]
4. Define Petrology. Describe the classification of sedimentary rock. [1+3]
5. Describe physical and engineering properties of following rocks: [3×2]
   a) Quartzite
   b) Slate
   c) Granite
6. Differentiate between Apparent dip amount and true dip amounts What is geological compass? [1+3]
7. What is geological structure? Describe types of geological structure . [2+4]
8. Define Geological cycle morine. Describe land form developed by geological works of running water. [2+2+4]
9. Describe tectonic division of Nepal Himalaya. Describe midland zone w.r.t elevation and rock characteristics. [3+2]

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03 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2070 Chaitra

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

Subject: - Engineering Geology I *(CE503)*

- ✓ 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 engineering geology according to IAEG. Sate the scope and objective of engineering geology. [1+1]
2. What is geological time scale? Describe the formation of Himalaya. [1+1]
3. How do you differentiate silicate and carbonate minerals? Describe the physical properties of minerals. [1+2]
4. Define Rock cycle. What are the characteristics metamorphic rocks? [1+3]
5. Describe the physical and engineering properties of the following rocks. [3×2]
   a) Gneiss
   b) Phyllite
   c) Limestone
6. Describe the different types of deformation in rocks. Give the geometrical classification of joints with neat diagram. [3+3]
7. What is fault? How do you differentiate between faults and fold in the field. [1+3]
8. Define volcano. Differentiate between and erosion. Describe the different types of landform produced by wind. [2+4+2]
9. Write down the geomorphic sub-division of the Nepal Himalaya. Describe the geology of lesser Himalaya. [2+3]

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04 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2070 Ashad

Exam.	Old Back (2065 & Earlier Batch)		
Level	BE	Full Marks	80
Programme	BCE	Pass Marks	32
Year / Part	II / I	Time	3 hrs.

Subject: - Engineering Geology *(EG523CE)*

- ✓ 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) How is the earth formed? Write down its structure and environment. [4+4]
   b) What is seismicity? Describe about fold mountains. [5+3]
2. a) Why do engineers carry out engineering geological studies in Nepal? Write down the relationship between geology and earth science. [4+4]
   b) Describe symmetry elements of crystals. How are minerals identified? Describe. [3+5]
3. a) How are sedimentary rocks formed? Describe texture of igneous rock. [3+5]
   b) Define fold. Describe effect and engineering significance of fault. [3+5]
4. a) How does mass movement occurred? Describe classification of landslide according to Varne. [3+5]
   b) Define site investigation. Describe sub-surface site investigation of foundation site of a Dam. [2+6]
5. a) Define Over break. Describe geological investigation activities in Tunnel. [3+5]
   b) Describe Darcy's law. Describe types of aquifer with suitable diagram. [4+4]
6. Write short notes on: [4×4]
   a) Physical properties of igneous rock
   b) Engineering classification of rock masses
   c) Interpretation of Topographic maps
   d) Geology of Terai siwalik zones

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2080 Baishakh

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

Subject: - Engineering Chemistry (*SH 403*)

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

1. What is single electrode potential? How is it originated? Illustrate it with zinc electrode. What is the emf of the following cell at 25°C? [1+2+2]
   $Zn(s)/Zn^{++}(0.2M)\|\ Ag^{+}$ (0.002 M)/Ag (s). The standard emf of the cell is 1.54V.
2. Derive Henderson's equation for basic buffer. The pH of a buffer solution containing 0.1 M CH_3COOH and 0.1 M CH_3COONa is 4.74. If 0.05 mole of HCl is added to one litre of this buffer solution. What will be the pH? (K_a of $CH_3COOH = 1.8\times10^{-5}$). [2+3]
3. Write about the different types of catalysts. Explain the adsorption theory of Catalysis using suitable example. [2+3]
4. How can a constant layer of ozone be naturally maintained in the stratosphere? Why is ozone layer indispensable for the existence of living beings? Explain how the use of chlorofluorocarbon has caused the depletion of ozone layer. [1+1+3]
5. What are water pollutants? Write the major sources, effects and remedies of water pollution. [1+4]
6. Distinguish between organic and inorganic polymer. Write the preparation and uses of Polymeric Sulphur $(PS)_n$ and Polythiazyl. [2+3]
7. What is FRP? Write down the preparation and uses of Teflon and Nylon 6,6. [1+2+2]
8. What are transition elements? Explain the colour formation and variable oxidation states of transition elements. [1+2+2]
9. Explain. Why (i) TiO_2 is colorless but $TiCl_3$ is not. (ii) Cu^{+} is diamagnetic whereas Cu^{++} is paramagnetic. [2.5+2.5]
10. How does double salt differ from complex salt? Draw the structure of $K_4[Fe(CN)_6]$ using Werner's postulates. Write the IUPAC name of the following: [2+1+2]
    i) $[Ni(CN)_4]^{2-}$ (ii) $K_2[ZnCl_4]$ (iii) $[Fe(H_2O)_6]^{3+}$ (iv) $Na_3[Al(C_2O_4)_3]$
11. Define complex compound. Explain the formation of $[Ni(CO)_4]$ and $[Fe(CN)_6]^{-3}$ on the basis of VBT. Also mention the magnetic property and geometry. [1+2+2]
12. What low explosive? Write the preparation and important uses of the explosives obtain from toluene and glycerol. [1+2+2]
13. a) List out the functions of lubricants. Explain solid lubricant with examples.
    b) What are the requisites of a good paint? [2+1+2]
14. a) What isomerism is shown by butenedioic acid and why?
    b) Distinguish between enantiomers and diastereoisomers with a suitable examples. [2+3]
15. Explain the reaction mechanism of hydrolysis of tert-butyl bromide. How does SN_1 differ from SN_2 reaction? [3+2]
16. Explain the saytzeff's rule with an example. Write the reaction mechanism of dehydrohalogeration of tertiary alkyl halide. [2+3]

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2079 Bhadra

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

Subject: - Engineering Chemistry (*SH 403*)

- ✓ 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 principle involved in the construction of galvanic cell. Draw the cell diagram and calculate the emf of following cell at 25°C. (Given: $E°Al^{3+}/Al$ = -1.66 V and $E°Cu^{2+}/Cu$ = 0.34V)
   Al (s) / Al^{3+} (0.75 M) || Cu^{2+} (0.50 M) / Cu (s) [2+3]
2. Give an example of a buffer solution with a pH less than 7 and show how it resists the PH change on addition of small amount of acid or base?
   100 ml of 0.2 M acetic acid solution is mixed with 300 ml of 0.3 M sodium acetate solution. Calculate the pH of resulting mixture. (pKa = 4.74) [2.5+2.5]
3. What is meant by homogenous catalysis? Explain the adsorption theory of catalysis with suitable example. [1+4]
4. What does a primary pollutant mean? What are the harmful effects of CO on human being? What is the difference between good ozone and bad ozone? [1+2+2]
5. a) Define the terms BOD and COD.
   b) Define soil pollution. What are the causes of soil pollution? [2+1+2]
6. What are the general characteristics of inorganic polymer? Write the preparation and uses of chalcogenide glasses. Also mention two uses of silicones. [2+2+1]
7. Define the term biodegradable polymer with suitable example. Write down the preparation and application of Teflon and polyurethane. [1+2+2]
8. Why does d-block element is called transitional element? Describe the 3d series elements on the basis of color formation and variable oxidation state. [1+2+2]
9. Explain the variation of ionization potential across the 3d series of elements. Why are copper (II) complexes paramagnetic but copper (I) complexes diamagnetic? [2+3]
10. Write the postulates of Werner's coordination theory. Show the Werner's representation of $Co(NH_3)_4$. Cl_2 and Co $(NH_3)_5$. Cl. Write the IUPAC name of following complexes:
    (i) Na_4 [Fe $(CN)_6$] (ii) [$Ag(CN)_2]^-$ [2+2+1]
11. Explain on the basis of valence bond theory-$[Co\ (NH_3)_6]^{3+}$ is diamagnetic but $[Cu\ (NH_3)_6]^{2+}$ is paramagnetic. [2.5+2.5]
12. What are plastic explosives? Write the preparation and uses of trinitrotoluene (TNT) and Gun cotton. [1+2+2]
13. a) What are the requisites of a good paint? Write the uses of emulsion.
    b) What is the purpose of lubrication? Mention the conditions at which the solid lubricants are used. [2.5+2.5]
14. a) Explain the condition required for optional activity of a molecule. Explain the stereoisomeric forms of 3-bromo-2-butanol.
    b) Write the cis and trans isomers of butene dioic acid. [1+2+2]
15. Explain the reaction mechanism for the hydrolysis of tertiary alkyl halide by aqueous NaOH. How the nature of solvent governs S_N1 and S_N2 reaction? [3+2]
16. What is elimination reaction? Discuss the mechanism of E2 reaction. Write your acquaintance with Sayrzeff's rule. [1+2+2]

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division

2079 Baishakh

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

Subject: - Engineering Chemistry *(SH 403)*

- ✓ 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. Give an example of an acidic buffer and show how it resists the change in its pH on addition of strong acid or base. Calculate the pH of 200 ml of 0.2 M CH_3COOH in which 100 ml of 0.15 M NaOH is added. [3+2]
2. Define an electrochemical cell. What is the role of salt bridge in a voltaic cell? Calculate the emf of the following cell: [1+1+3]

   $Mn/Mn^{2+}//Fe^{2+}/Fe$

   When an iron rod is immersed in 1.0 M $FeSO_4$ solution and Mn rod is immersed in 0.1 M $MnSO_4$ solution. Given $E°_{Fe/Fe}{}^{++} = 0.44$ V and $E°_{Mn}{}^{++}{}_{/Mn} = -1.18$ V.
3. Define autocatalysis with examples. Write any two criteria for choosing a catalyst for industrial purposes. Explain with an example the adsorption theory of catalysis. [2+1+3]
4. What are major pollutants? Mention the possible remedies for water pollution. [1+4]
5. Write short notes on: (a) Acid rain and its effect and (b) Global warming [2.5+2.5]
6. Give an account of polymeric sulphur nitride and Silicones. [2.5+2.5]
7. What is non-biodegradable polymer? Give the preparation and uses of Polystyrene and epoxy resins. [1+4]
8. Explain diamagnetic, paramagnetic and ferromagnetic substances with example? Illustrate why does the paramagnetism in 3d – transition elements first increase, reach the maximum near the middle of the series and then decrease? [3+2]
9. a) Explain why compounds of V^{5+} are colourless but V^{3+} are coloured.
   b) Discuss complex formation in the case of transition elements. [2.5+2.5]
10. $[Ni(CN)_4]^{2-}$ ion has a square planar geometry and $[Ni(CO)_4]$ has tetrahedral geometry. Explain this on the basis of valence bond theory and discuss their magnetic behaviour. [5]
11. a) Define ligands. Classify them with examples on the basis of the number of donor sites. [1+2]
    b) Using IUPAC names, write the formula for the following: [2]
       (i) Potassium tetracyanonickelete (II)
       (ii) Pentaamminenitritocobalt (III) ion
       (iii) Tetrahydroxozincate (II) ion
       (iv) Chlorobis (ethylenediamine) nitrocobalt (III) chloride
12. What are the characteristics of an explosive? Give the preparation and uses of 2, 4, 6-trinitrotoluene and nitrocellulose. [1+2+2]
13. a) Define paints and mention their major requisites.
    b) What are lubricants? Write the functions of lubricants. [2.5+2.5]
14. Write the possible stereo isomers of 2, 3-dichloropentane and mention the possible enantiomers and diastereomers. Why is isomer less stable than trans-isomer? [3+2]
15. Why does SN_2 reaction proceed with inversion of configuration only? Explain the mechanism involved in the hydrolysis of tertiary alkyl halide with aqueous NaOH. [2+3]
16. What is meant by bimolecular elimination reaction? Describe the mechanism for the dehydrohalogenation of 3° alkyl halide. [2+3]

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division

2078 Kartik

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

Subject: - Engineering Chemistry *(SH 403)*

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

1. What is Daniel cell? Calculate the emf of the following combination. [1+4]

   $Fe^{++}(0.2M) \rightarrow Fe^{+++}(0.1M) + e^-$, $E^\circ = -0.77V$

   $Cu^{++}(0.3M) + 2e^- \rightarrow Cu$, $E^\circ = 0.34V$

2. Derive Henderson equation. To 1 liter of buffer solution containing 0.1M NH_4OH and 0.2M NH_4Cl, if 0.2 g of NaOH is added, what will be the pH of the resulting solution? [pK_b=4.74]. [2+3]

3. a) Define the terms: [2×1]

   (i) Auto Catalyst
   (ii) Catalytic poisons

   b) Describe the absorption theory of catalysis with an example. [3]

4. What is Particulate Matter (PM)? What are the types and sources of particulate matter causing air pollution? Also mention their adverse effect. [1+2+2]

5. Write the consequence of acid rain. How do oxides of Nitrogen and sulphur make water acidic? [2+3]

6. What do you mean by biodegradable polymers? Give the preparation and uses of epoxy resin and polystyrene. [1+4]

7. What is inorganic polymer? Write the preparation and uses of Polyphosphazine and Polymeric sulphur. [1+4]

8. Why are d-block elements called transition elements? Write the electronic configuration of elements of 3d series. [1.5+3.5]

9. Mention the main reasons of exhibiting variable oxidation states of transition elements. Manganese exhibits the highest oxidation state among the 3d elements, why? Cu^{+2} compounds are coloured and paramagnetic while Zn^{+2} compounds are white and diamagnetic, explain. [2+1+2]

10. Compare the magnetic behaviour of the complex $[NiCl_4]^{2-}$ and $[Ni(CN)_4]^{2-}$ using valence bond theory. [2.5+2.5]

11. a) What do you understand by a chelating ligand? Describe Sidwick theory of co-ordination compounds with an example. [1+2]

    b) Name the following complexes by IUPAC system. [4×0.5]

    (i) $[Co(NH_3)_5SO_4]Br$
    (ii) $[Co(en)_3]Br_3$
    (iii) $K_3[Cr(NO_3)_6]$
    (iv) $[Ni(CN)_4]^{2-}$

12. What is explosive? Write the preparations and uses of trinitrotoluene(TNT) and trinitrocellulose. [1+4]

13. a) Mention the functions of lubricant and discuss about solid lubricant. [2.5]

    b) Write requisites of good paints and mention the important constitutes of paints. [2.5]

14. a) Give the necessary conditions for the molecule to exhibit geometrical isomerism and write an example with Z and E notation. [2.5]

    b) Write the possible optical isomer of 2, 3-dichloropentane and distinguish enantiomers and diastereomers. [2.5]

15. a) Explain the mechanism of the reaction of bromomethane in aqueous potassium hydroxide. [3]

    b) What types of nucleophile and solvent favours SN_2 and SN_1 reaction mechanism? [2]

16. Discuss the mechanism for the reaction of tertiary alkyl halide with alcoholic sodium hydroxide. Write the differences between E_1 and E_2 reactions. [3+2]

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2078 Bhadra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BCE, BGE, BME, BCM	Pass Marks	32
Year / Part		Time	3 hrs.

Subject: - Engineering Chemistry *(SH 403)*

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

1. What is normal hydrogen electrode? Calculate the emf of given combination at 20°C; [2+3]
   (i) $Fe^{++}(1M) = Fe^{+++}(0.2M) + e$, E^0=-0.77V
   (ii) $Sn^{++}(0.3M) + 2e = Sn$, E^0 = -0.14V
2. Could you prepare the acidific buffer of pH =1? Why and how? Calculate the pH of mixture obtained by mixing 50cc of 0.5N NH_4OH and 100cc of 0.2M NH_4Cl solutions. ($Kb = 1.8\times10^{-5}$) [2+3]
3. What are the characteristics of Catalysts? Explain their activity on the basis of adsorption theory of catalysis. [2+3]
4. a) Why are the oxides of sulphur called air Pollutants? [2]
   b) Mention the sources and consequences of greenhouse effect. [3]
5. What are the effect of soil pollution in agriculture and living beings? How is soil pollution controlled? [3+2]
6. How do you prepare polythiazyl? Mention the applications of polyphosphazines and chalcogenide glasses in engineering field. [2+3]
7. Discuss about the conducting polymers. Write the preparation and uses of Teflon and epoxy resin. [1+4]
8. Why are d-block elements called transition elements? Explain the origin of colour in transition metals on the basis of d-d transition. [1+4]
9. Explain the followings: [2×2.5]
   a) Presence of the unpaired electrons makes substance paramagnetic.
   b) Variable oxidation states are the main characteristic of transition elements.
10. a) Differentiate between double salt and complex salt with examples. [3]
    b) Write the IUPAC names of the followings: [2]
    (i) $Na_4[Fe(CN)_6]$ (ii) $[Zn(OH)_4]^{2-}$ (iii)$[Co(NH_3)_4Cl_2]Cl$ (iv)$[Co(en)_2Cl_2]^+$
11. Using VBT approach, explain the formulation of $[Fe(CN)_6]^{3-}$ and $[FeF_6]^{3-}$ and differentiate between these two. [4+1]
12. a) What is geometrical isomerism? Why is trans-isomer more stable than cis-isomer? [2]
    b) How do enantiomers differ from diastereomers? Illustrate with an example. [3]
13. a) Explain the mechanism for reaction between tertiary butyl bromide with aqueous KOH. [3]
    b) How does SN_2 reaction differ from SN_1 reaction? [2]
14. What is Saytzeff's rule? Explain it with an example. Explain the reaction mechanism for the dehydrohalogenation of tertiary alkyl halide. [2+3]
15. Give an account of low and high explosives. Write the preparation and uses of TNT. [3+2]
16. a) Show your acquaintance with liquid, semisolid and solid lubricant with examples. [3]
    b) Discuss two types of paints showing their applications in engineering works. [2]

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2076 Chaitra

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

Subject: - Engineering Chemistry *(SH 403)*

- ✓ 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. What is normal hydrogen electrode? How do you measure standard reduction potential of zinc electrode? Calculate the emf of the cell at 25°C, $Ni/Ni^{++}(0.8M)$ // $Ag^{+}(0.2M)$ / Ag
   Given, $E°\ Ni/Ni^{++} = +0.25V$, $E°\ Ag/Ag^{+} = -0.80V$. [1+1+3]
2. Explain the mechanism of basic buffer. Calculate the PH of the resulting buffer solution containing 100ml of 0.5M NH_4OH and 40ml if 1 M NH_4Cl in which 20cc of 0.5HCl is added. [2+3]
3. What is catalyst promoters? How does a catalyst increase the speed of reaction? Explain with example. Explain intermediate compound formulation theory of catalysis. [1+2+2]
4. What are the main sources of water pollution? Mention the measures to control water pollution. [2+3]
5. What is meant by ozone depletion? Write consequences of global warming and its possible remedies. [2+3]
6. What are biodegradable polymers? Write down the preparation and uses of Bakelite and Epoxy resin. [1+2+2]
7. What are polyphorphazenes? How are different types of polyphorphorzenes prepared? Mention the applications of polythiazyl in engineering field. [1+3+1]
8. Variable oxidation state is the main characteristics of transition elements, explain with reference to 3d series. [5]
9. Explain the followings.
   i) Mn^{+2} is more paramagetic than Cu^{+2}.
   ii) Zn^{+2} compounds are white while Fe^{+2} compounds are colored.
   iii) Transition elements from alloys. [2+2+1]
10. a) Differentiate between double and complex salts. Predict the magnetic properties of $[Co(NH_3)_6]Cl_3$ with the help of EAN. [2+1]
    b) Write the IUPAC name of the followings: [2]
    (i) $Na_3[Al(C_2O_4)_3]$
    (ii) $[C_o(NH_3)_4Cl_2]Cl$
    (iii) $[Cr(NH_3)_6]^{3+}$
    (iv) $[Zn(OH)_4]^{2+}$
11. With the help of VBT approach, point out the differences between $[Fe(CN)_6]^{4-}$ and $[FeF_6]^{3-}$ complex ions. [2.5×2]
12. a) Show your acquaintance with liquid and semi liquid lubricants. [2.5]
    b) What do you understand by paints? Mention the requisites of a good paint. [2.5]
13. What isomerism is shown by tartaric acid and why? Write the possible forms of tartaric acid and mention enantiomers and mesocompound. [5]
14. What is SN reaction? Explain the reaction mechanism of hydrolysis of tertiary alkyl halide by aqueous NaOH. [1+4]
15. Describe the mechanism of E^{1} reaction with suitable example. Give an account of Sayteff's rule. [4+1]
16. What are primary and low explosives? Write the preparation and uses of TNT and TNG. [5]

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2075 Chaitra

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

Subject: - Engineering Chemistry *(SH 403)*

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

1. What is normal hydrogen electrode? Why is salt bridge used in the construction of galvanic cell?
   Calculate the emf of the following cell at 20°C, Cr/Cr^{+++} (0.5M) // Fe | Fe^{++} (0.2M).
   Given $E°_{Cr/Cr^{+++}} = 0.75V$ and $E°_{Fe^{++}/Fe} = -0.44V$. [1+1+3]
2. Differentiate between acidic and basic buffers.100 ml of 0.5 M NH_4OH is mixed with 400 ml of 0.1 M NH_4Cl. what will be the pH of this solution. When 20 ml of 0.5 M HCL is added to it? K_b for $NH_3 = 1.8 \times 10^{-5}$ [2+3]
3. Define catalytic promoter and catalytic poison. Explain the adsorption theory of catalysis with a suitable example. [2+3]
4. Write down the major water pollutants and their harmful effects on mankind. Mention their possible remedies. [5]
5. Mention the major gases for causing green house effect and how are these gases released in the atmosphere? Mention the possible measures to control the global warming. [3+2]
6. Write down the preparation of polymeric sulphur nitride. Mention the engineering applications of polymeric sulphur nitride and chalcogenide glass. [2+3]
7. What are biodegradable and non biodegradable polymers? Mention the applications of Bakelite and epoxy resin. [2+3]
8. What are transition elements? Explain the colour of transition elements on the basis of d to d transition. [1+4]
9. What are d block elements? Why does the number of unpaired electron make the compound paramagnetic? Calculate the magnetic moment if the metal ion contains five unpaired electrons. [1+3+1]
10. a) What is primary valency? Describe simple test to distinguish between the following pairs of complexes on the basis of Werner's theory, (i) $[Co(NH_3)_5Cl]SO_4$ and $[Co(NH_3)_5SO_4]Cl$.
    b) Name the following complexes by IUPAC system
    (i) $[Cr(H_2O)_4(NH_3)_2]Cl_3$ (ii) $[Pt(NH_3)_2Cl_2]$ (iii) $Na_3[Al(C_2O_4)_3]$
    (iv) $[Co(NO_3)_6]^{3-}$ [2.5+2.5]
11. Explain the formation of (i) $[Fe(CN)_6]^{4-}$ and $[FeF_6]^{3-}$ ions with the help of VBT approach. Explain which one is inner orbital complex and outer orbital complex. [2.5+2.5]
12. What are high and low explosives? Write the important uses of TNT and TNG. [2+3]
13. a) What are lubricants? Mention the function of lubricant.
    b) What is paint? What are the major constituents of paint? Mention the requisites of paints. [2.5+2.5]
14. What is optical isomerism? Show all the possible stereoisomers of tartaric acid indicating enantiomers and meso-forms. [1+4]
15. Explain why SN^1 reaction gives the products with both retention and inversion of configuration but SN^2 gives only inversion of configuration. Write the mechanism of reaction between tertiary alkyl halide and aqueous sodium hydroxide. [2+3]
16. Explain the mechanism of E^1 reaction with a suitable example. Write the differences between E^1 and E^2 reactions mechanism. [3+2]

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2076 Ashwin

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

Subject: - Engineering Chemistry *(SH 403)*

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

1. What is single electrode potential? Write down the cell notation for standard hydrogen electrode. How will you predict the spontaneity of any redox system using emf? The value of E° for the $Zn(s) + Cu^{2+}(aq) \rightarrow Cu(s) + Zn^{2+}(aq)$ is 1.10 V. What is the value of E_{cell} when the concentration of Cu^{2+} is 1.0 M and the concentration of Zn^{2+} is 0.025 M? [1+1+1+2]
2. What happens when a small amount of acid or base is added on a buffer solution of acetic acid and sodium acetate? Determine the amount of sodium acetate required in 100 ml 0.2M acetic acid solution to prepare a buffer solution of pH 5.8 pK_a for acetic acid = 4.74 [2+3]
3. Differentiate between negative catalysis and catalytic poisoning. How a catalyst work and what is the role of promoter? [2+2+1]
4. What are the primary and secondary air pollutants? Describe with examples. What is acid rain and how does it occur? [2+1+2]
5. What is water pollution? What are the major pollutants that should be monitored in order to explain the drinking water quality? [1+4]
6. a) How do you differentiate a double salt from a complex? Explain with examples. [2]
   b) Write the IUPAC name and calculate the effective atomic number of following complexes. [3]
   (i) $[Co(NH_3)_3Cl_3]$ (ii) $K_3[Fe(C_2O_4)_3]$ (iii) $[AI(OH)(H_2O)_5]^{2+}$
7. What are low and high spin complexes? How does valance bond theory explain the geometry and magnetic behavior of a complex? Explain with reference to $[Fe(CN)_6]^{3-}$ [1+2+2]
8. Give the reasons for:
   a) Cu^+ compounds are diamagnetic where as Cu^{++} compounds are paramagnetic.
   b) Ti^{+++} compounds are colored where as Ti^{++++} compounds are colorless. [2.5+2.5]
9. What are transition elements? Why are they called so? Why do transition elements form complex. [1+1+3]
10. Define the following terms: [1×5]
    a) Primary explosives b) Secondary explosives c) Tertiary explosives
    d) Low explosives e) High explosives
11. Explain the chemical separation of racemic mixture. Write the structure cis and trans isomers of cyclo-octene. [2+3]

12. Write all the possible stereoisomers of tartaric acid. 'The meso form of tartaric acid cannot rotate plan polarized light.' Explain. [3+2]

13. Define the following terms: [1×5]

a) Solid lubricant b) Enamel c) Varnish d) Semi solid lubricants
e) Emulsion paints

14. What are biodegradable polymers? Describe the preparation and uses of polystyrene. [1+2+2]

15. Describe the preparation and uses of polyphosphazine. 'The SN^1 reaction gives both retention and inversion product but SN^2 reaction fevers inversion product.' Explain. [2+3]

16. What do you mean by elimination reaction? Explain the reaction mechanism of E1 reaction. [2+3]

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03 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2074 Chaitra

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

Subject: - Engineering Chemistry *(SH403)*

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

1. What is an electrochemical series? How does an electrolytic cell differ from a galvanic cell? Calculate the emf of the following cell at 25°C [1+2+2]

   $Zn/Zn^{++}(0.1M)//Cu^{++}(0.05M)/Cu$

   Given, $E^0Zn^{++}/Zn = -0.76V. E^0Cu^{++}/Cu = 0.34V$

2. a) How does an acidic buffer solution containing acetic acid and sodium acetate resist the change in p^H in in spite of the addition of the small amount of acid or base? Explain it. [2]

   b) Calculate the pH of resulting solution when 0.01 mole of NaOH is added to 500ml of 0.1M acetic acetic acid (p^{ka} for acetic is 4.74) [3]

3. What is homogeneous catalyst? How does a catalyst alter the rate of reaction? Explain with example. [1+4]

4. What is water pollution? Write down the major sources of water pollution and mention the possible measure to control. How does the oxides nitrogen make the water acidic? [1+3+1]

5. Write short notes on: [2.5+2.5]

   i) Ozone layer depletion
   ii) Global warming due to air pollution

6. What is conducting polymer? Describe the preparation and uses of polyurethane and Epoxy resin. [1+2+2]

7. a) Write down the structure of cyclic and cross linked silicones and also give the engineering applications of silicones. [1+1]

   b) What are the general characteristic of inorganic polymer? Write the preparation and uses of polymeric sulphur. [1+2]

8. Give reasons: [5]

   a) Transition elements are mostly paramagnetic
   b) Transition elements and their compounds show catalytic behavior
   c) $Fe_2(SO_4)_3$ is more stable then $FeSO_4$
   d) Compound of Ti^{+3} are coloured but those if Ti^{+4} are colourless
   e) Zn in 3d series is called typical transition element

9. Write the expected and actual electronic configuration of Cr in box notation. Why the actual electronic configuration of Cr is different from expected electronic configuration? In the 3-d transition series the size of atom decreases from Sc to Cr but the size remains almost similar from Cr to Zn. Explain. [1+1+1+2]

10. How does valence bond theory explain the geometry and magnetic behavior of a complex? Explain with suitable example. [5]

11. a) Explain the formation of $[FeF_6]^{3-}$ on the basis of VBT and predict its geometry as well as magnetism. [3]

    b) Write IUPAC names of the given examples. [2]

    i) $[Ni(CO)_4]$

    ii) $K_4[Fe(CN)_6]$

    iii) $Na[Ag(CN)_2]$

    iv) $K_2[HgI_4]$

12. What primary explosives, low explosives and high explosives? Write the preparation and uses of nitroglycerine. [3+2]

13. a) What is lubricant? In what situation grease and solid lubricant are used? [1+2]

    b) What are the characteristics of good paints? [2]

14. Explain enantiomers, racemic mixture and meso compounds with examples. Draw the structures and specify Z and E configuration of 4-methyl hept 3-ene and 2-chlori pent 2-ene. [3+2]

15. Describe the bimolecular nuclephilic substitution reaction in haloalkane with suitable example. What type of solvent is favour for this reaction? Write down the differences between S_{N_1} and S_{N_2} reactions? [2+1+2]

16. Explain the reaction mechanism of dehydrohalogenation of tertiary butyl bromide by alcoholic caustic soda. Mention the factors governing the mechanism of E1 reaction. [3+2]

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03 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2073 Chaitra

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

Subject: - Engineering Chemistry *(SH403)*

- ✓ 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 Buffer. Write the mechanism of acidic buffer. Calculate the pH of the solution formed by adding 0.2 g of sodium acetate in 200 mL 0.1 M acetic acid. pKa for acetic acid = 4.74. [1+2+2]
2. What is standard hydrogen electrode? How is it used to measure the single electrode potential? Why is salt bridge used in construction of galvanic cell? Calculate the emf of the following cell at 25°C. [1+1+1+2]
   [$E^0_{Ni^{++}/Ni}$ = -0.24V and $E^0_{Pb^{++}/Pb}$ = -0.12V].
   Ni (s) /Ni^{2+}(aq) (1M)//Pb^{2+}(aq) (1M)/Pb(s)
3. Explain with an example the mechanism of adsorption theory of catalysis. Write the differences between homogenous and heterogenous catalysis. [4+1]
4. Define soil pollution. Write the major sources of soil pollution, their negative effects and control measures. [1+2+2]
5. Write the formation, effects and remedies of SOx and NOx. [2.5+2.5]
6. What are biodegradable polymers? Give the preparation and uses of Nylon 6,6 and polyurethane. [1+2+2]
7. Describe the preparation and uses of polymeric sulphur $(PS)_n$ and polyphosphazines. [2.5+2.5]
8. Give an account for the following: [1+1+3]
   a) Cu^{2+} ($3d^9$) is more stable than Cu^+ ($3d^{10}$). Justify the statement.
   b) Why Zinc is called non-typical transition element?
   c) Explain magnetic properties of transition elements.
9. Explain with reasons:
   a) Transition metals can form most of the complex compounds.
   b) Zinc (II) compounds are white and diamagnetic while copper (II) compounds are colored and paramagnetic. [2.5+2.5]
10. Explain the formation of $[Co(NH_3)_6]^{3+}$ and $[CoF_6]^{3-}$ on the basis of Valence Bond Theory and also predict their magnetic property. [2+2+1]
11. Write the basic assumptions of Werner's theory of co-ordination compounds. $CoCl_3.4NH_3$ gives a precipitate with $AgNO_3$ solution. Explain it on the basis of Werner's theory. [3+2]
12. What are plastic explosives? Write the advantages of plastic explosives. Write the preparation of TNT, TNG and nitrocellulose. [1+1+3]

13. a) What are lubricants? Show your familiarity with application of different types of lubricants.
    b) Explain the method of application of paints in galvanized iron. [1+2+2]

14. a) Explain geometrical isomerism with examples. [1.5]
    b) Write all possible stereoisomers of 2,3-dibromopentane. Identify all possible enantiomers and diastereomers from the stereoisomers. [3.5]

15. What are the differences between E^1 and E^2 reactions? Explain the reaction mechanism for the reaction of primary alkyl halide with alcoholic NaOH. [2+3]

16. Why does SN^1 reaction give both retention and inversion isomers but SN^2 gives only inversion isomer? Write the mechanism for the reaction between bromoethane and aq.NaOH. [2+3]

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03 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2074 Ashwin

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

Subject: - Engineering Chemistry *(SH403)*

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

1. What is meant by Normal Hydrogen Electrode? Discuss its use to measure standard electrode potential of copper electrode. Calculate Emf of the following cell at 20°C.

   $Al(s) / Al^{+3}(0.2M) // Cu^{+2}(0.1M) / Cu(s)$
   Given: $E^0_{Al/Al^{+3}} = +1.66V$ and $E^0_{Cu/Cu^{+2}} = -0.34$ V [1+1.5+2.5]

2. What is meant by 'buffer solution' and buffer action? A litre of solution containing 0.5 mole of CH_3COOH and 0.5 mole of CH_3COONa provides a buffer of pH 4.74. Calculate the pH of solution after the addition of 0.02 mole NaOH [$K_a = 1.8\times10^{-5}$] [2+3]

3. Define Heterogenous catalysis. What are the general characteristics of a catalyst? Explain adsorption theory of catalysis. [1+2+2]

4. Write short notes on: [2.5+2.5]

   a) Global warming b) Acid Rain

5. What is soil pollution? Point out major soil pollutants, their effects and possible remedies? [1+4]

6. a) Why do the transition elements form complexes? [2.5]

   b) Why do the transition metals exhibit variable valency? [2.5]

7. a) What are transition elements? Which of the d-block elements are not considered as typical elements and why? [1+2]

   b) Write the electronic configuration and group of the following elements Cr, Fe, Cu and Zn. [2]

8. $[Fe(CN)_6]^{3-}$ and $[FeF_6]^{3-}$, both are octahedral complexes. Explain the difference between these two complexes on the basis of VBT. [5]

9. a) How do you distinct a double salt from a complex salt?

   b) Write the IUPAC names of the following co-ordination compounds.

   (i) $[Co(H_2O)_2(OH)_4]^-$ (ii) $[Ni(CN)_4]^{2-}$

   (iii) $K_3[Al(C_2O_4)_3]$ (vi) $[Cu(NH_3)_4]SO_4$ [3+2]

10. Define the following terms with example. [1×5]

    a) pigment b) thinner c) solid lubricant d) varnishes e) lacquers

11. Write the differences between organic and inorganic polymers. Write the preparation and applications of polyphosphazines. [2+3]

12. Write the method of preparation and two important uses of Bakelite and polyurethane. [2.5+2.5]

13. Write preparation and two important uses of

    a) TNT b) TNG [2.5+2.5]

14. How do enantiomers differ from diasteromers? Write all the possible stereoisomers of a compound that contain two asymmetric carbon atoms. [3+2]

15. What is elimination reaction? Explain the reaction mechanism for the dehydrohalogenation of primary alkyl halide. [1+4]

16. What are the factors affecting S_N^1 and S_N^2 reactions. Explain SN^2 reaction mechanism with reference to hydrolysis of alkyl halide. [2.5+2.5]

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03 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2072 Chaitra

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

Subject: - Engineering Chemistry *(SH403)*

- ✓ 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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1. What is buffer solution? Derive Henderson's equation for basic buffer. Calculate pH of a mixture of 10 m*l* of 0.1M ammonium chloride solution and same volume of 0.2 M ammonia solution. (pKb for ammonia solution = 4.74). [1+1+3]

2. [illegible] a galvanic cell generate electricity? Construct a cell with the following cell [illegible] standard emf of the cell. [1+1+1+2]

   [illegible]298K

   (1M) (1M)

   Given, standard reduction potential of Al and Zn are -1.66V and 0.76 V respectively.

3. What is catalysis? Explain intermediate compound formation theory and an industrial application of catalysis. [1+2.5+1.5]

4. What are the parameters of water pollution? Explain its causes and adverse effects. [3+1+1]

5. Write the functions of lubricant. Show your acquaintance with fluid film lubrication and its role in engineering. Give an example each of (a) semi solid lubricant and (b) emulsion. [1+2+1+1]

6. Write short notes on: (any two) [2.5+2.5]
   i) Global warming
   ii) Formation and depletion of ozone layer
   iii) Acid rain and its effects

7. What is conducting polymer? Give an account of polyphosphazines and chalcogenide galsses. Also write their applications in engineering field. [1+2+2]

8. Explain the following: [2+3]
   i) 3d- transition series show variable axidation states
   ii) Completely filled 3-d transition series are unable to form coloured compounds

9. What is a complex ion? Give example of a (i) complex cation and (ii) complex anion, with their IUPAC name. Also calculate EAN of central metal of these ions. [1+1+1+1+1]

10. Show your acquaintance on the basis of hydbridisation with inner orbital and outer orbital complexes with example. [2.5+2.5]

11. Differentiate between high explosive and low explosives. Write the preparation and applications of TNT. [3+2]

12. Write the method of preparation and uses of (a) polystyrene (b) Bakelite [2.5+2.5]

13. Distinguish between enantiomers and diastereomers. Show all optical isomers of (a) 3-Bromo 2-butanol and (b) Tartaric acid. Also show optically inactive meso form of tartaric acid. Explain why 3-Bromo 2-butanol doesn't exist in meso form. [1+1.5+1+1+0.5]

14. Explain E_2 and E_1 reactions with referance to dehydrohalogenation of haloalkane and point out the factors affecting these mechanism. [1.5+1.5+2]

15. Why does haloalkane favour S_N reaction? Explain why there is only inversion product in S_N2 and both inversion and retention products in S_N1 path. [1+2+2]

16. What is plastic explosive? Write preparation and uses of following: (a) TNT (b) Dynamite [1+2+2]

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03 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2073 Shrawan

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

Subject: - Engineering Chemistry *(SH403)*

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

1. What is salt bridge? Write its functions. Write electrode reaction, net cell reaction, EMF of the cell at 25°C and cell notation of the following electrode couple and also predict the spontaneity of the cell reaction. [1+1+3]

   $E^0Fe/Fe^{++} = 0.44V$, $E^0Ag/Ag^+ = -0.80V$

   $[Fe^{++}] = 0.01M$, $[Ag^+] = 0.1M$

2. What is buffer capacity? Write the characteristics of buffer solution. 200 ml of 0.1M C_6H_5 COONa is mixed with 400 ml of 0.2 M C_6H_5COOHa at 30°C dilute solution. Calculate the pH of solution. [1+2+2]
3. Explain the terms: (a) Acetocatalyst (b) Catalytic poisoining and (c) Promoters. [2+3]
4. Explain the mechanism of ozone layer depletion. Write its preventive measures and secondary pollution effects in troposphere. [2+1.5+1.5]
5. Define soil pollution. Write the major sources of soil pollution, their negative effects and control measures. [1+2+2]
6. Write short notes on: [2.5×2]
   i) Polyphosphazine
   ii) Chalcogenide glasses
7. a) Give an account for biodegradable and non biodegradable polymer with suitable example.
   b) What are fibers reinforced plastics? Write down the characteristics and its application. [2.5+2.5]
8. What are transition elements? How do they show: (i) catalytic behaviour (ii) coloured ions and (iii) variable oxidation states? [0.5+1.5+1.5+1.5]
9. Explain the formation of $[NiCl_4]^{2-}$ and $[Ni(CN)_4]^{-2}$ on the basic of VBT of coordination compounds. [2.5×2]
10. a) Write the formula of the following IUPAC name: [2]
    i) Potassium penta cyano nytrosyl ferate (III)
    ii) Pentaammine chloro cabalt (III) ion
    iii) Tetracarbonyl cabalt (O)
    iv) Pentamminenitrito cobalt (III) sulphate
    b) "$[Fe(CN)_6]^{4-}$ is diamagnetic but $[Fe(CN)_6]^{3-}$ is paramagnetic" justify. [1.5+1.5]

11. What are lubricants? What are the characters of good lubricants? What is emulsm paint? Write its applications? [1+2+1+1]

12. Define explosive. How it is used for defense purpose? What are the uses of TNT, TNG and cellulose nitrate? [1+1+1+1+1]

13. What are geometrical isomers? Geometrical isomer is not possible in the compound $CH_3CH = CH_2$ explain. Why are trans isomers more stable than Tis-isomers? [1+2+2]

14. What is a nucleophilic substitution reaction? Differentiate between SN^2 and SN^1 reactions. Write the factors affecting SN^2 and SN^1 reactions. [1+2+2]

15. Explain reaction mechanism for dehydrohalogenation of tertiary butyl bromide. What solvent favours the reaction mechanism? [4+1]

16. Write ground state electronic configuration of 3d transition series. How do you explain the formation of complexes by 3d transition elements? [2+3]

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03 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2072 Kartik

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

Subject: - Engineering Chemistry *(SH403)*

- ✓ 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. Derive the equation required to calculate the emf of cell at non-standard condition. What are the factors that affect the single electrode potential value? Calculate the oxidation electrode potential of given half cell reaction at 20°C. [2+1+2]

   $Fe^{+++}(0.1M) + e \rightarrow Fe^{++}(0.2M), E^0 = +0.77V$

2. What are the criteria for buffer system? Calculate the change in pH of buffer system having 200 cc of 0.1 m CH_3COOH and 0.1 M CH_3COONa when 1 millimole NaOH is added into it. ($K_a = 1.8\times10^{-5}$) [2+3]

3. What is autocatalysis? Explain the mechanism of adsorption theory of catalysis with example. [1+4]

4. What are the major pollutants responsible for water pollution? How do the oxides of sulphur and nitrogen make water acidic? [2+3]

5. What is meant by ozone depletion? Write its causes and consequences. [2+3]

6. a) What are chalcogenide glasses? Give an account of preparation and uses of chalcogenide glasses in the engineering field. [1+2+2]

   b) Write down the preparation of cyclic silicones.

7. a) Give an account for the biodegradable and non-biodegradable polymers with suitable examples. [2.5×2]

   b) What are fibers-reinforced plastics? Write down its applications.

8. Explain the origin of the adsorption spectra of transition elements with d to d transitions. [5]

9. Mention the main applications of 3d elements and give main causes of variable oxidation states shown by transition elements. [3+2]

10. a) Describe the simple test to distinguish between the following pairs of compounds on the basis of Werner's theory. $[Co(NH_3)_5Cl]SO_4$ and $[Co(NH_3)_5SO_4]Cl$ [2+2+1]

    b) Name the following complexes by IUPAC system.

       i) $K_3[AlF_6]$

       ii) $[Co(en)_3]Br_3$

       iii) $[Cr(H_2O)_5Cl]Cl_2$

       iv) $[Pt(NH_3)_4Cl_2]Cl_2$

    c) State EAN rule.

11. Using VBT, predict the possible number of unpaired number in the following complex compounds. $K_4[Fe(CN)_6]$ and $[FeF_6]^{3-}$ [2.5+2.5]

12. Write the mechanism for the conversion of Bromomethane into methanol in presence of aqueous alkali. Also explain the stereochemistry of the reaction. [3+2]

13. What do you mean by Elimination reactions? Explain the reaction mechanism for the dehydrohalogenation of tertiary alkyl halide. [2+3]

14. Write down the possible geometrical isomer of but-2-ene-1, 4-dioic acid. Why does this compound exhibit geometrical isomerism? Explain the difference between enantiomer and diastereoisomer giving an example of 3-bromo-2-butanol. [1+1+3]

15. What is the requisite of good explosive? How can you prepare TNT form benzene? Why does detonator required for the explosion of TNT? [2+2+1]

16. a) Show your acquaintance with liquid and semi-liquid lubricants. Under what situations greases are used? [3+2]

    b) What do you understand by paints? Mention the requisites of good paint.

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BCE I/I 140

03 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2071 Chaitra

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

Subject: - Engineering Chemistry *(SH403)*

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

1. What is SHE? Calculate the emf of electrode couple of $E^{\circ}_{Sn/Sn^{+2}} = -1.4V$ and $E^{\circ}_{Fe^{+2}/Fe^{+3}} = -0.77V$. Where the concentration of Sn^{+2}, Fe^{+2} and Fe^{+3} are 0.2M 0.1M and 1 M respectively. [2+3]
2. Explain the mechanism of buffer action with a suitable example. Calculate the weight in gram of NH_4Cl required to prepare buffer solution having pH = 9.35 in 200 cc of 0.2N ammonia solution. (pkb = 4.74) [3+2]
3. What is heterogeneous catalysis? How does a catalyst alter the rate of reaction? Give a brief account on the intermediate compound formation theory of catalysis. [1+1+3]
4. a) What is ozone depletion? Write the chemical reactions involved in the stratospheric ozone depletion by nitric oxide? [1+2+2]
   b) How does carbon dioxide cause atmospheric pollution?
5. What are the major water pollutants and their harmful effect? Mention the possible measures to control water pollution. [2+3]
6. a) Write the engineering applications of Silicone and give the structure of cyclic and cross linked silicons. [3+2]
   b) Write the preparation of polyphosphazine and its uses.
7. What are biodegradable polymers? Write down the preparation and uses of Nylon 6.6 and Teflon. [1+4]
8. a) Why do transition metals form complex compound? [3+2]
   b) Explain why the 3d transition series having completely filled d-orbital cannot form coloured compounds.
9. What are transition elements? Why does the presence of unpaired electrons make a substance paramagnetic in nature? Explain it with magnetic moment measurement. [1+4]
10. Name the following complexes by IUPAC system: [2+3]
    i) $[Cr(H_2O)_4(NH_3)_2]Br_3$
    ii) $[CuCl_2(CH_3NH_2)_2]$
    iii) $Ni[PtCl_6]$
    iv) $[Cr(NH_3)_6]^{3+}$

    State and explain EAN rule as applied to metal complexes.
11. Differentiate between inner and outer orbital complexes. Magnetic measurement on $K_3[Fe(CN)_6]$ indicates the presence of one unpaired electron, predict on the basis of VBT whether the given complex is inner or outer complex. [2+3]

12. Define explosives. Why are the primary explosives called "detonators"? Write the reaction of toluene forming an explosive. Mention the important uses of GTN and plastic explosives.[1+1+1+2]

13. a) What are solid lubricants? Mention the types and function of lubricants with examples.[1+2+2]

    b) Explain the method of application of paint in galvanized iron.

14. a) What isomerism is shown by tartaric acid and why? [2+3]

    b) Define enantiomers with examples. Differentiate between racemic mixture and mesocompound.

15. Explain the reaction mechanism for the hydrolysis of tertiary alkyl halide by aqueous NaOH. What solvent favours the reaction mechanism? [4+1]

16. What is Saytzeff's rule? Describe the mechanism for the reaction of 3°alkyl halide in alcoholic alkali. [2+3]

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03 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2071 Shawan

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

Subject: - Engineering Chemistry *(SH403)*

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

1. What is buffer solution? Calculate the pH of 500 cc of 0.2 M CH_3COOH solution when 2 g of sodium acetate is added. [K_a for CH_3COOH is 1.8×10^{-4}] [1+4]
2. What is Daniell cell? Answer the following question using equation (a) and (b) [1+4]
   (a) Fe^{++} (0.2M) = F^{+++} + e (0.1M), E^0 = -0.77V, (b) Cu (0.3M) - 2e = Cu^{++}, E^0 = -0.34V,
   (i) net cell reaction (ii) spontaneity of redox reaction (iii) cell notation (iv) emf of cell
3. What are catalytic promoter and catalytic poison? Explain their activity on the basis of adsorption theory of catalysis. [2+3]
4. a) What are chlorofluorocarbons? Explain their photolytic reactions in the upper atmosphere [3]
   b) Discuss about the air pollution caused by oxide of nonmetals? [2]
5. What are the major water pollutants? Point out their adverse effect and the possible measures to control water pollution. [1+2+2]
6. Write the preparation and uses of Teflon and epoxy resin. What are conducting polymers? Point out their applications in engineering field. [3+1+1]
7. a) Give preparation and uses of the nonmetallic super conductor. [3+2]
   b) Write down the main characteristic of inorganic polymers.
8. Give an account for the followings:
   i) Transition metals are well known to form complexs. [2]
   ii) Copper (I) compounds are white and diamegnetic where as copper (II) compounds are colored and paramagnetic. [2]
   iii) Zinc is nontypical transtion metal. [1]
9. a) Explain the variable oxidation states of transition elements. Which divalent metal has maximum paramagnetic character among the first transition metals? [2.5+1+1.5]
   b) A transition metal forms alloys with other transition metals easily. Why? Explain.
10. Explain how the two complexes of Ni, $[Ni(CN)_4]^{2-}$ and $[Ni(CO)_4]^{\circ}$ have different structures but do not differ in their magnetic behavior (Ni = 28). [5]
11. a) Write the IUPAC name of the following compounds/ions [2+1+2]
    I) $[Co(NH_3)_5NO_2]Cl_2$
    II) $[Fe(C_2O_4)_3]^{3-}$
    III) $[Cr(en)_2Cl_2]^+$
    IV) $NH_4[Cr(H_2O)_2(NCS)_4]$
    b) What is complex compound? What do you understand by principal and auxiliary valency of the central ion in complex compound? Illustrate them in $[Co(NH_3)_6]Cl_3$.

12. a) What are lubricating oils? Indicate its application in engineering work. [1+2]

b) Show your familiarity with the types of paint. [2]

13. a) Write the difference between enantiomers and diasterioisomers giving appropriate examples. [3+2]

b) Write Cis, Trans and Z, E notations for the possible isomes of but-2-endioic acid.

14. a) Explain the mechanism involved in the reaction between bromomethane and aqueous NaOH. [3]

b) How do nucleophile and solvent affect this type of reaction? [2]

15. a) Differentiate between E^1 and E^2 reaction. [2+3]

b) Explain the reaction mechanism for the dehydrohalogination of 3°alkyl halide.

16. What are low explosives? Write the preparation and uses of GTN and TNT. [1+4]

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2080 Baishakh

Exam.	Back		
Level	BE	Full Marks	80
Programme	All (Except BAR and BAS)	Pass Marks	32
Year / Part	I / I	Time	3 hrs.

Subject: - Computer Programming (*CT 401*)

- ✓ 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 is an application software different from system software? Explain with examples. [4]
   b) How is code in source file is converted to the executable file? Explain with key steps involved. [4]
2. a) How is constant different than a variable? [2]
   b) Write a C program to read an integer 'd' from the user. If 'd' is the radius of a circular ground in meters, then this program should calculate and display the area of the circle in square meter. [6]
3. What are formatted input/ output functions? Explain each in detail with examples. [2+4]
4. a) Differentiate between library function and user defined functions. Provide relevant examples. [3]
   b) What is a function prototype? Write a C program to find sum of first 10 natural numbers using recursion. [1+4]
5. a) Write a program to read marks of 48 students in a class and display the second highest mark. [5]
   b) How can we copy one string to another string without using any string handling function? [5]
6. What do you mean by array of structure? Write a program to create a structure named "Student" having members Roll, Name, Address and Marks. Use this structure to read the information of 48 students in a class and display the information of only those students whose marks is between 50 and 70. [2+8]
7. What are pointer arithmetic? Explain with example. Write a C program that uses pointer to read m×n matrix from user. Pass it to function that finds the transpose of the matrix. [4+4]
8. a) How is a binary file different than a text file? Write the syntax and use of fseek () and rewind() functions in C. [2+2]
   b) Write a C program to read the name, year_of_release, and language of 3 movies. Save the movie data of all 'English' language movies in a data file. [4]
9. What is the use of FORMAT statement? Explain 1 and F format with example. Write a program in FORTRAN to read a number from user and check whether it is a prime number or not. [4+4]
10. Write short notes on: [2×3]
    a) While and do-while statement
    b) String manipulation in C.

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2079 Bhadra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	All except BAS & BAR	Pass Marks	32
Year / Part	I / I	Time	3 hrs.

Subject: - Computer Programming (*CT 401*)

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

1. a) Differentiate between system software and application software. Provide relevant examples for each of them. [4]
   b) List the steps involved in solving a problem using a computer. Why do we need an algorithm before writing program code? [2+2]
2. a) Define tokens in C programming language. How are variables declared as constant? Explain with example. [2+2]
   b) Write the output of the following: [6]

```
# include < stdio.h >
int main ( )
{
char str1 [50], str2 [50] = { 'N' , 'E' , 'P' , 'A' , 'L' } ;
scanf ( "% [A-Z]" , str1 ) ;
printf ("%s\n" , str1) ;
printf ("% 0.5 s\n" , str2) ;
printf ("% 5.3 s\n" , str2) ;
printf ("% -0.3 s" , str2) ;
return 0;
}
```

Input string: KATHmanDU

3. How are break and continue statements used to jump out from the loop? Write a program to evaluate the following series until the term value becomes less than 10^{-6}: $\cos(x) = 1 - \frac{x^2}{2!} + \frac{x^4}{4!} - \frac{x^6}{6!} + \frac{x^8}{8!} \ldots\ldots$ [4+6]
4. a) Write a syntax of function declaration, function definition and function call in C programming. Can a main function be called recursively in C? Justify your opinion. [3+1]
   b) Explain the use of recursive function with a suitable example. [4]
5. a) Differentiate between array and string. Explain how to declare and use multi dimensional arrays in C. [3+2]
   b) Write a C program to read a string from the user. Pass the string to a function and sort the alphabets in descending order. For example, if the user entered "exam" then the program should display "xmea". [5]
6. a) What is the meaning of data type used in pointer declaration? Define a function in your program to swap two integers using pass by reference. [1+3]
   b) Write a program to find the frequency of a number in array. Explain the relation of pointer and array using this program. [4]
7. Write the purpose and syntax of fopen () and fclose () function. WAP to create a structure book with its member name price and author. Read 10 records from user write it to a file named "book.dat". Read information from book.dat file, search author name "Gotterfried". If found copy the records to a file "gotterfried.dat" [3+7]
8. What are the data types available in FORTRAN? Write a program in FORTRAN to check a number is palindrome or not. [3+5]
9. Write short notes on: [2×4]
   a) Associativity in C
   b) Entry and exit control loop

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2079 Baishakh

Exam.	Back		
Level	BE	Full Marks	80
Programme	All (Except BAR and BAS)	Pass Marks	32
Year / Part	I / I	Time	3 hrs.

Subject: - Computer Programming *(CT 401)*

- ✓ 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 program development and compilation process in detail. Draw a flowchart to find all possible roots of a quadratic equation. [4+4]
2. Describe fundamental data types in the C programming language. What are relational and logical operators? Explain their precedance, associativity and their uses with example. [3+1+4]
3. Explain how scanf() and printf() are used. Write syntax and use of gets(), getchar(), scanf() and getche(); [4+4]
4. Discuss the difference between while and dowhile structure with examples. Write a program to find the following sum of following series up to n terms. [3+5]

$$\text{sum} = 1 + \frac{x^1}{1!} + \frac{x^2}{2!} + \frac{x^3}{3!} + \frac{x^4}{4!} + \ldots\ldots$$

5. Give the necessary condition for a function to be a recursive. Write a program to generate Fibonacci series up n terms. You need to make a recursive function to generate the each term of Fibonacci series. [3+5]
6. Why do we need array in programming? Write a program to display the addition of two matrix. Your program should include one function named input to enter the values of two matrix, one function named add to perform addition of two matrix and one function named display to show the result obtained after addition of two matrix. [1+7]
7. What is difference between array and structure? Create a structure TIME containing hour, minutes and seconds as its member. Write a program that uses this structure to input start time and stop time. Pass structures to a function by reference that calculates the sum and difference of start and stop time. Display the sum and difference from calling function. [2+6]
8. How is an array related with pointer? Write a program to read a string containing letters, numbers and special characters, transfer only letters contained in it into another string using pointer, finally display the second string containing only alphabets. [2+6]
9. Discuss "a", "r" and "w" modes used in data file operations. Write a program that reads numbers from a file containing series of numbers and separates odd numbers from even numbers and writes them on two separate files. [2+6]
10. How are one dimensional array declared in FORTRAN. Write a program in FORTRAN to read and compute the transpose of any matrix. [2+6]

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2078 Bhadra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	ALL except BAR	Pass Marks	32
Year / Part	I / I	Time	3 hrs.

Subject: - Computer Programming *(CT 401)*

- ✓ 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 a program? Explain different types of programming language in brief. [1+3]
   b) What is an algorithm? Explain how does algorithm and flowchart helps in computer programming. [1+3]
2. a) Explain Ternary operator in C with an example. Define following terms. [2+2]
   (i) Preprocessor directives (ii) Keywords
   b) Write the output of the following C program. [4]

```
int a,b;
double c = 123.55667788
char str[] = "I enjoy programming";
scanf(" %3d%2d", &a, &b);
printf("a = %5\n b=%-7d",a,b);
printf("\n%10.7s",str);
printf("\n%0.3f",c);
printf("\n%-10.6f",c);
```

   input:123456 789
3. Write the difference between formatted I/O and unformatted I/O functions in C-programming. Write the syntax for following functions. [2+4]
   (i) getche() (ii) getchar() (iii) scanf()
4. a) What do you mean by iteration? Explain the operation of break and continue statement with a suitable example. [1+3]
   b) Write a C program to check whether an entered word is a palindrome or not without using library function. [6]
5. a) What do you mean by a function header? Explain the function parameters and its types. [1+3]
   b) Write a C program to calculate the sum of digits of a given number unless the sum becomes a single digit using recursion. [Hint: 9785 => 29 => 11 => 2] [4]
6. a) What is an array? Why is it necessary in c programming? [1+2]
   b) Write a program which display following pattern. [5]

```
H
HE
HEL
HELL
HELLO
HELL
HEL
HE
H
```

7. Is there any relation between array and pointer? If yes, show the relation between array and pointer with a suitable example. [1+3]

8. What is structure? Write a program to read a structure named "Faculty" having StaffID, Name, Address and ServiceYear as member. Where ServiceYear is another structure having DurationInYear as member. Now display the details of those faculties whose service duration is more than 10 and less than 30 years. [1+7]

9. a) Why do we need file handing? Write different modes of file opening. [1+3]

   b) What is the purpose of fseek and write a program to write the name, roll no, and age of five students into a disk file name "STUDENT.DAT". [6]

10. Describe X format and T format in FORTRAN. Differentiate between unconditional goto and computed goto in FORTRAN. Write a program in FORTRAN to sort elements of a ID array in ascending as well as descending order. [2+2+6]

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2078 Kartik

Exam.	Back		
Level	BE	Full Marks	80
Programme	All except BAR	Pass Marks	32
Year / Part	I / I	Time	3 hrs.

Subject: - Computer Programming *(CT 401)*

- ✓ 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 recent software trends. Explain in details about the features that a software should include. [2+2]

   b) List out the general rules for flowcharting. What are the errors that might occur during debugging? [2+2]

2. a) What are pre-processor directives? Explain compilation process with suitable block diagram. [1+3]

   b) Why do we need to analyse the problem before solving it? Define tokens, expression and identifiers. [1+3]

3. a) What is the control statement? Write down the classification of control statements. [1+2]

   b) Write down the syntax of a given function. [4×1]

   (i) printf()
   (ii) scanf()
   (iii)getchar()
   (iv)getch()

4. a) Write the output of following program: [3]

```
int main()
{
char ch='G';
int g=10;
float gravity = 9.81;
printf("%%d%%f\n");
printf("%10d\n", g);
printf("%3c\n", ch);
printf("%.3f\n", gravity);
printf("%-10.1f%d\n", gravity, g);
return 0;
}
```

   b) Define and write syntax of the following: [3×1]

   (i) gets()
   (ii) putchar()
   (iii)scanf()

5. Why do we need loop for programming? Write a program to evaluate the following series. [2+4]

$$cos(x) = 1 - \frac{x^2}{2!} + \frac{x^4}{4!} - \frac{x^6}{6!} \ldots\ldots\ldots \text{ n terms}$$

6. Why do we need to declare a function? Define formal parameter and actual parameter. Evaluate following series using recursive function. [2+2+4]

1, 11, 111, 1111, 11111, ... n terms

7. a) Define an array of string with an example. Distinguish between an array and a pointer. [2+2]

   b) Write a C program to insert an element to a desired position to an array using function. The new element to be inserted and desired position should be givne by user. [6]

8. a) Define a void pointer with an appropriate example. [2]

   b) Write a C program that uses pointer to represent two 2-D array of size of m×n and p×q respectively. Find the product of these two matrices if possible otherwise display a message "Calculation cannot be performed" using function. [6]

9. Discuss about nested structure with a suitable example. Create a structure called "student" with data member name, address and id.pass structure to function and sort the information of student on the basis of alphabetical order of "name" and display the result in main() function. [2+6]

10. Write a C program to create a new file named "employee.dat" which consist the information of 10 employees. Employee information includes empName, salary and post. Read the file back to search the word "manager". [6]

11. Explain different format types used in FORTRAN. Mention different data types used in FORTRAN. [3+2]

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2076 Chaitra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	All except BAS & BAR	Pass Marks	32
Year / Part	I / I	Time	3 hrs.

Subject: - Computer Programming *(CT 401)*

- ✓ 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. What are different types of computer software? What do you mean by high level and low level programming languages? A long with the block diagram explain the steps involved during compilation of a source code. [2+2+4]
2. Explain different types of error that usually appears during the programming. Define preprocessing directive and explain its type with example. Write the algorithm and draw the flowchart to find the reverse of given number. [2+2+4]
3. Why are formatted output important in C language? Write a program to print all the roots (Even imaginary roots) of quadratic equation. [3+5]
4. Explain the importance of a switch case statement. Compare switch-case with if-else ladder. Write a program to find sum of numbers from 1 to 100 which are exactly divisible by 5 and not by 3. [2+2+4]
5. How is function declared? Why is function prototype necessary? Write recursive function segment that returns the sum of numbers from 1 to n given by the user. [2+1+5]
6. How can you pass one dimensional array to function and what does name of an array in function call represents? Write a program to find the largest and smallest element of an array using a single function and display the result in calling function. [3+5]
7. Explain how a structure can be defined and structure variables can be declared in C. Write a program that reads name, roll numbers, program and marks obtained in five subjects by students until the user enters 'e' and display the student detail and total marks obtained by each student. [3+5]
8. What is pointer? Discuss its relationship with an array. Write a function program that behaves strcpy() function using pointer as arguement. [1+2+5]
9. Explain different modes in opening file. Write a program to read a string, write it into a file and display the content of a file into a screen. [4+4]
10. Explain different data types available in FORTRAN. Write a program in FORTRAN to check whether a number given by user is palindrome or not. [2+6]

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2076 Ashwin

Exam.	Back		
Level	BE	Full Marks	80
Programme	All (Except BAR and BAS)	Pass Marks	32
Year / Part	I / I	Time	3 hrs.

Subject: - Computer Programming *(CT 401)*

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

1. a) Define a language processor. Explain the main types of language processor in detail. [2+3]
   b) List the basic step of problem solving using computer. Write an algorithm and draw a flowchart to find the sum of N natural number. [1+4]
2. a) Define formatted and unformatted I/O functions. Write the operations of following functions: [2+3]
   (i) getch()
   (ii) getche()
   (iii)getchar()
   b) What is an expression? Write a program to display the smallest number between three integers entered from user using conditional operator. [1+4]
3. a) Differentiate between while and Do-while looping statement with example. [4]
   b) Write a program to evaluate the following series up n term. Prompt the user to input value of n and x. $f(x) = 1-x^2/2!+x^4/4!-x^6/6!+x^8/8!$---------up to n terms. [6]
4. a) What are the different types of functions available in C? What do you mean by pass by reference and pass by value. [2+3]
   b) What are the similarities and difference between iteration and recursive function? Give suitable example. [5]
5. How do you initialize a 2D array? Explain with an example. Write a program to input two matrices of size m×n and p×q respectively. Pass these matrices to the function to calculate the product matrix. Display the product matrix in the main () function. [2+8]
6. a) What is a structure? When do we use structure? [2+2]
   b) Write a program using pointer to swap the value of two variable where the swapping operation is performed in separate function. [6]
7. a) Why are fgets(), fputs(), fgetc() and fputc() used? [4]
   b) Write a program to display the record in sorted order, sorting is performed in ascending order with respect to name using data files concept. [6]
8. a) Compare Logical IF and Arithmetic If statement in FORTRAN with example. [4]
   b) Write a FORTRAN program to sort 10 integers given from user and display the second largest integer. [6]

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2075 Chaitra

Exam.	Regular/Back		
Level	BE	Full Marks	80
Programme	All (Except BAE)	Pass Marks	32
Year / Part	I / I	Time	3 hrs.

Subject: - Computer Programming *(CT 401)*

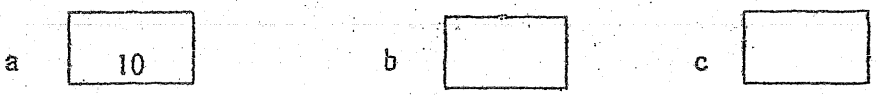
- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt All questions.*
- ✓ *The figures in the margin indicate Full Marks.*
- ✓ *Assume suitable data if necessary.*

1. a) What is computer programming and computer software? Explain about types of programming languages and software. [2+2]
   b) What do you mean by compiler? Explain in brief the steps involved during compilation process along with block diagram. [2+4]
2. a) What is expression? What kind of information is represented by expression? [2+2]
   b) What is the purpose of the putchar function? How is it used within a C program? Compare with the getchar function with example. [6]
3. a) Compare nested-if control structure with else-if ladder structure along with flowchart. [4]
   b) Write a program to read a number from user, count the number of even digits contained in it and display whether the resulting count is prime or not. [6]
4. a) Write a program to generate the following output. [6]

```
1 2 3 4 5 4 3 2 1
  1 2 3 4 3 2 1
    1 2 3 2 1
      1 2 1
        1
```

   b) What is a function? What type is the main () function? Explain actual parameter and formal parameter with example. [1+1+2]
5. a) Write a program to read one dimensional array of n elements, pass it to a function for processing so that, the program should display the largest and smallest element of an array from the main function. [6]
   b) How can we initialize 2D array of character data type during compilation? Illustrate with suitable example. [4]
6. a) What is a structure? Explain nested structure with an example. [1+2]
   b) Write a program to define a structure named Person with Name, address, salary as its member. Enter values for five persons. Pass the structure to a function which increases the salary by 15% each. Display the updated information in the main () function. [7]

7. a) Write the output of the following. [6]



address: 65510 address: 65550 address: 65580

```
int a=10,*b, **c;
b=&a;
c=&b;
printf("%d\t%d\n",b,*c);
printf("%d\t%d\n", c, **c);
printf("%d\t%d", *b+5, &c+2);
```

b) What do you mean by Generic pointer, Null pointer and File pointer? [4]

8. a) Explain the FORTRAN structure. What are data types in FORTRAN? [2+2]

b) Write a program to print the Fibonacci series until the term is less than 500. [6]

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01 : TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2075 Ashwin

Exam.	Back		
Level	BE	Full Marks	80
Programme	All (Except B. Arch)	Pass Marks	32
Year / Part	I / I	Time	3 hrs.

Subject: - Computer Programming *(CT401)*

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

1. a) What is computer program? Discuss in brief about different generation of programming languages. [1+4]
   b) Why is algorithm and flow chart development important in problem solving? Write an algorithm and draw flow chart to test a number entered by user whether it is even or not. [2+3]
2. a) What is the identifier? What are the ways to give value to variable? Explain with example? [1+2+1]
   b) Explain about input and output function available in C with syntax and example of each part. [2+2+2]
3. a) Write algorithm, draw flow chart and program to input a number check it is Armstrong or not. [2+2+2]
   b) What do you mean by selective and repetive statement? Why do we need break and continue statement? [2+2]
4. a) What do you mean by "call by value and call by reference"? Explain it with suitable example. [4]
   b) Can we pass whole array element from the function? Write the program to pass an array to function and sort them. [6]
5. a) Write a program that finds the largest word in a given sentence. [4]
   b) Differentiate between the methods of passing argument to function with example. What are their advantages and disadvantages? [6]
6. What is structure? Why is it necessary? Write a program to add two distances given in feet and inch format using structure. [1+1+6]
7. a) What is null pointer? What will be the output of following program, explain. [1+3]

```
#include<stdio.h>
int main() {
   if( ! NULL )
      printf("C programming is easy");
   else
      printf("C programming is not easy");
   return 0 ;
}
```

   b) Write a program to calculate the length of string without using string handling function. [4]
8. A file name employee.txt stores employee name, employee id and employee salary. Write a program to display the detail of all employees in the order of their salary. [8]
9. Write a program in FORTRAN to read 10 integers from user and short them in ascending order and display it in screen. [6]

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01 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2074 Chaitra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	All (Except B. Arch)	Pass Marks	32
Year / Part	I / I	Time	3 hrs.

Subject: - Computer Programming *(CT401)*

- ✓ 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 a programming language? What is the difference between source code and object code. [2+2]
   b) What is debugging and testing? What are the step that need to be followed for developing the application software. [2+2]
2. a) What is the difference between variable declaration and variable definition? Explain with example. [4]
   b) What do you mean by macro expansion and file inclusion in C? Explain with example. [4]
3. What are functions used for formatted and unformatted output? Write down its syntax. Write down the output of printf() function for the following sections of statements. [4+4]

```
float a = 5.7891;
int b = 6789;
printf("a=%4f and b=%-7d from first line", a,b);
printf("a=%-7.2f and b=%07d from second line", a,b);
printf("a=%.2f and b=%2d from third line", a,b);
```

4. a) Explain about while loop with its syntax and flowchat. [4]
   b) Write a program to convert a decimal number into binary number. [6]
5. a) Can a function return an array to the calling function? Explain with example. [4]
   b) Write a program to read a mxn matrix of integers and to find the largest elements of each row. Store the largest elements of the row in a one-dimensional array of m integers before displaying them. [6]
6. a) How does a structure differ from an array? What are the different ways to access structure member? [4]
   b) Create a structure named student that has name, roll and marks as members. Assume appropriate types and size of members. Use this structure to read and display records of 10 students. Crete two functions: One is to read information of students and other to display the information. [6]
7. a) Define following term: [5]
      i) int*p;
      ii) int p(char*a)
      iii) int(*p(char*a))
      iv) int *p(void)
      v) int*(*p[10])char a)
   b) Write the advantages of using pointer in C- programming. [3]
8. Write a program to copy to copy content of one file source.txt to another destination.txt. [8]
9. a) Explain the FORTRAN structure. What are different types on FORTAN? [2+3]
   b) Write a FORTRAN program to read N number to find second largest number among them. [5]

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02 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2074 Ashwin

Exam.	Back		
Level	BE	Full Marks	80
Programme	All (Except B. Arch.)	Pass Marks	32
Year / Part	I / I	Time	3 hrs.

Subject: - Computer Programming *(CT401)*

- ✓ 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 computer programs and computer programming? Explain the steps that are required to build a computer program for solving a certain problem. [2+6]

2. Explain with an example the role that precedence and associativity play in the execution of an expression. Rewrite the following program by correcting any errors, if present and also write down the output of the corrected code. [4+4]

```
Define MAX '5'
int main ( )
{
  int case[MAX]={2,3,5,4,10},i,sum=0;
  for(i=0,i<MAX,i+=1)
  {
    printf("Case %d = %3.2d\n",i,case[i]);
    sum +=* case+i;
  };
  average = sum/MAX;
  printf("%06.2f",average);
  return 1;
}
```

3. a) Compare if-else-if ladder and switch construct with example and flowchart. [5]

   b) Write a program in C to generate following pattern using unformatted input/output functions only. [5]

```
N
e e e
P P P P P
a a a a a a a
L L L L L L L L L
```

4. Write a program in C to find out whether the n^{th} term of the Fibonacci series is a prime number or not. Read the value of n from the user and display the result in the main function. Use separate user-defined functions to generate the n^{th} Fibonacci term and to check whether a number is prime or not. [8]

5. a) How two dimensional arrays are created in C programming? Write a program to read square matrix of size N×N and find sum of both diagonals. [2+4]

   b) Write a program in C to check whether a given string is palindrome or not using user defined function. [4]

6. What are the advantages of using pointer in C programming? Write a program in C to find second largest elements from an array containing N elements using concept of pointer. [2+4]

7. Explain structures and nested structures? Create a structure to hold any complex number x+iy. Write a program that uses the structure to read two complex numbers and display a third complex number which is the multiplication of the entered complex numbers. [3+5]

8. a) What are different input/output functions used with data files in C? Explain with syntax and examples. [4]

   b) Write a program in C to read integers from user until user says "no". After reading the data write all the odd numbers to a file name odd.txt and all the even number to file named even.txt. [4]

9. When can we use recursive functions? Why do we need control statements in computer programs? Differentiate between do...while and for statements. [2+2+2]

10. What are the characteristics of FORTRAN Programming? Write a program in FORTRAN to calculate the value of π by evaluating the following formula for the first 25 terms. [8]

$$\pi = 4\left(1 - \frac{1}{3} + \frac{1}{5} - \frac{1}{7} + \frac{1}{9} - \cdots\right)$$

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02 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2073 Chaitra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	All (Except B.Arch.)	Pass Marks	32
Year / Part	I / I	Time	3 hrs.

Subject: - Computer Programming *(CT401)*

- ✓ 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 generations of programming language. Distinguish between High level and Low level programming language. [3+3]
2. What is an algorithm and how it differs from pseudo-code? Develop algorithm and draw flowchart to find the largest of N numbers. [2+3+3]
3. a) What are identifiers? List the rules to define valid C identifiers. [2+3]
   b) What is operator? Describe the conditional operator in C with syntax and example. [2+3]
4. What are the differences between global and local function, variables and data types, & (Ampersand) operator and * operators used in c-programming language? Explain with example. [4+4]
5. a) Differentiate between pass by value and pass by reference. [3]
   b) Explain the significance of user defined functions with example. [5]
6. a) Write a program to read a string and check whether it consists of Alphabet or not. Use user defined function to accomplish the task. [5]
   b) Explain how 2D array is passed to a function. Write a C program to display largest and smallest elements of a 2D array. [5]
7. What is nested structure? Write a program in C to read name, age and salary of 10 different employees as the three members of a structure named as "employee". Sort this data in salary basis using user defined function and display sorted data from main function. [2+8]
8. Write a program in C-programming language to compute the cosine series. (hints: $\cos(x) = 1-x^2/2!+x^4/4!-x^6/6!+$.....up to n terms) [6]
9. Write a program to open file named INVENTORY and store in it for maximum 10000 data of ITEM_NAME, NUMBER, PRICE, QUANTITY. Extend the program to read this data from the above given filename and display the inventory table with the value of each item. [6]
10. a) Compare unconditional goto and computed goto in FORTRAN with syntax. [3]
    b) Write a program in FORTRAN to read an array containing N elements, sort this data in ascending order and display the result. [5]

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4/13

05 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2073 Shrawan

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

Subject: - Computer Programming *(CT401)*

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

1. a) What do you mean by Programming Language? Explain about the evolution of programming languages. [1+3]
   b) What are the advantages of a Flowchart design? Write down the guidelines to be followed to draw a flowchart. [2+2]
2. a) What is the purpose of the semicolon that appears at the end of most assignment statement in C? Explain the program compilation, linking and loading process with example. [2+4]
   b) Discuss the types of errors in programming. How do you debug a C-program? [2+4]
3. a) Explain relational and logical operators. [4]
   b) Write a C program to display following pattern without using formatted input/output statements. [4]

```
Programming
rogrammin
ogrammi
gramm
ram
a
```

4. a) Why do we need control statements? Compare switch and if-else-if ladder with example. [4]
   b) Write a C program to display all characters between a given ranges. [6]
5. a) What are the advantages of using functions? Differentiate between Library functions and User-defined functions with suitable example. [5]
   b) Write a program to check whether a given number is Armstrong number or not using recursive function. [5]
6. a) Write a C program to read two strings in main and compare them using userdefined function. Display appropriate message from main. [4]
   b) What are overflow and underflow errors in context of array? Write a program to add corresponding elements of two arrays. The results should form a new array. [2+4]
7. a) Why should we prefer structure over array? Explain nested structure with example. [2+4]
   b) Write a program to read name and roll number of 48 students from user and store them in file. If the file already contains data, your program should add new data at the end of the file. [6]
8. a) What is the structure of FORTRAN program? [5]
   b) Write a FORTRAN program to read n numbers and display largest number among them. [5]

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01/10

05 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2072 Chaitra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	ALL (Except B. Arch)	Pass Marks	32
Year / Part	I / I	Time	3 hrs.

Subject: - Computer Programming *(CT401)*

- ✓ 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 a flow chart? Use the various commonly used flow chart symbols. How does a flow chart help computer programming? [2+2+2]
   b) What is a program? Briefly describe types of computer software. [2+2]
2. a) What is an operator, datatype, constant and variable? Define. [6]
   b) Define and write syntax of the following: [4]
      i) gets()
      ii) putchar()
      iii) scanf()
      iv) strlen()
3. a) How is the switch statement used in decision making? Explain with a suitable example. [4]
   b) Write a program to check whether a given integer is a triangular number or not. [6]

   (Any number is a triangular number if the sum of natural number from 1 to any number i is exactly equal to that number. For e.g 1,3,6,10,15 etc are triangular number as, 1+2=3, 1+2+3=6, 1+2+3+4=10, 1+2+3+4+5=15)
4. a) Briefly explain the passing by value and passing by reference in function with example. [6]
   b) Write a program to calculate sum of digits of a given 5-digits number entered by the user using recursive function. [4]
5. What is a string? Write a program to read a 3*3 square matrix, find minimum integer value of a matrix, replace the diagonal elements by the minimum element and display it using pointer. [2+8]
6. a) What is the principal difference between a structure and an array? [2]
   b) Write a program to read structure "college" having name, estDate and location where estDate is an another structure having day, month and year as members. Display the records of 10 colleges. [8]
7. a) What is a data file in C? What are the modes in file handling? Explain briefly. [1+3]
   b) Write a program to read the information of a file named "data.txt" and write its contents to another file "record.txt". [6]
8. a) Compare DO and implied DO statement in FORTRAN. [3]
   b) Write a FORTRAN program to add and subtract two matrices and display the results in matrix form. [7]

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05 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2072 Kartik

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

Subject: - Computer Programming *(CT401)*

- ✓ 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 different generation of programming languages. [4]
   b) Why do we need analysis and design before coding a program? [4]
2. a) What do you mean by precedence and associativity of an operator? Explain with suitable example. [3]
   b) What are the differences between formatted and unformatted Input / Output. Give suitable example with sample output for the following: %10i, %3c, %-10.3f and %x. [1+4]
3. a) What are the purpose of the continue statement? Within which control statements can continue statement be included? Compare with the break statement. [1+2+2]
   b) Write a program to find the sum of series $Sn = \sum 1/n^2$ up to N term. [5]
4. What is the meaning of function prototyping? Write a program to calculate the sum of the series 1+11+111+.....+up to N terms using recursive function. If N is read as 5, the series is: 1+11+111+1111+11111. [2+6]
5. a) Explain with an example for compile time initialization of 2D array. Describe how compilier manages according to the number of initializers and size of an array given by a user in case of 1D array. [2+3]
   b) Write a program to read a word from a main function, pass it into a function that will convert all of its characters into upper case if the first character is in lower case and into lower case if the first character is in upper case. Display the converted string from main function. [5]
6. a) Explain need of structures. How can we create and use a structure within another. [2+3]
   b) Explain dot and arrow operators for accessing the members of a structure. [3]
7. a) If Ptr is a pointer to user defined type or basic type, by how many bytes is Ptr incremented when the statement Ptr++ is executed? [2]
   b) Write a C program that calls reverse array () to reverse the array and return the array and display the element of reversed array using pointer. [6]
8. List different types of standard I/O used in C. Write a program to write name, roll no and age of five students into a disk file name "STUDENT.DAT". [2+6]
9. a) Explain different types of goto statements in FORTRAN programming with suitable example. Write a program to read n from user and display the sum of following series till n^{th} terms: 1+(1+2)+(1+2+3)+(1+2+3+4)+.....n [4+4]
   b) Explain with suitable example to show how an Impiled Do loop works in FORTRAN. [4]

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05 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2071 Chaitra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	All (Except B. Arch)	Pass Marks	32
Year / Part	I / I	Time	3 hrs.

Subject: - Computer Programming *(CT401)*

- ✓ 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 mean by compilation? What is mean by interpretation? How do these two processes differ? [4]
   b) Define programming language? What are the features of good computer program? [1+3]
2. a) What are preprocessor directives? Explain constants and variables. [2+2]
   b) Write syntax and example of following statements/functions: [1×4]
      i) printf
      ii) getch
      iii) scanf
      iv) long
3. What are control statements? Illustrate nested IF statement with its flowchart. Write a program to calculate the series: $1\times10+3\times20+6\times30+.....+\frac{N(N+1)}{2}\times10N$, where N is an integer term read from the keyboard. [2+2+6]
4. a) Write a program to display Armstrong numbers between the range entered by a user and also display their counts. You must use a function to check for Armstrong numbers and display them from main. [4]
   b) What do you mean by nested function and recursive function? Give an example of recursive function. [2+2]
5. a) Write a C program to read a string and display its reverse. Use user defined function to count number of characters in it and to reverse it. [4]
   b) Write an algorithm to insert a value in an array at a position given by user. [4]
6. a) What is a tag? Must a tag be included in a structure type definition? Must a tag be included in a structure variable declaration? Explain. [1+1+2]
   b) Write a C program that reads several different names and address using structure computer, rearrange the names into alphabetical order and write out alphabetical list. [4]
7. Illustrate with example that "Array is indirectly a pointer". Write program to calculate sum and average of integer numbers between M and N (where value of M and N are read from keyboard) using pointer. [4+4]
8. Write a program to continuously read name, age and salary of a worker and write it into a file until user confirms to end. Then read n from user and display the n^{th} record in the file. Details of worker must be represented by a structure. [7]
9. a) Compare arithmetic and logical if statements in FORTRAN. [7]
   b) Write a FORTRAN program to display nature of roots of a quadratic equation. Calculate and display the roots, if they are real and equal. [8]

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05 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2071 Shawan

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

Subject: - Computer Programming *(CT401)*

- ✓ 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) Categorise programming languages on the basic of their uses and applications. Among them which programming language is C programming? [4]
   b) List and define different steps to solve the problem in computer system. [4]
2. a) Differentiate between declaration and definition. Explain structure of C program with an appropriate example. [4]
   b) Write syntax, example and use of following: [1×4]
      i) pintf( )
      ii) scanf( )
      iii) getche( )
      iv) getch( )
3. Write the difference between do and do..... while loop and write the program "to find whether a year is leap or not". [3+7]
4. What is recursive function? How does it work? Find out sum of digit of number until the number becomes one digit number.[891>18>9]. [2+2+4]
5. a) Write a program to read a string and rewrite its characters in alphabetical order. [4]
   b) A multinational company has hired 3 sales persons for marketing/selling its 3 different products in Kathmandu. Each sales person sells each of these products. Write a program to read number of each product sold by all sales-persons. Calculate total sells of each item and the total sells of each sales-person. Use arrays. [6]
6. a) Explain about "Arrays within structures" along with programming example. [4]
   b) Write the program "to understand how structure members are sent to a function". [4]
7. Write down advantages of pointer. Write a program using pointer to swap the value of two variables where the swapping operation is performed in separate function. [2+6]
8. Write a C program to store employee details in a text file. Read data from the text file, sort them in ascending order of salary and store the sorted record to a binary file. Display the details and rank of employee given by the user. [8]
9. a) What do you mean by formatted and unformatted input/output statements in Fortran and also give suitable example which explain the concept of Formatted I/O. [8]
   b) Write the program to convert a binary number to a decimal number using Fortran programming language. [4]

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05 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2070 Ashad

Exam.			
Level	BE	Full Marks	80
Programme	All (Except B. Arch)	Pass Marks	32
Year / Part	I / I	Time	3 hrs.

Subject: - Computer Programming *(CT401)*

- ✓ 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 software. Explain its types. [3]
   b) What are the steps required to develop a computer program? Explain. [5]

2. a) What are relational operators and assignment operators? Explain with examples. [3]
   b) Rewrite the following program by correcting any syntactical errors, if present. Also show the output of the corrected code. [3+2]

```
#include <stdio.h>
int main ( )
{
    float root, int i = 1;
    do { sum = 2i – 1;
         print ("\t%d\n", sum);
         i *= 5/3;
    } while (sum <= 15)
    root = pow (i, 1/2);
    print ("\n%.3f", root);
    return void;
}
```

3. a) Write a program to read the number until - 1 is encountered. Also count the number of even number and odd numbers entered by the user. [6]
   b) Distinguish between break and continue statement with example. [4]

4. a) Explain how function is defined in C? Differentiate call by value and call by reference. [1+2]
   b) Write a program using a function that returns the largest number from an array of numbers that is passed to the function. [5]

5. a) How are one dimensional and two dimensional arrays created in C? Explain with examples. [2+2]
   b) Write a C program to read two matrices from user, add them and display the result in matrix form. [6]

6. What do you mean by nested structures? Give suitable example. Write a program to read the heights of two students and display the difference between their heights. Use feet and inches as members of a structure to define height. [2+6]

7. a) Compare array and pointer with example. [3]
   b) Write a program to read a string from user and use a user defined function to copy the content of the read string into another character array changing lower case letter to upper if any. Use pointer to process the string. [5]

8. Write a program to read the details of book authors and write it to a file, until the user confirms to end. Then read and display the n^{th} record in the file, where n is read from the user. The data for authors must be represented by structures that contain name, nationally and number of books published. [8]

9. a) Explain the FORTRAN structure. What are data types in FORTRAN. [2+2]
   b) Write a program in FORTRAN to solve quadratic equation and display roots in proper format. [8]

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2080 Baishakh

Exam.	Back		
Level	BE	Full Marks	80
Programme	All (Except BAR)	Pass Marks	32
Year / Part	I / I	Time	3 hrs.

Subject: - Engineering Mathematics I (*SH 401*)

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

1. If $y = \log(x+\sqrt{a^2+x^2})$, then show that [5]

   i) $(a^2+x^2)\,y_2 + xy_1 = 0$

   ii) $(a^2+x^2)\,y_{n+2} + (2n+1)\,xy_{n+1} + n^2y_n = 0$.

2. Assuming the validity of expansion prove that the series by using Maclaurin's series: [5]

$$\frac{x}{e^x-1} = 1 - \frac{x}{2} + \frac{x^2}{12} - \frac{x^4}{720} + \ldots\ldots\ldots$$

3. Evaluate: $\lim_{x\to 0}\left(\frac{\sin x}{x}\right)^{\frac{1}{x^2}}$ [5]

4. Define an asymptotes to a curve. File all the asymptotes of the cubic [5]
   $x^3 - 2y^3 + xy(2x-y) + y(x-y) + 1 = 0$.

5. Find the pedal equation of the curve: $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$. [5]

6. Show that $\int_0^a \frac{\sqrt{\cot x}}{1+\sqrt{\cot x}}dx = \frac{\pi}{4}$. [5]

7. Evaluate: $\int_0^{\pi} \frac{\log(1+a\cos x)}{\cos x}dx$, using the rule of differentiation under the sign of integration. [5]

8. Define Beta and Gamma function. Using Beta and Gamma function evaluate: [1+4]

$$\int_0^{\frac{\pi}{4}} \cos^2\theta \sin^4\theta\, d\theta.$$

9. Find the volume of the solid formed by revolution of cardioid r = a (1-cosθ) about the initial line. [5]

10. Solve $\frac{dy}{dx} = 2y\tan x + y^2\tan^2 x$. [5]

11. Solve the differential equation: $y = yp^2 + 2px$ [5]

12. Solve the differential equation: $\frac{d^2y}{dx^2} - 2\frac{dy}{dx} + y = xe^x \sin x$. [5]

13. Solve the differential equation: $x^2\frac{d^2y}{dx^2} + 4x\frac{dy}{dx} + 2y = e^x$. [5]

OR

The current in a circuit containing resistance R and inductance L in a series with voltage source E. Find the current in the circuit as the function of time. [5]

14. Derive the standard equation of ellipse. [5]

15. Find the angle through which the axes may be turned so that the equation $x+2y+5=0$ may be reduced to $x = c$ and also determine the value of c. [5]

16. Show that the conic $3x^2 + 10xy + 3y^2-26x - 22y + 43 =0$ is a hyperbola. Also find the eccentricity. [1+4]

OR

Describe and sketch the conic

$$r = \frac{4\sec\theta}{2\sec\theta - 1}$$

[5]

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2079 Bhadra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	All except BAR	Pass Marks	32
Year / Part	I / I	Time	3 hrs.

Subject: - Engineering Mathematics I (*SH 401*)

- ✓ 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. State Leibnitz's theorem. If $y = a\cos(\log x) + b\sin(\log x)$ then show that $x^2y_{n+2} + (2n+1)xy_{n+1} x + (n^2+1)y_n = 0$.
2. Apply Maclaurin's series to find the expansion of $e^x \sec x$ as far as the term in x^3.
3. State L'Hopital's rule. Using it evaluate $\lim_{x\to 0}\left(\frac{\sin x}{x}\right)^{\frac{1}{x^2}}$
4. Find the asymptotes of the curve
   $(x+y)^2(x+2y+2) = x + 9y - 2$
5. Show that for the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2} = 1$, the radius of curvature at the extremity of the major axis is equal to half of the Latus rectum.
6. Integrate: $\int_0^{\frac{\pi}{2}} \frac{\cos x dx}{(1+\sin x)(2+\sin x)}$
7. Apply the rule of differentiation under integral sign to evaluate: $\int_0^\infty \frac{e^{-ax}\sin x}{x}dx$ and hence deduce that $\int_0^\infty \frac{\sin x}{x}dx = \frac{\pi}{2}$
8. Define Beta and Gamma functions. Evaluate: $\int_0^a x^4\sqrt{a^2-x^2}\,dx$
9. Show that the area of the astroid $x^{2/3}-y^{2/3}=a^{2/3}$ is $\frac{3\pi a^2}{8}$

   OR

   Find the volume of the solid of revolution of the cardoid $r = a(1+\cos\theta)$ about the initial line.
10. Solve: $x\frac{dy}{dx}+2y = x^2\log x$
11. Solve: $y = yp^2 + 2px$ where $p = \frac{dy}{dx}$
12. Solve: $\frac{d^2y}{dx^2}+3\frac{dy}{dx}+2y = e^{2x}\sin x$
13. Solve: $x\frac{d^2y}{dx^2}-2\frac{dy}{dx}+2\frac{y}{x} = \frac{1}{x^2}$
14. Derive the standard equation of an ellipse.
15. Through what angle should the axes be rotated to reduce the equation $3x^2+2xy+3y^2-\sqrt{2}x = 0$ in to one with the xy term missing?
16. Find the center, length of the axes and eccentricity of the conic
    $9x^2+4xy+6y^2-22x-16y+9 = 0$

    OR

    Describe and sketch the graph of the equation $r = \frac{10}{3+2\cos\theta}$

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2079 Baishakh

Exam.	Back		
Level	BE	Full Marks	80
Programme	All (Except BAR)	Pass Marks	32
Year / Part	I / I	Time	3 hrs.

Subject: - Engineering Mathematics I *(SH 401)*

- ✓ 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. State Leibnitz's theorem. If $y = \log(x + \sqrt{a^2 + x^2})$ then using the theorem show that $(a^2 + x^2)y_2 + xy_1 = 0$ and hence show that $(a^2 + x^2)y_{n+2} + (2n + 1)xy_{n+1} + n^2y_n = 0$. [1+4]
2. Assuming the validity of expansion, find the expansion of: log(secx) by using Maclaurin's theorem. [5]
3. What do you mean by indeterminate form? State various forms of indeterminacy. Evaluate $\lim_{x \to 0}\left(\frac{\sin x}{x}\right)^{\frac{1}{x^2}}$. [5]
4. Define asymptotes and its types. Find the asymptotes of the curve $x^3 + 4x^2y + 5xy^2 + 2y^3 + 2x^2 + 4xy + 2y^2 - x - 9y + 1 = 0$. [1+4]
5. Find the pedal equation of the curve of $r^m = a^m \cos m\theta$. [5]
6. Show that $\int_0^{\pi/2} \frac{x}{\sin x + \cos x} dx = \frac{\pi}{2\sqrt{2}} \log(\sqrt{2} + 1)$. [5]
7. Evaluate, by using the rule of differentiation under the sign of integration: $\int_0^{\pi} \frac{\log(1 + a\cos x)}{\cos x} dx$. [5]
8. Define Beta and Gamma function and use these to evaluate $\int_0^1 \frac{dx}{(1 - x^6)^{1/6}}$. [5]
9. Find the area included between an arc of cycloid $x = a(\theta - \sin\theta)$, $y = a(1 - \cos\theta)$ and its base.

   OR

   Find the volume of the solid formed by revolution of the cardoid $r = a(1 + \cos\theta)$ about the initial base. [5]
10. Solve the differential equation $\frac{dy}{dx} + \frac{x}{1 - x^2} y = x\sqrt{y}$. [5]
11. State Clairatut's equation, find the general and singular solution of $y = px + p - p^2$. [5]
12. Find the particular integral and hence solve the differential equation $y'' - 2y' + 5y = e^{2x} \sin x$. [5]
13. Solve the differential equation $x^2 \frac{d^2y}{dx^2} - x\frac{dy}{dx} + 2y = x \log x$. [5]
14. Through what angle should the axes be rotated to reduce the equation $3x^2 + 2xy + 3y^2 - \sqrt{2}x = 0$ into one with the xy term missing? Also obtain the transformed equation. [2+3]
15. Deduce the standard equation of the hyperbola. [5]
16. Describe and sketch the graph of the equation $r = \frac{10}{2 - 3\sin\theta}$

    OR

    Find the centre, length of axes and eccentricity of the conic $3x^2 + 8xy - 3y^2 - 40x - 20y + 50 = 0$. [5]

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2078 Kartik

Exam.	Back		
Level	BE	Full Marks	80
Programme	All except BAR	Pass Marks	32
Year / Part	I / I	Time	3 hrs.

Subject: - Engineering Mathematics I *(SH 401)*

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

1. State Leibnitz's theorem. If $y^{1/m} + y^{-1/m} = 2x$, prove that $(x^2-1)y_2 + xy_1 - m^2 y = 0$, and hence show that $(x^2-1)y_{n+2} + (2n+1)xy_{n+1} + (n^2-m^2)y_n = 0$.

2. Apply Maclaurin's series to find the expansion of $\frac{e^x}{1+e^x}$ as far as the term in x^3 and hence find the expansion of $\log(1+e^x)$.

3. State L-Hospital's rule. Evaluate $\lim_{x \to 0}\left(\frac{\sin x}{x}\right)^{1/x^2}$

4. Find the asymptotes of the curve of $x^2(x-y)^2 - a^2(x^2+y^2) = 0$.

5. Define the radius of curvature, obtain the radius of curvature for the curve at the origin $x^3+y^3=3axy$.

6. Prove that: $\int_0^{\pi} \frac{x\tan x}{\sec x + \tan x}dx = \frac{\pi}{2}(\pi - 2)$

7. Apply the method of differentiation under integral sign to prove.

$$\int_0^{\pi} \frac{dx}{(a+b\cos x)^2} = -\frac{\pi a}{(a^2-b^2)^{3/2}}$$

8. State Beta and Gamma function. Use them to evaluate: $\int_0^1 x^6\sqrt{1-x^2}\,dx$

9. Define the term quadrature. Find the area bounded by the curve $r = a(1-\cos\theta)$.

   OR

   Find the volume of the solid formed by the revolution of cycloid $x = a(\theta + \sin\theta)$, $y = a(1+\cos\theta)$ about x-axis.

10. Solve the differential equations: $(x+y+1)dx + (y-x)dy = 0$

11. Find the general solution of the differential equation: $e^y - p^3 - p = 0$ where $p = \frac{dy}{dx}$.

12. Solve the different equation: $(D^2+2D+1)y=e^x+x^2$

13. Solve: $(x^2D^2+xD-1)y=x^2$

OR

A radioactive material has an initial mass 100mg. After 2 years, it is left to 80mg. Find the amount of material at any time t.

14. Through what angle the axes be rotated to remove the term containing xy in $11x^2+4xy+14y^2-5=0$.

15. Define hyperbola as a locus of a point and deduce the equation of hyperbola in standard form.

16. Find the center, length of axes, and eccentricity of the following conic:

$$3x^2+8xy-3y^2-20y-40x+50=0$$

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2078 Bhadra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	All except BAR	Pass Marks	32
Year / Part	I / I	Time	3 hrs.

Subject: - Engineering Mathematics I *(SH 401)*

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

1. If $y=(x^2-1)^n$, then prove that: $(x^2-1)y_{n+2}+2xy_{n+1}-n(n+1)y_n=0$ [5]
2. Assuming the validity of expansion, expand $\log(1+x)$ by using Maclaurin's theorem. [5]
3. Give an example of indeterminate from. Evaluate: $\lim_{x\to 0}(\cot x)^{\frac{1}{\log x}}$ [5]
4. Find the asymptote of the curve: $(x^2-y^2)^2-2(x^2+y^2)+x-1=0$ [5]
5. Find the radius of curvature for the curve $r^m=a^m\cos m\theta$. [5]

   OR

   Find the pedal equation of the following curves $y^2=4a(x+a)$. [5]
6. Evaluate: $\int_0^1 \frac{\log(1+x)}{(1+x^2)}dx$ [5]
7. Evaluate by using the rule of differentiation under the sign of integration: $\int_0^\infty \frac{log(1+a^2x^2)}{1+b^2x^2}dx$ [5]
8. Define Gamma function. Use it to prove: $\int_0^{\pi/8}\cos^3 4x\,dx=\frac{1}{6}$ [5]
9. Find the area of a loop of the curve : $a^2y^2=a^2x^2-x^4$ [5]

   OR

   Prove that the volume and surface area of a sphere of radius 'a' is $\frac{4}{3}\pi a^3$ and $4\pi a^2$ respectively.. [5]
10. Solve: $\frac{dy}{dx}+\frac{y}{x}\log y=\frac{y}{x^2}(\log y)^2$ [5]
11. Find the general solution of the differential equation $y=(1+p)x+ap^2$. [5]
12. Solve: $(D^2+3D+2)y=e^{2x}\sin x$ [5]
13. Solve: $(x^2D^2-2)y=x^2+\frac{1}{x}$

    OR

    A certain culture of bacteria grows at rate proportional to its size. If the size doubles in 4 days, find the time required for the culture to increase to 10 times to its original size. [5]
14. Through what angle must the axes be rotated to remove the term containing xy in $11x^2+4xy+14y^2=5$. [5]
15. Prove that: $2x^2+3y^2-4x-12y+13=0$ represents equation of ellipse. Find its center, length of axes, eccentricity, and direct ices of ellipse. [5]
16. Show that the line $x\cos\alpha+y\sin\alpha=p$ will be a tangent to the hyperbola $\frac{x^2}{a^2}-\frac{y^2}{b^2}=1$ if $a^2\cos^2\alpha-b^2\sin^2\alpha=p^2$. [5]

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2076 Chaitra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	All except BAR	Pass Marks	32
Year / Part	I / I	Time	3 hrs.

Subject: - Engineering mathematics I *(SH 401)*

- ✓ 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. If $y=a\cos(\log x) + b \sin(\log x)$ prove that:

   (i) $x^2y_2+xy_1+y=0$
   (ii) $x^2y_{n+2}+(2n+1)xy_{n+1}+(n^2+1)y_n=0$

2. State and prove Lagrange's mean value theorem.

3. State L' Hospital's Rule and hence evaluate $\lim_{x\to 0}(\cot x)^{\sin 2x}$

4. Find the asymptote of $(x+y)^2(x+2y+2) = x+9y-2$

5. Find the radius of curvature of the curve $r = a(1 - \cos\theta)$.

   Or,

   Find the pedal equation of $y^2=4a(x+a)$

6. Evaluate $\int_0^{\pi/2} \frac{x\sin x\cos x}{\cos^4 x+\sin^4 x}dx$

7. Using the rule of differentiation under the integral sign, evaluate $\int_0^{\infty}\frac{\log(1+a^2x^2)}{1+b^2x^2}dx$

8. Obtain the reduction formula for $\int_0^{\pi/2}\cos^n x dx$ and hence evaluate $\int_0^{\pi/2}\cos^{10} x dx$.

9. Obtain the area of a loop of the curve $y^2(a^2+x^2)=x^2(a^2-x^2)$

   Or,

   Find the volume of the solid formed by the revolution of the cycloid $x=a(\theta+\sin\theta)$

10. Solve the differential equation: $\frac{dy}{dx}=\frac{y}{x}+\tan\frac{y}{x}$

11. Find the general solution of $y=Px+x^4p^2$

12. Solve $(D^2-2D+5)y = e^{2x}\sin x$

13. Solve $x^2\frac{d^2y}{dx^2}-2x\frac{dy}{dx}-4y=x^4$

    Or,

    A radio active material has an initial mass 100mg. After two years, it is left to 75mg. Find the amount of the material at any time t.

14. What does the equation $3x^2+3y^2+2xy=2$ become when the axes are turned through an angle 45° with the original axes.

15. Obtain the equation of hyperbola in standard form.

16. Find the center for the conic $3x^2+8xy-3y^2-40x-20y+50=0$.

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2076 Ashwin

Exam.	Back		
Level	BE	Full Marks	80
Programme	All (Except BAR)	Pass Marks	32
Year / Part	I / I	Time	3 hrs.

Subject: - Engineering Mathematics I *(SH 401)*

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

1. If $y=\sin(m\sin^{-1}x)$, show that $(1-x^2)y_{n+2}-(2n+1)xy_{n+1}+(m^2-n^2)y_n=0$, where suffices of y denote the respective order of derivatives of y. [5]
2. State Lagrange's mean value theorem. Verify it for the function $y=\sin x$ on $\left[-\frac{\pi}{2},\frac{\pi}{2}\right]$. Is this theorem valid for the function $y=\tan x$ on $[0,\pi]$? [1+3+1]
3. Evaluate $\lim_{x\to 0}\left(\frac{\tan x}{x}\right)^{1/x}$ [5]
4. Find the asymptotes of the curve $(x+y)^2(x+2y+2)=x+9y-2$. [5]
5. Find the pedal equation of the curve $y^2=4a(x+a)$. [5]
6. Evaluate, if possible $\int_0^e \ell n\, x\,dx$. [5]
7. Apply differentiation under integral sign to evaluate $\int_0^\infty \frac{e^{-ax}\sin x}{x}dx$ and then show that $\int_0^\infty \frac{\sin x}{x}dx=\frac{\pi}{2}$. [4+1]
8. Define Beta and Gamma function and use it to show that, $\int_0^{\pi/6}\cos^4 3\theta\sin^2 6\theta\ d\theta=\frac{5\pi}{192}$. [5]
9. Find the volume of the solid formed by the revolution of the cardioid r = a(1 + cos θ) about the initial line. [5]
10. Solve the differential equation $\frac{dy}{dx}+y\cot x=2\cos x$. [5]
11. If p stands for $\frac{dy}{dx}$, then solve the differential equation $y-2px+ayp^2=0$. [5]
12. Solve the differential equation $(D^2-2D+5)\,y=e^{2x}\sin x$. [5]
13. Solve the differential equation $(x^2D^2+xD+1)y=\sin(\log x^2)$ [5]
14. Define ellipse and obtain the equation of ellipse in standard form. [5]
15. Prove that the locus of a point which moves in such a way that the difference of its distances from the point (5, 0) and (-5, 0) is 2 is a hyperbola. [5]
16. Describe and sketch the graph of the conic $r=\frac{10}{3+2\sin\theta}$ [5]

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2075 Chaitra

Exam.	Regular / Back		
Level	BE	Full Marks	80
Programme	All (Except BAE)	Pass Marks	32
Year / Part	I / I	Time	3 hrs.

Subject: - Engineering Mathematics I *(SH 401)*

- ✓ 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. If $y = e^{a\sin^{-1}x}$, then prove that $(1-x^2)y_{n+2} - (2n+1)xy_{n+1} - (n^2+a^2)y_n = 0$

2. Assuming the validity of expansion, find the expansion of $\log(1+e^x)$ by using Machlaurin's Theorem.

3. Evaluate: $\lim_{x\to 0} \left(\frac{\sin x}{x}\right)^{1/x}$

4. Find the asymptotes of the curve:
$$y^2 = \frac{(a-x)^2}{a^2+x^2}x^2$$

5. Show that for the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$, the radius of curvature at the extremity of major axis is equal to half of the latus rectum.

6. Show that $\int_0^1 \cot^{-1}(1-x+x^2)dx = \frac{\pi}{2} - \log 2.$

7. Evaluate by using the rule of differentiation under the sign of integration
$$\int_0^{\pi} \frac{\log(1+a\cos x)}{\cos x}dx$$

8. Prove that: $\int_0^{\infty} \sqrt{y}e^{-y^2}dy \times \int_0^{\infty} \frac{e^{-y^2}}{\sqrt{y}}dy = \frac{\Pi}{2\sqrt{2}}$

9. Find the surface area of solid generated by revolution of cycloid.
$x = a(\theta+\sin\theta), y = a(1+\cos\theta)$ about its axis.

10. Solve the differential equation:
$$\frac{dy}{dx} + \frac{1}{x}\sin 2y = x^3\cos^2 y$$

11. If p denotes $\frac{dy}{dx}$, then solve $p^3 - 4xyp + 8y^2 = 0$.

12. Solve: $\frac{d^2y}{dx^2} - 2\frac{dy}{dx} + y = x^2e^{3x}$

13. Solve: $x^2\frac{d^2y}{dx^2} - x\frac{dy}{dx} + y = \log x$

14. Derive the standard equation of an ellipse.

15. Find the condition that the line $x\cos\alpha + y\sin\alpha = p$ to touch hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ and also find point of contact.

16. Find the centre, length of axes and eccentricity of conic $9x^2 + 4xy + 6y^2 - 22x - 16y + 9 = 0$.

OR

Describe and sketch the graph of polar equation: $r = \frac{4}{1+3\cos\theta}$

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02 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2075 Ashwin

Exam.	Back		
Level	BE	Full Marks	80
Programme	ALL (Except B. Arch)	Pass Marks	32
Year / Part	I / I	Time	3 hrs.

Subject: - Engineering Mathematics I *(SH401)*

- ✓ 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. State Leibnitz's theorem. If $y^{\frac{1}{m}}+y^{\frac{-1}{m}}=2x$, show that $(x^2-1)y_2+xy_1-m^2y=0$ and hence prove that $(x^2-1)y_{n+2}+(2n+1)xy_{n+1}+(n^2-m^2)y_n=0$. [2+3]
2. State Roller's theorem. Does the theorem hold when the function is not continuous at the end points? Justify your answer. Verify the theorem for $f(x)=x^2-4x+3$ on $[1,3]$. [5]
3. State L-Hospital's theorem and evaluate $\lim_{x\to 0}\left(\frac{\sin x}{x}\right)^{\frac{1}{x^2}}$ [5]
4. Find the asymptotes of curve $4x^3-3xy^2-y^3+2x^2-xy-y^2-1=0$ [5]
5. Find the pedal equation of the curve $y^2=4c(x+c)$ [5]
6. Show that $\int_0^{\frac{\pi}{2}}\frac{\sin^2 x}{\sin x+\cos x}dx=\frac{1}{\sqrt{2}}\log(\sqrt{2}+1)$ [5]
7. Evaluate, by using differentiation under the sign of integration [5]
$$\int_0^{\infty}\frac{\log(1+a^2x^2)}{1+b^2x^2}dx$$
8. Define Beta-Gamma function and use it to evaluate $\int_0^{\frac{\pi}{6}}\cos^4 3\theta.\sin^2 6\theta.d\theta$ [5]
9. Find the surface area of the solid generated by the revolution of the cardioids $r=a(1+\cos\theta)$ about the initial line. [5]
10. Transform the equation $12x^2-10xy+2y^2+11x-5y+2=0$ by translating the axes into an equation with linear term missing. [5]
11. Derive the standard equation of hyperbola. [5]
12. Find the centre, Length of axes and eccentricity of the conic [5]
$$9x^2+4xy+6y^2-22x-16y+9=0$$

OR

Describe and sketch the graph of the equation $r=\frac{12\sec\theta}{2+3\sec\theta}$

13. Solve $\frac{dy}{dx}+\frac{\sin 2y}{x}=x^3\cos^2 y$ [5]
14. Solve the differential equation of $xp^2-2yp+ax=0$ [5]
15. Solve $(D^2-1)y=\sinh(x)$ [5]
16. $(x^2D^2+xD+1)y=\sin(\log x^2)$ [5]

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022 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2074 Chaitra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	ALL (Except B. Arch)	Pass Marks	32
Year / Part	I / I	Time	3 hrs.

Subject: - Engineering Mathematics I *(SH401)*

- ✓ 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. State Leibnitz theorem. If $\log y = \tan^{-1} x$, then show that
   $(1+x^2)y_{n+2} + (2nx+2x-1)y_{n+1} + (n^2+n)y_n = 0$ [1+4]
2. State Rolle's theorem. Is the theorem true when the function is not continuous at the end points? Justify your answer. Verify Rolle's theorem for $f(x) = x^2 5x + 6$ on [2,3]. [1+2+2]
3. State L-Hospital's rule. Evaluate $\lim_{x \to 1} (2-x)^{\tan\left(\frac{\pi x}{2}\right)}$ [1+4]
4. Find the asymptotes of the curve $(x+y)^2(x+2y+2) = x+9y-2$ [5]
5. Find the pedal equation of the ellipse $\frac{x^2}{b^2} + \frac{y^2}{a^2} = 1$. [5]
6. Evaluate the integral $\int_{-1}^{1} \frac{1}{x^2} dx$ [5]
7. Apply the rule of differentiation under integral sign to evaluate $\int_0^\infty \frac{e^{-ax} \sin x}{x} dx$ and hence deduce that $\int_0^\infty \frac{\sin x}{x} dx = \frac{\pi}{2}$ [5]
8. Define Beta function. Apply Beta and Gamma function to evaluate $\int_0^{2a} x^5 \sqrt{2ax - x^2}\, dx$ [5]
9. Find the area common to the circle r = a and the cordioid r = a(1+cosθ) [5]
10. Through what angle should the axes be rotated to reduce the equation $3x^2 + 2xy + 3y^2 - \sqrt{2x} = 0$ into one with the xy term missing? Also obtain the transformed equation. [2+3]
11. Derive the equation of an ellipse in standard form. [5]
12. Find the product of semi-axis of the conic $x^2 - 4xy + 5y^2 = 2$ [5]

OR

Describe and sketch the graph of conic $r = \frac{12}{3 + 2\cos\theta}$

13. Solve the differentiate equation of $(x^2 - y^2)dx + 2xydy = 0$ [5]
14. Solve: $y = yp^2 + 2px$ where $p = \frac{dy}{dx}$ [5]
15. Solve $(D^2 - 6D + 9)y = x^2 e^{2x}$ [5]
16. Solve the differential equation of $x^2 \frac{d^2y}{dx^2} - 2x\frac{dy}{dx} + 2y = 4x^3$ [5]

01 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2073 Chaitra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	All (Except B.Arch.)	Pass Marks	32
Year / Part	I / I	Time	3 hrs.

Subject: - Engineering Mathematics I *(SH401)*

- ✓ 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. State Leibnitz theorem. If $y = e^{x^2}$, then show that $y_{n+1} - 2xy_n - 2ny_{n-1} = 0$.
2. Expand $e^x \log_e(1+x)$ in ascending powers of x upto the term containing x^4 in Maclaurin's series.
3. State L-hospital's rule. Evaluate,
$$\lim_{x \to 0} \left(\frac{1}{x^2}\right)^{\tan x}$$
4. State the types of asymptotes to a curve. Find the asymptotes of the curve $(x^2 - y^2)(x + 2y + 1) + x + y + 1 = 0$.
5. Find the chord of curvature through the pole for the curve r = a (1+cosθ).
6. Show that $\int_0^\infty \frac{\log(1+x^2)}{1+x^2} dx = \pi \log 2$
7. Apply the method of differentiation under integral sign to prove
$$\int_0^{\pi/2} \frac{dx}{(a^2 \sin^2 x + b^2 \cos^2 x)^2} = \frac{\pi(a^2 + b^2)}{4a^3 b^3}$$
8. Using Beta -Gamma Function, show that
$$\int_0^{\pi/4} \sin^4 x . \cos^2 x \, dx = \frac{3\pi - 4}{192}$$
9. Find the area included between an arc of cycloid x = a (θ-sinθ), y = a (1- cosθ) and its base.

OR

Find the volume of the solid formed by the revolution of the cardoid r = a (1+cosθ) about the initial base.

10. What does the equation $x^2 + 2\sqrt{3}xy - y^2 = 2a^2$ become when the axes are turned through an angle 30° to the original axes?
11. Derive the equation of an ellipse in the standard form.

12. Find the eccentricity of the conic,

$$x^2 + 4xy + y^2 - 2x + 2y - 6 = 0$$

OR

Describe and sketch the conic

$$r = \frac{10\,\mathrm{cosec}\theta}{2\,\mathrm{cosec}\theta + 3}$$

13. Solve: $\frac{dy}{dx} = \frac{x + 2y - 3}{2x + y - 3}$

14. Solve: $\frac{dy}{dx} + y\tan x = \sec x$

15. Solve: $y = 2px + p^3y^2$; where $p = \frac{dy}{dx}$

16. Solve: $x^2\frac{d^2y}{dx^2} - 2x\frac{dy}{dx} + 2y = \frac{1}{x}$

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01 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2074 Ashwin

Exam.	Back		
Level	BE	Full Marks	80
Programme	All (Except B.Arch.)	Pass Marks	32
Year / Part	I / I	Time	3 hrs.

Subject: - Engineering Mathematics I *(SH401)*

- ✓ 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. State Leibnitz's theorem on heigher order derivative. If $y = e^{a\tan^{-1}x}$, prove that $(1+x^2)y_{n+2} + (2nx + 2x - a)y_{n+1} + n(n+1)y_n = 0$
2. State difference between Roll's Theorem and Lagrange's Mean value theorem. Verify Lagrange's mean value theorem for f(x) = x(x-1)(x-2) when $x \in \left[0, \frac{1}{2}\right]$.
3. Define inderminate form of a function. Evaluate
$$\lim_{x \to 0} \left(\frac{\tan x}{x}\right)^{1/x^2}$$
4. Define asymptote to a curve. Find the asymptotes of curve. $y^3 + 2xy^2 + x^2y - y + 1 = 0$.
5. Find radius of curvature of the curve $x^3 + y^3 = 3axy$ at origin.

OR

Find the pedal equation of the polar curve $r^m = a^m \cos m\theta$.

6. Integrate : $\int_0^{\pi/2} \frac{\cos x\, dx}{(1+\sin x)(2+\sin x)}$
7. Apply differentiation under integral sign to evaluate $\int_0^{\infty} \frac{e^{-ax}\sin x}{x} dx$.
8. Define Beta and Gamma function. Use them to evaluate $\int_0^{2a} x^5\sqrt{2ax - x^2}\, dx$.
9. Show that the area of the curve $x^{2/3} + y^{2/3} = a^{2/3}$ is $\frac{3}{8}\pi a^2$.

OR

Find the volume of the solid formed by the revolution of the cardoid $r = a(1+\cos\theta)$ about the initial line.

10. Solve: $(1+y^2)dx = (\tan^{-1}y - x)dy$
11. Solve: $y = px - \sqrt{m^2 + p^2}$ where $p = \frac{dy}{dx}$.

12. Solve: $(D^2+2D+1)y=e^x+x^2$.

13. Solve: Solve: $x^2\frac{d^2y}{dx^2}-2x\frac{dy}{dx}-4y=x^4$.

OR

A resistance of 100 ohms, an inductance of 0.5 Henry are connected in series with a battery of 20 volts. Find the current in the circuit as a function of time.

14. What does the equation of lines $7x^2+4xy+4y^2=0$ become when the axes are the bisectors of the angles between them?

15. Derive the equation of hyperbola in standard form.

16. Find the foci and eccentricity of the conic $x^2+4xy+y^2-2x+2y-6=0$.

OR

Describe and sketch the graph of the conic $r=\frac{12}{6+2\sin\theta}$.

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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	ALL (Except B.Arch)	Pass Marks	32
Year / Part	I / I	Time	3 hrs.

Subject: - Engineering Mathematics I *(SH401)*

- ✓ 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. State Leibnitz's theorem. If $y=(\sin^{-1}x)^2$, show that
$(1-x^2)y_{n+2}-(2n+1)xy_{n+1}-n^2y_n=0$

2. Verify Rolle's Theorem for $f(x)=\log\frac{x^2+ab}{(a+b)x}$; $x\varepsilon[a,b]$. How does Rolle's Theorem differ from Lagrange's mean value theorem.

3. Evaluate $\lim_{x\to 0^+}\left(\frac{\sin x}{x}\right)^{\frac{1}{x}}$

4. Find the asymptotes to the curve $y^3+2xy^2+x^2y-y+1=0$

5. Find the radius of curvature at origin for the curve $x^3+y^3=3axy$.

6. Show that $\int_0^{\pi} x\log(\sin x)dx=\frac{\pi^2}{2}\log\frac{1}{2}$

7. Apply the rule of differentiation under integral sign to evaluate $\int_0^{\infty}\frac{e^{-ax}\sin x}{x}dx$ and hence deduce that $\int_0^{\infty}\frac{\sin x}{x}dx=\frac{\pi}{2}$

8. Define Beta function. Apply Beta and Gamma function to evaluate $\int_0^{2a}x^5\sqrt{2ax-x^2}\,dx$

9. Find the volume generated by revolution of astroid $x^{2/3}+y^{2/3}=a^{2/3}$ about x-axis.

10. What does the equation $3x^2+3y^2+2xy=2$ becomes when the axes are turned through an angle of 45° to the original axes?

11. Find center, length of axes, eccentricity and directrices of the conic
$3x^2+8xy-3y^2-40x-20y+50=0$

OR

Describe and sketch the conic $r=\frac{12}{2-6\cos\theta}$

12. Deduce standard equation of ellipse.

13. Solve the differential equation: $(1+y^2)+(x-e^{\tan^{-1}y})\frac{dy}{dx}=0$

14. Solve: $xp^2-2yp+ax=0$ where $p=\frac{dy}{dx}$

15. Solve: $\frac{d^2y}{dx^2}+3\frac{dy}{dx}+2y=e^{2x}.\sin x$

16. Resistance of 100 ohms, an inductance of 0.5 Henry are connected in series with battery 20 volts. Find the current in the circuit as a function of time.

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01 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2072 Chaitra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	ALL (Except B. Arch)	Pass Marks	32
Year / Part	I / I	Time	3 hrs.

Subject: - Engineering Mathematics I *(SH401)*

- ✓ 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. State Leibnitz's theorem. If $y=(x^2-1)^n$, then prove that

$(x^2-1)y_{n+2}+2xy_{n+1}-n(n-1)y_n=0$

2. Assuming the validity of expansion, expand $\log(1+\sin x)$ by Maclaurin's therom.

3. Evaluate $\lim_{x\to 0}\frac{(1+x)^{1/x}-e}{x}$

4. Find the asymptotes of the curve: $x(x-y)^2-3(x^2-y^2)+8y=0$

5. Find the radius of curvature at any point (r,θ) for the curve $a^2=r^2\cos 2\theta$

6. Show that: $\int_0^{\pi}\frac{x\sin x}{1+\cos^2 x}dx=\frac{\pi^2}{4}$

7. Apply differentiation under integral sign to evaluate $\int_0^{\pi/2}\log\frac{a+b\sin x}{a-b\sin x}\frac{dx}{\sin x}$

8. Define Gamma function. Apply Beta and Gamma function to evaluate:

$\int_0^{\pi/6}\cos^2 6\theta.\sin^4 3\theta=\frac{7\pi}{192}$

9. Find the area inclosed by $y^2(a-x)=x^3$ and its asymptotes.

10. If the axes be turned through and angle of $\tan^{-1}2$, what does the equation $4xy-3x^2-a^2=0$ become?

11. Find the center, length of axes, eccentricity and directrices of the conic.

$2x^2+3y^2-4x-12y+13=0$

OR

Describe and sketch the graph of the conic $r=\frac{10}{3+2\cos\theta}$

12. Deduce standard equation of hyperbola.

13. Solve the differential equation: $x\log x\frac{dy}{dx}+y=2\log x$

14. Solve: $(x-a)p^2+(x-y)p-y=0$: where $p=\frac{dy}{dx}$

15. Solve: $(D^2-D-2)y=e^x+\sin 2x$

16. Find a current i(t) in the RLC circuit assuming zero initial current and charge q, if R = 80 ohms, L = 20 Henry, C = 0.01 Fardays and E = 100 volts.

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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	All (Except B.Arch)	Pass Marks	32
Year / Part	I / I	Time	3 hrs.

Subject: - Engineering Mathematics I *(SH401)*

- ✓ 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. If $y = (\sin^{-1} x)^2$, then show that:
   i) $(1-x^2)y_2 - xy_1 - 2 = 0$
   ii) $(1-x^2)y_{n+2} - (2n+1)xy_{n+1} - n^2 y_n = 0$
2. State Rolle's Theorem and verify the theorem for $f(x) = \frac{x(x+3)}{e^{x/2}}; x \in [-3, 0]$
3. Evaluate: $\lim_{x \to 0} \left(\frac{\tan x}{x}\right)^{1/x}$
4. Find the asymptotes of the curve: $(a+x)^2(b^2+x^2) = x^2.y^2$
5. Find the pedal equation of the curve $r^2 = a^2 \cos 2\theta$
6. Evaluate $\int_0^{\pi/4} \frac{(\sin x + \cos x)}{(9 + 16\sin 2x)} dx$
7. Use Beta Gamma function to evaluate $\int_0^{2a} x^5.\sqrt{2ax - x^2}.dx$
8. Evaluate by using the rule of differentiation under the sign of integration.
   $\int_0^{\infty} \frac{e^{-x} \sin bx}{x} . dx$
9. Find the area of one loop of the curve $r = a \sin 3\theta$

OR

Find the volume of the solid formed by the revolution of the cardioid $r = a(1+\cos\theta)$ about the initial line.

Find center and eccentricity of conic $x^2 + 4xy + y^2 - 2x + 2y - 6 = 0$

OR

Describe and sketch the graph of the equation $r = \frac{10}{3 + 2\cos\theta}$

10. Find the condition that the line lx + my + n = 0 may be a normal to the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$

11. Show that the pair of tangents drawn from the center of a hyperbola are its asymptotes.

12. Solve the differential equation: $\frac{dy}{dx}=\frac{y}{x}+\tan\frac{y}{x}$

13. Solve: $y-2px+ayp^2=0$ where $p=\frac{dy}{dx}$

14. Solve the differential equation: $x\frac{dy}{dx}+y\log y=xye^x$

15. Solve the differential equation: $x^2\frac{d^2y}{dx^2}+x\frac{dy}{dx}-4y=x^2$

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01 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2071 Chaitra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	All (Except B.Arch)	Pass Marks	32
Year / Part	I / I	Time	3 hrs.

Subject: - Engineering Mathematics I *(SH401)*

- ✓ 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. State Leibnity's theorem on Leigher derivatives:

   If $y = \sin(m \sin^{-1} x)$ then show that

   $(1-x^2)\, y_{n+2} - (2n+1)\, x y_{n+1} + (m^2-n^2) y_n = 0$

2. Assuming the validity of expansion, find the expansion of the function $\frac{e^x}{1+e^x}$ by Maclaurin's theorem.

3. Evaluate $\lim_{x\to 0} \frac{xe^x - (1+x)\log(1+x)}{x^2}$

4. Find the asymptotes of the curve $y^3 + 2xy^2 + x^2y - y + 1 = 0$

5. Find the radius of curvature of the curve $y = x^2(x-3)$ at the points where the tangent is parallel to x-axis

   OR

   Find the pedal equation of the curve $r^2 = a^2 \cos 2\theta$

6. Show that $\int_0^a \frac{dx}{x+\sqrt{a^2-x^2}} = \frac{\Pi}{4}$

7. Apply differentiation under integral sign to evaluate $\int_0^{\Pi/2} \frac{dx}{(a^2\sin^2 x + b^2\cos^2 x)^2}$

8. Use gamma function to prove that $\int_0^1 \frac{dx}{(1-x^6)^{1/6}} = \Pi/3$

9. Find the volume or surface area of solid generated by revolving the cycloid $x = a(\theta+\sin\theta)$, $y = a(1+\cos\theta)$ about its base.

10. If the line lx+my+n=0 is normal to the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ then show that $\frac{a^2}{l^2}+\frac{b^2}{m^2}=\frac{(a^2-b^2)^2}{n^2}$

11. Solve the locus of a point which moves in such a way that the difference of its distance from two fixed points is constant is Hyperbola.

12. Solve the differential equation $x\frac{d^2y}{dx^2}+2\frac{dy}{dx}=6x$

13. Solve $(x^2D^2+xD+1)y=\sin(\log x^2)$

14. Solve $y=yp^2+2px$ where $p=\frac{dy}{dx}$

15. Solve: $\frac{d^2y}{dx^2}+3\frac{dy}{dx}+2y=e^{2x}\sin x$

16. Describe and sketch the graph of the equation $r=\frac{10}{2-3\sin\theta}$

OR

Show that the conic section represented by the equation $14x^2-4xy+11y^2-44x-58y+71=0$ is an ellipse. Also find its center, eccentricity, latus rectuns and foci

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01 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2070 Chaitra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	All (Except B.Arch)	Pass Marks	32
Year / Part	I / I	Time	3 hrs.

12/26

Subject: - Engineering Mathematics I *(SH401)*

- ✓ 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. If $Y = \sin(m \sin^{-1}x)$, then show that $(1-x^2)y_{n+2} - (2n+1)xy_{n+1} + (m^2 - n^2)y_n = 0$
2. Apply Maclaurin's series to find the expansion of $\frac{e^x}{1+e^x}$ as far as the term in x^3
3. Evaluate: $\lim_{x \to a} \left(2 - \frac{x}{a}\right)^{\tan\frac{\pi x}{2a}}$
4. Find the asymptotes of the curve $x(x-y)^2 - 3(x^2 - y^2) + 8y = 0$
5. Find the pedal equation of the curve $x^{\frac{2}{3}} + y^{\frac{2}{3}} = a^{\frac{2}{3}}$
6. Apply the method of differentiation under integral sign to evaluate $\int_0^\infty \frac{\log(1+a^2x^2)}{1+b^2x^2}dx$
7. Show that $\int_0^\infty \frac{\log(1+x^2)}{1+x^2}dx = \pi \log 2$
8. Use Gamma function to prove that $\int_0^1 \frac{dx}{(1-x^6)^{\frac{1}{6}}} = \frac{\pi}{3}$
9. Find the area of two loops of the curve $a^2y^2 = a^2x^2 - x^4$

OR

Find the volume of the solid formed by the revolution of the cycloid $x = a(\theta + \sin\theta)$, $y = a(1 - \cos\theta)$ about the tangent at the vertex.

10. Solve the differential equation $(1+y^2) + (x - e^{\tan^{-1}y})\frac{dy}{dx} = 0$
11. Solve: $y - 3px + ayp^2 = 0$
12. Solve: $(D^2 - 2D + 5)y = e^{2x}.\sin x$
13. A resistance of 100 Ohms, an inductance of 0.5 Henry are connected in series with a battery 20 volts. Find the current in the circuit as a function of time.
14. What does the equation $3x^2 + 3y^2 + 2xy = 2$ becomes when the axes are turned through an angle 45° to the original axes.
15. Show that the locus of a point which moves in such a way that the differences of its distance from two fixed points is constant is a hyperbola.
16. Find the center, length of the axes and eccentricity of the conic $2x^2 + 3y^2 - 4x - 12y + 13 = 0$

OR

Describe and sketch the graph of the polar equation of conic $r = \frac{10\,\mathrm{cosec}\theta}{2\,\mathrm{cosec}\theta + 3}$

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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	All (Except B.Arch)	Pass Marks	32
Year / Part	I / I	Time	3 hrs.

Subject: - Engineering Mathematics I *(SH401)*

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

1. If $y = \log\left(x + \sqrt{a^2 + x^2}\right)$, then show that $\left(a^2 + x^2\right)y_{n+2} + (2n+1)xy_{n+1} + n^2 y_n = 0$ [5]
2. State and prove Lagrange's Mean Value theorem. [5]
3. Evaluate: $\lim_{x \to \prod} (\sin x)^{\tan x}$ [5]
4. Find the asymption of the curve $a^2y^2 + x^2y^2 - a^2x^2 + 2ax^3 - x^4 = 0$ [5]
5. Find the radius of curvature at the origin for the curve $x^3 + y^3 = 3axy$
6. Evaluate $\int_0^a \frac{\sqrt{x}}{\sqrt{x} + \sqrt{a - x}}\, dx$ [5]
7. Apply differentiation under integral sign to evaluate $\int_0^\infty \frac{e^{-ax} - e^{-bx}}{x}\, dx$ [5]
8. Using Gamma function show that $\int_0^{\frac{\pi}{4}} \sin^4 x \cos^2 x\, dx = \frac{3\pi - 4}{192}$ [5]
9. Find the area bounded by the curve $x^2 = 4y$ and the line $x = 4y - 2$

   OR

   Find the volume of the solid generated by the revolution of the cardioid $r = a(1 - \cos\theta)$ about the initial line.
10. Solve: $\sin x \frac{dy}{dx} + y\cos x = x\sin x$ [5]
11. Solve: $xp^2 - 2yp + ax = 0$ where $p = \frac{dy}{dx}$ [5]
12. Solve: $\frac{d^2y}{dx^2} - 2\frac{dy}{dx} + y = x^2e^{3x}$ [5]
13. Solve: $x^2\frac{d^2y}{dx^2} - x\frac{dy}{dx} + y = \log x$ [5]
14. Transform the equation $x^2 - 2xy + y^2 + x - 3y = 0$ to axes through the point (-1,0) parallel to the lines bisecting the angles between the original axes. [5]
15. Find the center, length of axes and the eccentricity of the ellipse $2x^2 + 3y^2 - 4x - 12y + 13 = 0$ [5]
16. Find the length of axes and ecentricity of the conic [5]

$$14x^2 - 4xy + 11y^2 - 44x - 58y + 71 = 0$$

OR

Describe and sketch the conic $r = \frac{12}{2 - 6\cos\theta}$

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01 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2070 Ashad

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

Subject: - Mathematics I *(SH401)*

- ✓ 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. State Leibnitz's Theorem on higher derivatives. If $y = \sin(m \sin^{-1}x)$ then show that $(1-x^2)\,y_{n+2} - (2n+1)\,xy_{n+1} + (m^2-n^2)y_n = 0$

2. State Rolle's Theorem and verify it for the function $f(x) = \dfrac{x(x+3)}{e^{\frac{x}{2}}}$, $x \varepsilon [-3,0]$

3. Evaluate: $\lim_{x \to 0} \left(\dfrac{\tan x}{x}\right)^{\frac{1}{x^2}}$

4. Find the asymptotes of the curve $(x^2-y^2)^2 - 2(x^2+y^2) + x - 1 = 0$

5. Show that the radius of curvature at any point (r,θ) of the curve $r^m = a^m \cos m\theta$ is $\dfrac{a^m}{(m+1)r^{m+1}}$

6. Show that $\int_0^1 \dfrac{\log(1+x)}{1+x^2}\,dx = \dfrac{\pi}{8}\log 2$

7. Evaluate by using the rule of differentiation under the sign of integration $\int_0^\infty \dfrac{e^{-x}\sin bx}{x}dx$

8. Use Gamma function to prove $\int_0^{\frac{\pi}{6}} \cos^4 3\theta.\ \sin^2 6\theta = \dfrac{5\pi}{192}$

9. Find the area bounded by the curve $x^2y = a^2(a-y)$ and $X-$axis

OR

Show that the volume of the solid formed by revolving the ellipse $\dfrac{x^2}{a^2} + \dfrac{y^2}{b^2} = 1$ about the line $x = 2a$ is $4\pi^2a^2b$ cubic units.

10. Solve the differential equation $(1+y^2)\,dy = (\tan^{-1}y - x)\,dx$

11. Solve the differential equation $y = yp^2 + 2px$ where $p = \dfrac{dy}{dx}$

12. Solve the differential equation $(D^2 - 2D + 5)y = e^{2x}.\sin x$

13. Solve the differential equation $x^2\frac{d^2y}{dx^2} - x\frac{dy}{dx} + 2y = x\log x$

OR

Newton's law of cooling states that the temperature of an object changes at the rate proportional to the difference of temperature between the object and its surroundings. Supposing water at 100°C cools to 80°C in 10 minutes in a room temperature of 30°C find the time when the temperature of water will become 40°C?

14. If the axes be turned through an angle $\tan\theta = 2$ what does the equation $4xy - 3x^2 - a^2 = 0$ becomes.

15. Find the condition that the straight line $x\cos\alpha + y\sin\alpha = p$ touches the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$

16. Find the centre, length of axes and eccentricity of the conic $9x^2 + 4xy + 6y^2 - 22x - 16y + 9 = 0$

OR

Describe and sketch the graph of the equation $r = \frac{12}{3 + 2\cos\theta}$

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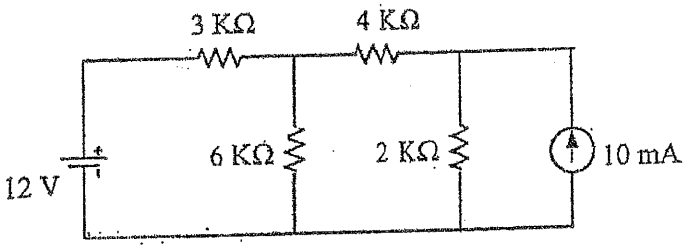
TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2080 Shrawan

Exam.	Back		
Level	BE	Full Marks	80
Programme	All Except BCH,BEI,BAR	Pass Marks	32
Year / Part	I / II	Time	3 hrs.

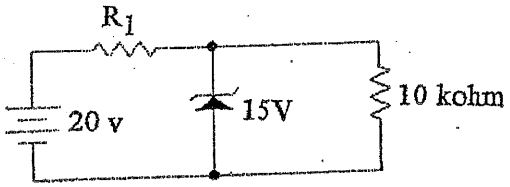
Subject: - Basic Electronics Engineering *(EX 451)*

- ✓ 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. Determine V_{th}, R_{th} and the current through 4kΩ resistor using Thevenin's theorem. [4]



2. What do you mean by a filter circuit? Explain the operation of RC high pass filter with its transfer function and frequency response. [1+3]
3. Explain the operation of Full wave Bridge rectifier with necessary diagrams. [4]
4. A Zener with given specification is used for stabilized supply to a variable load as shown in figure below. Given Pmax = 0.6w. Calculate: [4]
   a) Series resistance required.
   b) Diode current when RL= 10k.



5. How can we use BJT transistor as switch and logic inverter. [2+2]
6. Draw the collector feedback type DC biasing circuit. If V_{cc} = 10V, R_B =950kΩ, R_C =2.2kΩ and β=150, calculate collector current (I_C) and collector emitter voltage (V_{CE}). [4]
7. Describe the construction and working principal of N-channel Depletion type MOSFET with the help of family of Drain current characteristics curve. [8]
8. List out ideal characteristics of op-amp. Derive voltage gain of inverting op-amp configuration. [3+3]
9. Describe the working principle of square wave generator circuit using operational amplifier. [5]
10. Derive the expression for gain of negative feedback amplifier. What are the Barkhausen criteria for sinusoidal oscillation? [3+2]
11. What is optical fiber? Explain the advantages of optical communication over copper cable communication. [1+4]
12. Why modulation is needed? Differentiate internet and intranet. [2+3]

13. Perform the following conversions: [2]

(i) $(A3C.B)_{16} = (?)_8$

(ii) $(211)_x = (152)_8$. Find the value of x.

14. Prove that NAND is a universal gate. [3]

15. Explain the operation of JK flip flop necessary waveforms. [5]

16. Simplify the expression using K-Map, F(A,B,C)= A'B+BC'+AC' [6]

17. Write short notes on: (Any Two) [2×3]

a) Transducer

b) Regulated Power Supply

c) Digital Multimeter

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division

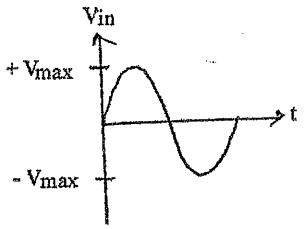
2079 Ashwin

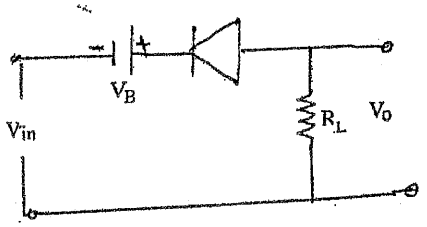
Exam.	Back		
Level	BE	Full Marks	80
Programme	BCE, BEL, BEX, BCT, BME, BAM, BIE, BAG, BGE	Pass Marks	32
Year / Part	I / II	Time	3 hrs.

Subject: - Basic Electronics Engineering (*EX 451*)

- ✓ 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 dependent and independent signal sources with suitable symbols and examples. [4]
2. Explain the operation of RC High pass filter with necessary circuit diagram and transfer characteristics curve. [4]
3. Find the output waveform of the given input wave. (Assume diode is ideal). [4]





4. Describe the AC model of semiconductor diode and derive the expression for small signal incremental resistance of the diode. [4]
5. If V_{cc} = 10V, R_B = 900 KΩ, R_c = 2KΩ and β = 150, calculate the collector current I_c for collector feedback type dc biasing circuit. [5]
6. Explain operation of CMOS NOR with necessary diagram. [5]
7. Explain the operation of BJT as a switch. [6]
8. Design summing amplifier to using Op-Amp to get the output voltage $V_0 = -V_1+2V_2+3V_1$. [5]
9. Derive output voltage expression for Op-amp integrator and differentiator. [4+4]
10. Draw the circuit diagram of Triangular wave generator and write its frequency of oscillation. [3]
11. Define modulation. Explain Amplitude Modulation (AM) in brief with necessary waveforms and expressions. [1+4]
12. Illustrate block diagram of digital communication system. [4]
13. Perform the following: [4]
    a) $(573.73)_8 = (?)_{16}$
    b) $(267.02135)_{10} = (?)_2$
    c) $(508)_{10} = (?)_{BCD}$
    d) Subtract $(24)_{10}$ from $(48)_{10}$ using 2's complement method.
14. Simplify Boolean Expression by using K-MAP. Also draw circuit. [6]

    F = A'C+A'B+AB'C+BC
15. Construct T flip-flop with its characteristics table and equation. [5]
16. Write short notes on: (Any Two) [2×4]
    a) Strain gauge
    b) Regulated power supply
    c) Digital multimeter

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division

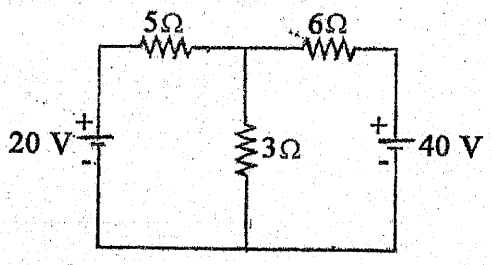
2079 Chaitra

Exam.	Regular		
Level	BE	**Full Marks**	80
Programme	BCE, BEL, BEX, BCT, BME, BAM, BIE, BAG, BGE, BAS	**Pass Marks**	32
Year / Part	I / II	**Time**	3 hrs.

Subject: - Basic Electronics Engineering *(EX 451)*

- ✓ 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. Find the current through 3Ω Resistor using superposition theorem. [4]



2. What is a filter? Explain high-pass filter. [4]
3. What is PN junction diode? Explain the small signal model of the diode with necessary derivations and transfer characteristics. [2+6]
4. Draw emitter-feedback bias circuit of BJT. Find I_C and V_{CE} in the circuit if $V_{CC} = +10V$, $R_B = 400K\Omega$, $R_C = 3K\Omega$, $R_E = 2K\Omega$ and $\beta = 50$. [4]
5. Explain BJT as a switch and logic inverter. [4]
6. Explain the operation of N channel depletion type MOSFET with necessary diagram. [8]
7. What is virtual ground concept in an op-amp? Design a circuit using op-amp whose output is as follows:
   $V_0 = -V_1 + 3V_2 + 5V_3$ [1+3]
8. Design a Wein bridge oscillator that will oscillate at 25KHz. [4]
9. Mention any four characteristics of an ideal op-amp. Derive an expression for output voltage of an integrator circuit using op-amp. [2+4]
10. Explain the working a digital Multimeter with necessary block diagram. [5]
11. Draw the block diagram of optical fiber communication system. What are the advantages of optical fiber communication system? [6]
12. Explain the working of data logger. [5]
13. Perform the following conversions: [2]
    a) $(B2C.B)_{16} = (?)_8$
    b) $(211)x = (152)_8$. Find the value of x.
14. Design X-OR gate using only NAND gates. [4]
15. Explain the operation of SR flip-flop with necessary diagram and truth table. [6]
16. Design a 3 bit up Asynchronous counter and explain its working with necessary waveforms. [6]

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division

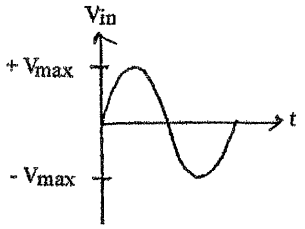
2079 Ashwin

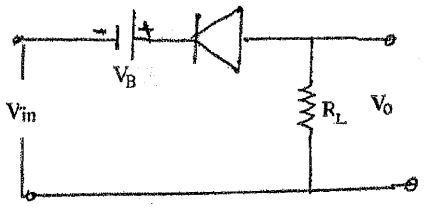
Exam.	Back		
Level	BE	Full Marks	80
Programme	BCE, BEL, BEX, BCT, BME, BAM, BIE, BAG, BGE	Pass Marks	32
Year / Part	I / II	Time	3 hrs.

Subject: - Basic Electronics Engineering (*EX 451*)

- ✓ 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 dependent and independent signal sources with suitable symbols and examples. [4]
2. Explain the operation of RC High pass filter with necessary circuit diagram and transfer characteristics curve. [4]
3. Find the output waveform of the given input wave. (Assume diode is ideal). [4]





4. Describe the AC model of semiconductor diode and derive the expression for small signal incremental resistance of the diode. [4]
5. If V_{cc} = 10V, R_B = 900 KΩ, R_c = 2KΩ and β = 150, calculate the collector current I_c for collector feedback type dc biasing circuit. [5]
6. Explain operation of CMOS NOR with necessary diagram. [5]
7. Explain the operation of BJT as a switch. [6]
8. Design summing amplifier to using Op-Amp to get the output voltage $V_0 = -V_1+2V_2+3V_1$. [5]
9. Derive output voltage expression for Op-amp integrator and differentiator. [4+4]
10. Draw the circuit diagram of Triangular wave generator and write its frequency of oscillation. [3]
11. Define modulation. Explain Amplitude Modulation (AM) in brief with necessary waveforms and expressions. [1+4]
12. Illustrate block diagram of digital communication system. [4]
13. Perform the following: [4]
    a) $(573.73)_8 = (?)_{16}$
    b) $(267.02135)_{10} = (?)_2$
    c) $(508)_{10} = (?)_{BCD}$
    d) Subtract $(24)_{10}$ from $(48)_{10}$ using 2's complement method.
14. Simplify Boolean Expression by using K-MAP. Also draw circuit. [6]

    F = A'C+A'B+AB'C+BC
15. Construct T flip-flop with its characteristics table and equation. [5]
16. Write short notes on: (Any Two) [2×4]
    a) Strain gauge
    b) Regulated power supply
    c) Digital multimeter

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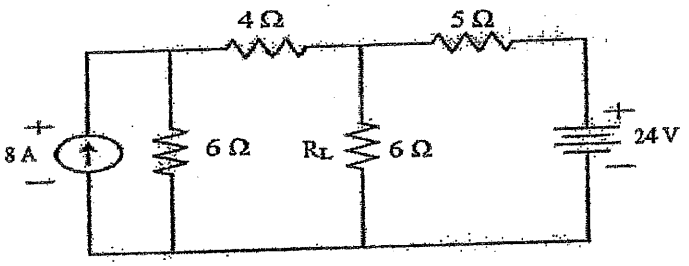
TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2079 Jestha

Exam.	Back		
Level	BE	Full Marks	80
Programme	All except BAR	Pass Marks	32
Year / Part	I / II	Time	3 hrs.

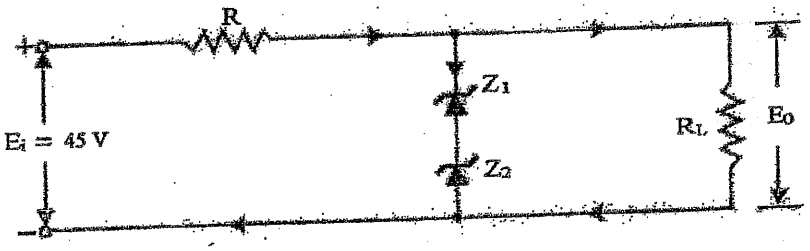
Subject: - Basic Electronics Engineering (*EX 451*)

- ✓ 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. Thevenise the following circuit and calculate the current flowing through RL. [5]



2. Define active and passive components in electronic system. Calculate the value of resistor having color codes YELLOW, VOILET, ORANGE, GOLD. [4]
3. Explain the operation of RC high pass filter with necessary diagram. [4]
4. Explain forward and reverse characteristics of semiconductor diode with diagrams. [5]
5. Explain large signal models of semiconductor diode with necessary diagrams. [5]
6. Explain the operation of full wave center tapped rectifier with necessary diagrams. [5]
7. The circuit of figure below uses two zener doides, each rated at 15 V, 200 mA. If the circuit is connected to a 45-volt unregulated supply, determine: (i) The regulated output voltage (ii) The value of series resistance R. [5]



8. Explain common emitter configuration of NPN transistor with its characteristics with necessary diagrams. [5]
9. Calculate the Q point of the voltage divider biasing circuit where VCC = 15V, R1 = 10K, R2 = 5K, RC = 1K, RE = 2K and β = 100. [5]
10. Explain the operation of N channel enhancement type MOSFET with necessary diagram. [5]
11. Write down the properties of idle op.amp. Design the op amp circuit that produces output $V_0 = 4V_1 + 2V_2 - 0.5V_3$. [2+3]
12. Draw the circuit diagram for sine wave oscillator using op-amp. Write the formula for frequency calculation. [3]
13. Simplify the Boolean function using k map and realize the logic circuit.

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F $\sum(0,1,2,4,5,6,8,9,12,13,14)$. [4+2]

14. Explain the block diagrams of communication system. Write down the advantages of FM over AM. [5]

15. Explain the operation of JK flip flop with necessary diagram. [5]

16. Write short notes on: (Any two) [2×4]

a) Data logger
b) DMM
c) Remote control

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division

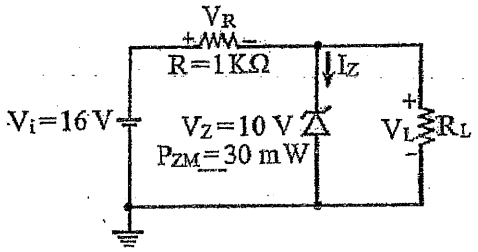
2078 Chaitra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BCE, BEL, BEX, BCT, BME, BAM, BIE, BAG, BGE, BAS	Pass Marks	32
Year / Part	I / II	Time	3 hrs.

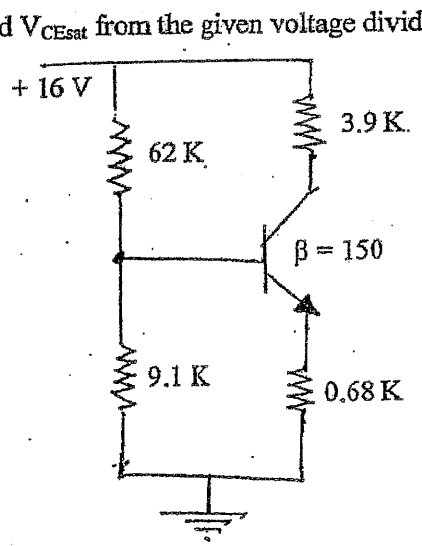
Subject: - Basic Electronics Engineering *(EX 451)*

- ✓ 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 Active and Passive components with examples. [3]
2. What is filter? Explain the procedure to calculate value of resistance for band 5. [1+3]
3. For the Zener diode network shown below, determine V_L, V_R, I_Z and P_Z for $R_L = 3\ K\Omega$. [4]



4. Explain the working principal of full wave Bridge rectifier circuit and define its parameters. [5]
5. Find I_{BQ}, I_{CQ}, V_{CEQ}, I_{Csat} and V_{CEsat} from the given voltage divider circuit. [6]



6. Explain N-channel E-MOSFET operation along with its characteristic curve. [7]
7. Draw the circuit diagram of BJT differential amplifier. [3]
8. Mention any four properties of an ideal op-amp. Derive the expression of voltage gain of an inverting amplifier using op-amp. [2+4]

9. State Barkhausen criteria for oscillation. Draw Wein bridge oscillator circuit to generate sine wave and derive the frequency of the generated sine wave. [2+4]

10. Differentiate between positive and negative feedback system with applications. [4]

11. Describe properties of EMW propagation. Draw structure of Optical fiber. [3+2]

12. Differentiate between Internet and Intranet. [3]

13. Convert the following: [5]

    a) $(257.24)_8 = (\ ?\ )_{10}$
    b) $(3B9)_{16} = (\ ?\ )_8$
    c) $(10110)_{Grey} = (\ ?\ )_2$
    d) $(2345.67)_{10} = (\ ?\ )_{16}$
    e) Subtract $(49)_{10}$ from $(37)_{10}$ using 2's complement method

14. Describe SR latch with necessary circuit diagram and truth table. [6]

15. Simplify the following Boolean Expression using K-Map and implement the simplified expression using NAND gate only: $F(A, B, C) = \Sigma\ (0, 1, 2, 5) + D\ (3, 4, 6)$ [3+2]

16. Write short notes on: (Any Two) [2×4]

    a) Data logger
    b) Digital Multimeter
    c) Regulated power supply

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division

2078 Poush

Exam.	Back		
Level	BE	Full Marks	80
Programme	BCE, BEL, BEX, BCT, BME, BAM, BIE, BAG, BGE, BAS	Pass Marks	32
Year / Part	I / II	Time	3 hrs.

Subject: - Basic Electronics Engineering *(EX 451)*

- ✓ 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. Write the color code for carbon resistor 4.7Ω±1%. [1]
2. Briefly explain about different types of controlled source. Explain the operation of RC High Pass filter with its frequency response. [3+4]
3. Explain the operation of center tapped full wave rectifier and find its PIV rating for diode with necessary diagrams. [5]
4. Draw the clipper circuit and find the output voltage with sinusoidal input voltage. [3]
5. What is MOSFET? Explain the construction and working principle of enhancement type MOSFET. [1+6]
6. Why BJT is called bipolar and FET is called unipolar device? Explain the operation of transistor as a switch in cut-off and saturation region. [1+4]
7. Draw the DC load line and determine the Q-pt of the voltage divider biased transistor circuit having V_{CC}=20V, R_C=2KΩ, R_E=4KΩ, R_1=20KΩ, R_2=10KΩ and β=100. [4]
8. Explain virtual ground concept of Op-amp. Design the summing amplifier using Op-amp to get the output voltage: $V_0 = V_1 - 2V_2 - 4V_3 + 5V_4$. [2+4]
9. List out Barkhausen criteria. Draw the circuit diagram of op-amp square wave generator and mention its frequency of oscillation. [2+2+2]
10. Explain Wein Bridge oscillator. [4]
11. Draw the block diagram of communication system and briefly explain each block. Differentiate between internet and intranet. [5+3]
12. Write short notes on: (Any Two) [2×4]
    a) Audio video system
    b) Remote control
    c) Digital multimeter
13. Convert the following : (Any Three) [3×2]
    a) $(10101.101)_2=(?)_{10}$
    b) $(9001180)_{10}=(?)_{BCD}$
    c) $(2AB.5E)_{16}=(?)_8$
    d) $(34)_{10}$-$(12)_{10}$ using 1's complement method.
14. Explain JK filp flop using NAND gates only. [4]
15. Simplify the expression $F(A,B,C,D)=\Sigma(1,5,6,7,11,12,13,15)$ and realize it with logic gate. [6]

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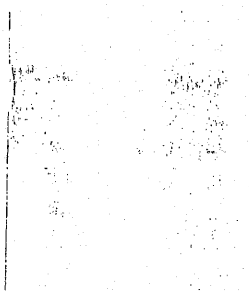

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division

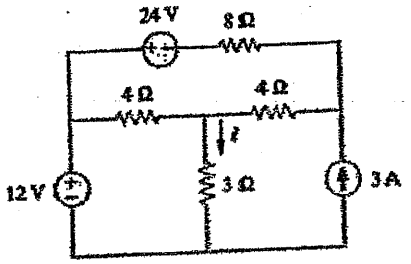
2078 Baishakh

Exam.	Back		
Level	BE	Full Marks	80
Programme	BCE, BEL, BEX, BCT, BME, BAM, BIE, BAG, BGE, BAS	Pass Marks	32
Year / Part	I / II	Time	3 hrs.

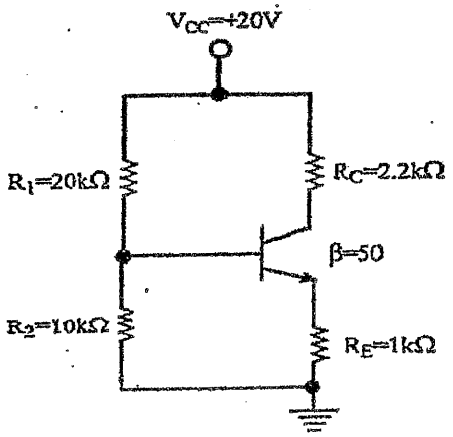
Subject: - Basic Electronics Engineering *(EX 451)*

- ✓ 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. State the difference between Active and Passive components. Describe the operation of RC high pass filter with necessary diagrams. [1+4]
2. Using the principle of superposition, find the current i through the 3 Ω resistor in figure below. [5]



3. What is diode? Explain large signal model of PN junction diode. [1+5]
4. Draw the circuit diagram of differential amplifier using BJT. [2]
5. Explain the construction and working principle of Enhancement type N-channel MOSFET with necessary mathematical expression and characteristic curves. [6]
6. Determine the collector current (I_C) and collector emitter voltage (V_{CE}) of the following BJT circuit. [5]



7. Draw the circuit diagram of CMOS inverter. [3]

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8. What do you mean by virtual short circuit in Op-amp. Draw the circuit diagram of differentiating amplifier using op-amp and derive the expression for output voltage. [1+4]

9. Describe the operation of square wave generator using op-amp and find its frequency of oscillation. [5]

10. What is operational amplifier? Explain Wein bridge oscillator. [1+5]

11. Describe communication system in brief with a complete block diagram. [4]

12. Draw and explain the block diagram of data logger and oscilloscope. [4+4]

13. What is Antenna? Discuss the role of Antenna in communication system. [2+2]

14. Convert the following number system into: (Any Three) [3×2]
    a) $(59.60)_{10}$ ---- $(\ )_2$
    b) $(37.FE)_{16}$ ---- $(\ )_8$
    c) $(11.011)_2$ ---- $(\ )_{10}$
    d) $(33.25)_8$ ---- $(\ )_{10}$

15. Solve using k-map: $F = A'B'C' + B'CD' + A'BCD' + AB'C'$. [6]

16. Explain the operation of JK flip-flop with necessary diagrams and characteristics table. [4]

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division

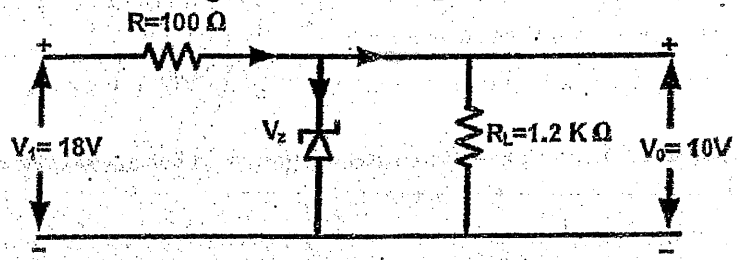
2077 Chaitra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BCE, BEL, BEX, BCT, BME, BAM, BIE, BAG, BGE, BAS	Pass Marks	32
Year / Part	I / II	Time	3 hrs.

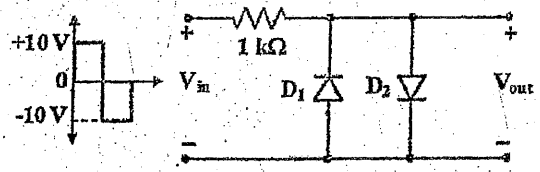
Subject: - Basic Electronics Engineering *(EX 451)*

- ✓ 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.*

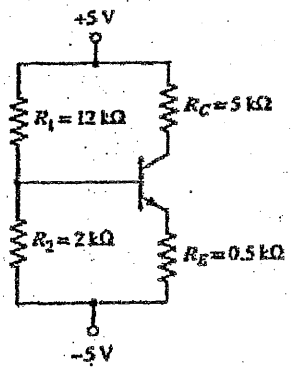
1. Write the color coding of the following values of resistors: [4]
   a) 47 ±5% k Ω b) 548 ±10%Ω
2. Explain RC low pass filter with necessary derivations and diagrams. [4]
3. Find the Zener Current in the given circuit when R_L = 1.2 kΩ. Assume V_Z = 10V. [4]



4. Find the output voltage waveform when the input is applied to the circuit a shown in the figure using silicon diodes. [4]



5. Describe the input and output characteristics of common emitter BJT configuration with the help of circuit diagram and graph with various region of operation. [6]
6. Describe the construction and working principal of Depletion MOSFET with necessary diagrams. [5]
7. Find collector current (I_C) and collector emitter voltage (V_{CE}) of the BJT circuit given below with β = 100. [5]



8. List out ideal characteristics of op-amp. Derive voltage gain of non-inverting op-amp configuration. [2+4]

9. Design the summer circuit using operational amplifier: [5]

$$V_0 = V_1 + 2V_2 + 3V_3$$

10. Explain the concept of gain stability. Describe the working principal of square wave generator circuit using operational amplifier. [1+4]

11. Explain the complete block diagram of communication system. [4]

12. What is optical fiber? What are the advantages of optical fibers over traditional communication systems? [1+3]

13. Write short notes on: (Any Two) [2×4]

a) Strain gauge b) Data logger c) Digital multimeter

14. Convert the following: (Any Three) [3×2]

a) $(10101.101)_2 = (?)_{10}$
b) $(9001180)_{10} = (?)_{BCD}$
c) $(2AB.5E)_{16} = (?)_8$
d) $(34)_{10} - (12)_{10}$ using 1's complement method.

15. Simplify the expression using K-Map, F(x, y, z) = X'YZ + X'Y'Z + XYZ and realize it using logic gates. [6]

16. Explain the operation of JK flip-flop with necessary diagrams and characteristics table. [4]

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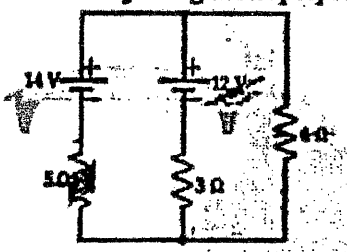
TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2076 Bhadra

Exam.	Regular / Back		
Level	BE	Full Marks	80
Programme	ALL Except BEI, BAR	Pass Marks	32
Year / Part	I / II	Time	3 hrs.

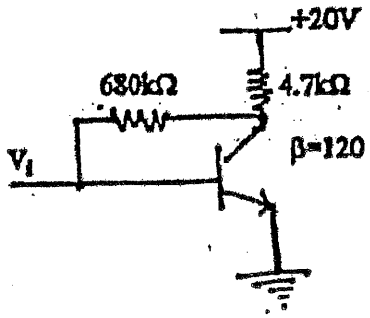
Subject: - Basic Electronics Engineering *(EX451)*

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

1. What is filter? Explain High Pass Filter. [1+3]
2. Find the voltage across the 4Ω resistor by using the Superposition theorem. [6]



3. Explain the operation of photo diode. Draw the circuit diagram of fullwave bridge rectifier. [4+2]
4. Show the relationship between current gain alpha (α) and beta (β) of BJT. Explain the importance of dc loadline analysis in transistor biasing to find collector current & collector emitter voltage. [2+3]
5. Differentiate between depletion and enhancement type MOSFET. Explain NMOS as a switch. [2+4]
6. Determine I_{CQ} and V_{CEQ} for the following circuit. [5]



7. Explain how square wave is generated at output terminal using Op-Amp circuit as square wave generator and draw the circuit diagram of triangular wave generator. [4+2]
8. Show the concept of positive feedback with suitable block diagram. Draw the circuit diagram of Wein Bridge Oscillator using Op-amp. [3+2]
9. Design a summer circuit using op amp as: $V_o=-5V_1-10V_2-15V_3$
   Where, V_o is an output voltage and V_1, V_2 & V_3 are input voltages. [5]
10. Differentiate between internet and intranet. How Light-propagates through Optical fiber? [2+3]

11. Why modulation is needed? Differentiate AM and FM.

12. Differentiate between SR and JK filp-flop. Explain Master-Slave flip-flop with block diagram. [2+3]

13. Simplify using Boolean Algebra. [1+3]

a) $AC+ABC+\overline{A}(C+A\overline{C})$ [3×2]

b) $(A+B)(\overline{A}+B)(A+\overline{B})$

c) Subtract $(20)_{10}$ form $(3)_{10}$ using 1's complement method

14. Simplify the function using K-map:
$F(D,C,B,A)=\Sigma(3,4,5,7,9,13,14,15)$ and realize this circuit using gates. [6]

15. Write short notes on: *(Any Two)* [3×2]

a) Data logger

b) Regulated power supply

c) Transducer

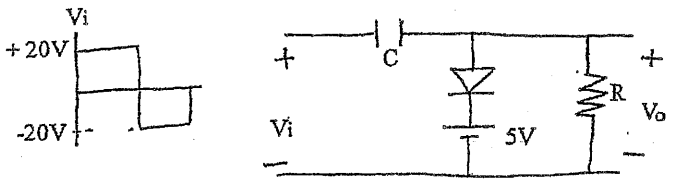
04 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2076 Baisakh

Exam.	Back		
Level	BE	Full Marks	80
Programme	All (Except BAR)	Pass Marks	32
Year / Part	I / II	Time	3 hrs.

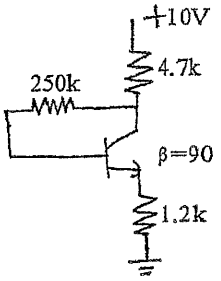
Subject: - Basic Electronics Engineering *(EX 451)*

- ✓ 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.*

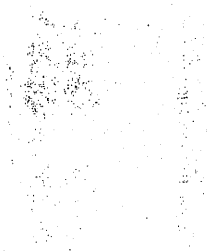
1. Define dependent or controlled source. Briefly explain its type with suitable examples. [5]
2. Differentiate between active and passive components. [3]
3. Explain the operation of Varactor diode with its characteristic curve. [5]
4. Sketch V_0 for given network. Assume diode is made of silicon. [5]



5. Describe the input and output characteristics of common emitter configuration circuit of BJT with the help of circuit diagram and graph with various regions of operation. [6]
6. Determine Quiescent levels of ICQ and VCEQ for the network. [6]



7. Derive the expression of output voltage for integrator and differentiator using op-amp. [5]
8. State the Barkhausen Criteria for oscillation. Show how square wave is generated using Op-amp. [2+6]
9. What is electromagnetic wave? Explain about EMW propagation. [1+3]
10. Differentiate between: [3+3]
    a) Internet and Intranet
    b) Broadcasting and Communication
11. Using K-map simplify the expression $F(a,b,c)=\bar{a}bc+b\bar{c}+ab\bar{c}+a\bar{b}c$ [4]
12. Substract $(11100)_2$ from $(10011)_2$ using 2's complement method. [3]
13. Define Demultiplexer. Explain the operation of binary to octal decoder. [6]
14. Construct S-R flip-flop using NAND Gate only and explain the operation with characteristic table. [6]
15. Draw a basic lock diagram of oscilloscope and explain its function. [5]
16. Write short notes on: (Any one) [3]
    a) Strain Gauge
    b) Regulated Power Supply



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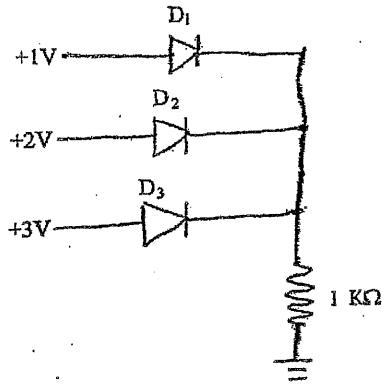
04 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2075 Bhadra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	All (Except B.Arch.)	Pass Marks	32
Year / Part	I / II	Time	3 hrs.

Subject: - Basic Electronics Engineering *(EX451)*

- ✓ 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 an ideal voltage source? Why is this voltage source practically unrealizable? Explain practical voltage source with an example. [1.5+1+1.5]
2. Why are resistors, inductors and capacitors called passive elements? How can these components be used to realize a filter circuit that passes high frequency signals only? [1+3]
3. Describe the small signal model of semiconductor diode. And derive the expression for dynamic resistance rd. [6]
4. Assuming diodes used in the circuit are ideal. Find current through 1 KΩ resistor. [4]



5. Design Op-amp circuit to get output $V_0 = 0.5V_1 - 2V_2 - V_3$. Here V_1, V_2 and V_3 are three input voltage source. [4]
6. Explain the working of triangular wave generator with necessary diagram. [5]
7. Draw the circuit diagram of Wien bridge Oscillator. Write frequency of Oscillation. [3]
8. Explain the need of modulation in a communication system. [3]
9. Explain the block diagram of optical fibre communication and explain the advantages of optical communication over copper cable communication. [6]
10. Convert the following numbers as indicated. [1.5×2]

    a) $(EIA)_{16} = (\ )_8$ b) $(35.7)_{10} = (\ )_2$
11. State and prove De-Morgan's Theorems. [3]
12. Define encoder. Explain the operation of octal to binary encoder with logical diagram. [6]

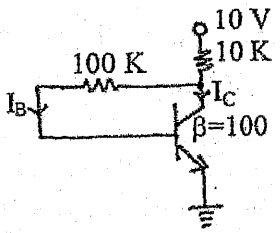
2.9

13. Obtain the simplified expression for the following boolean function using K-Map. [3]

$F(x, y, z) = \Sigma m (0, 2, 4, 5, 6)$

14. Construct clocked SR flip-flop with its characteristics table and equation. [5]

15. For the circuit given below determine I_B, I_C and V_{CE}. [2+2+2]



16. Explain the working principle of n-channel Enhancement type MOSFET. [6]

17. Explain the block diagram of data logger briefly. [4]

18. What is a digital multimeter? Draw its block diagram and explain how it measures resistance. [1+4]

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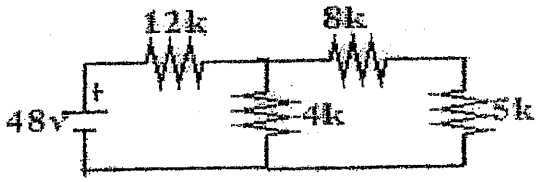
04 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2075 Baishakh

Exam.	Back		
Level	BE	Full Marks	80
Programme	All (Except B. Arch)	Pass Marks	32
Year / Part	I / II	Time	3 hrs.

Subject: - Basic Electronics Engineering *(EX451)*

- ✓ 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. Determine Vth, Rth and the current through 5 KΩ resistor using Thevenin's theorem. [4]



2. What do you mean by a filter circuit? Explain the operation of RC low pass filter with its transfer function and frequency response. [4]
3. Explain large signal models of PN junction diode. [4]
4. Explain the working principle of full wave bridge rectifier with necessary diagrams and expressions. [4]
5. Draw the DC load line and determine the Q point of the voltage divider biased transistor circuit having V_{CC} = 20v, RC = 2K, R1 = 20k, R2=10k, RE=4k, β=100. [6]
6. Describe the construction and working principle of n-channel depletion type MOSFET with necessary diagrams. [6]
7. Explain the operation of CMOS invertor with necessary diagram. [4]
8. Describe the working principle of square wave generator circuit using operational amplifier. [4]
9. What do you mean by virtual short circuit in OP amp? Draw the circuit diagram of the inverting integrator and show that the output is proportional to the time-integrai of the input. [2+2+2]
10. State Barkhausen criteria for oscillation. Draw Wein bridge oscillator circuit to generate sine wave and derive the frequency of the generate sine wave. [2+2+2]
11. Explain working principle of optical fiber. List out the advantages of optical fiber communication over copper cable communication. [2+4]
12. Write short notes: (any two) [2×3]
    i) Data Logger
    ii) Digital Multimeter (DMM)
    iii) Regulated Power Supply
13. What is an anetenna? Explain any two properties of the antenna. [2+2]
14. Simply the expression using K-Map, F(A,B,C)=A'B+BC'+AC'. [4]
15. Explain the operation of JK flip-flop with necessary diagrams and characteristic table. [6]
16. What is multiplexer (MUX) Explain 4:1 Multiplexer. [6]

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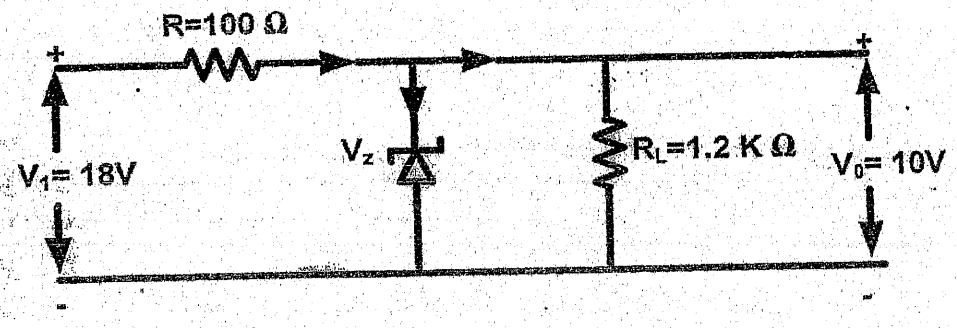
04 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2074 Bhadra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	All (Except B. Arch)	Pass Marks	32
Year / Part	I / II	Time	3 hrs.

Subject: - Basic Electronics Engineering *(EX451)*

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

1. What is Active and Passive Component? Define transconductance and voltage gain with reference to BJT. [2+4]
2. Draw the circuit diagram of RC High pass filter and explain its operation with the help of frequency dependent response at the output. [5]
3. Find the Zener Current in the given circuit when $R_L = 1.2\ K\Omega$. Assume $V_Z = 10$ V. [5]



4. What is clipper and clamper circuit? [2]
5. Draw emitter feedback bias circuit of BJT by labeling all the circuit components. Find I_C and V_{CE} in the circuit if $V_{CC} = +12$ V, $R_B = 430\ k\Omega$, $R_C = 2\ k\Omega$, $R_E = 1\ k\ \Omega$ and $\beta = 50$. [2+4]
6. Draw the circuit diagram of differential amplifier using BJT. [2]
7. Describe the working principle of n-channel enhancement type MOSFET. [6]
8. Mention any four properties of ideal Op-amp. Derive the expression of voltage gain of non-inverting amplifier using Op-amp. [2+4]
9. State Barkhausen criteria. Draw the circuit diagram of square wave generator and explain how it works. [2+4]
10. Draw the circuit diagram of Wien Bridge oscillator. [4]
11. Differentiate between following communication systems. [3+3]
    i) Wired and wireless communication system
    ii) Broadcasting and communication
12. What are the advantages and disadvantages of optical communication system? [4]
13. Write short notes on: (any two) [2×3]
    i) Oscilloscope
    ii) Data logger
    iii) Regulated power supply using IC
14. State DeMorgan's theorem. Subtract $(1111)_2$ from $(1110)_2$ using 2's complement method. [3+3]
15. Simplify an expression $F(A,B,C,D) = \sum(1,3,7,9,11,14,15)$ by using K-map. [4]
16. Explain the operation of clocked R-S Flip-Flop with necessary diagram. [6]

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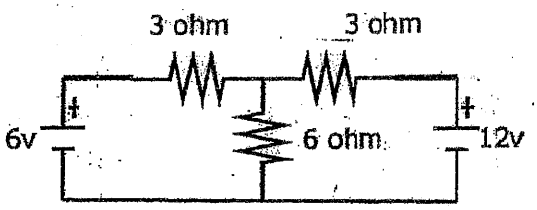
04 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2073 Bhadra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	All (Except B.Arch.)	Pass Marks	32
Year / Part	I / II	Time	3 hrs.

Subject: - Basic Electronics Engineering *(EX451)*

- ✓ 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 different types of controlled source with figures. [4]
2. Calculate the current flowing in each branch using superposition theorem. [6]



3. Describe the rectification process. Explain the operation of half wave rectifier with necessary diagrams. [1+4]
4. What is diode clamper? Describe the operation diode clamper circuit. [1+4]
5. Draw the DC load line and determine the Q point of the voltage divider biased transistor circuit having Vcc = 15v, Rc = 1kΩ, R1 = 10 kΩ, R2 = 5kΩ, Rc = 2kΩ and β = 75. [6]
6. Why BJT is a bipolar and MOSFET is an unipolar device? And draw the circuit diagram of differential amplifier using BJT. [2+2]
7. Explain the operation of CMOS switch with necessary diagrams. [4]
8. Mention any four properties of an ideal OP amp. Derive the expression of voltage gain of an inverting amplifier using OP amp. [2+4]
9. Draw a circuit diagram of square wave generator using OP amp. Explain how it generates the square wave. Express the frequency of the square wave generated. [2+3+1]
10. What is Optical fiber? Explain the advantages of optical fiber communication over coaxial cable communication. [1+3]
11. Define communication system. And describe communication system in brief with the complete block diagram. [2+3]
12. Simplify the expression using K-Map, F(x,y,z) = X'YZ+X'Y'Z+XYZ and realize it using logic gates. [5]
13. Mention the types of flip flops and explain the operation of J-K flip flop with necessary diagrams. [1+4]
14. Draw a block diagram of digital multimeter. Explain how it measures dc current flowing through it. [5]
15. Draw and explain the block diagram of data logger. [4]
16. Write short notes on: (any two) [2×3]
    a) Light emitting diode
    b) Output characteristics of common base configuration
    c) Regulated power supply

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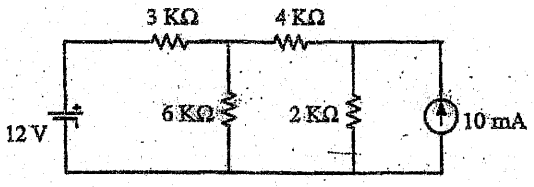
04 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2073 Magh

Exam.	New Back (2066 & Later Batch)		
Level	BE	Full Marks	80
Programme	All (Except B.Arch)	Pass Marks	32
Year / Part	I / II	Time	3 hrs.

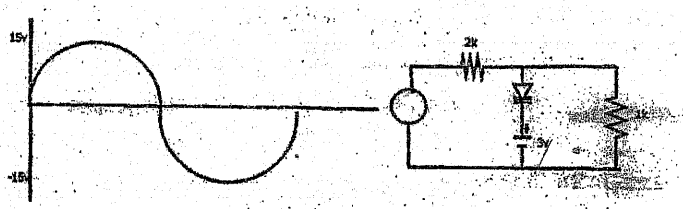
Subject: - Basic Electronics Engineering *(EX451)*

- 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. State Thevenin's theorem and use it to find the current through 4 kΩ resistor. [1+5]



2. Explain the operation of RC low pass filter with its transfer function and frequency response. [4]
3. What is diode? Explain the I-V characteristics of PN junction diode. [1+4]
4. Define pulse shaping circuits. Find the output wave form of the given circuit. [1+4]



5. Draw emitter feedback bias circuit of BJT by labeling all the circuit components. Find I_C and V_{CE} in the circuit if $V_{CC} = +12V$, $R_B = 430\ k\Omega$, $R_C = 2\ k\Omega$, $R_E = 1\ k\Omega$ and $\beta = 50$. [2+3]
6. Draw the structure of CMOS. Describe the operation of CMOS logic inverter. [5]
7. Explain the concept of virtual ground. Design a summer circuit using op-amp to get the output voltage as: $V_0 = -(V_1+10V_2+25V_3)$ [1+4]
8. Define positive feedback. Draw the circuit diagram for Wien Bridge oscillator and explain the principal of operation. [1+4]
9. Draw a block diagram of communication system and explain each block briefly. [6]
10. Write short note on optical fiber. What are the advantages of optical fiber communication over traditional communication system? [2+2]
11. State and prove De-Morgan's theorems. [4]
12. Explain the operation of SR flip-flop with necessary diagram. [5]
13. Convert the following number system. [3]

    (a) $(25.5)_{10} = (?)_2$ (b) $(EAB)_{16} = (?)_{10}$ (c) $(9180)_{10} = (?)_{BCD}$

14. Write short notes on: (any two) [2×5]
    a) Strain Gauge
    b) Data Logger
    c) DMM
15. Describe the construction and working principal of N-channel Depletion type MOSFET. [8]

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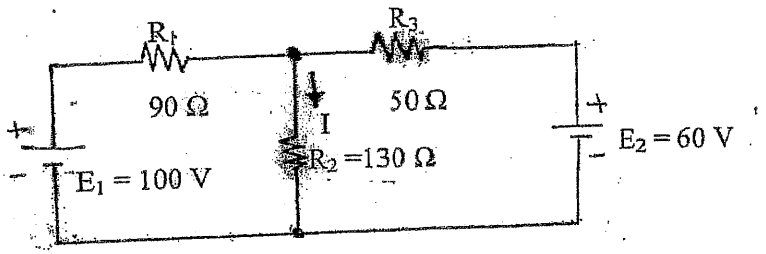
04 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2072 Magh

Exam.	[redacted]		
Level	BE	Full Marks	80
Programme	All (Except B. Arch)	Pass Marks	32
Year / Part	I / II	Time	3 hrs.

Subject: - Basic Electronics Engineering *(EX451)*

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

1. Describe the principle of Thevenins theorem by solving the following pro[redacted] [4]



Find the current through R_2.

2. Draw the circuit diagram of RC high pass filter and explain its operation with the help of frequency dependent response at the output. [1+3]
3. Draw and explain the operation of the full-wave rectifier circuit using center tapped transformer. [4]
4. Explain the piece wise linear models of PN junction diode. [4]
5. What is a clamper circuit? Draw the clamper circuit that adds +5volts DC level on AC voltage. [1+3]
6. Draw collector feedback type dc biasing circuit. If Vcc = 10V, R_B = 950 KΩ, R_C = 2.2 KΩ and β = 150, Calculate dc operating collector current (IcQ) [4]
7. Describe the construction and working principle of n-channel Enhancement type MOSFET. [6]
8. Draw the circuit diagram of differential amplifier using BJT and sketch the waveform at the collector terminals for sinusoidal differential input. [4]
9. State four important properties of ideal operational amplifier and determine the voltage gain of non-inverting operational amplifier circuit. [2+4]
10. Draw circuit diagram of triangular wave generator with square wave a input signal. Explain the working principle of square wave generator circuit using operational amplifier. [2+4]
11. Define communication system. Draw and explain the block diagram of communication system. [2+4]
12. Subtract $(1111)_2$ from $(1100)_2$ using 2's complement method. [2]
13. State De Morgan's theorem and Duality theorem with two examples for each. [4]
14. Simplify the following expression: [3+3]
    i) $F(x,y,z) = xyz + x'y'z + xy'z' + x'y'z' + x'yz$
    ii) $F(x,y,z) = \sum (0,2,5,7)$
15. Write short notes on. [4×4]
    a) Oscilloscope
    b) Digital voltmeter
    c) Positive and negative feedbacks
    d) Varactor diode

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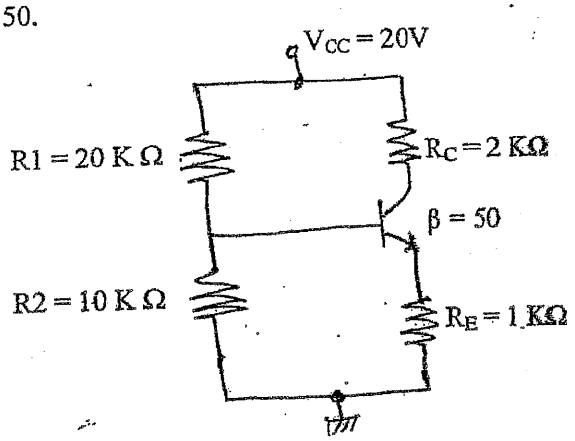
04 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2072 Ashwin

Exam.	Regular		
Level	BE	Full Marks	80
Programme	All (Except B. Arch)	Pass Marks	32
Year / Part	I / II	Time	3 hrs.

Subject: - Basic Electronics Engineering *(EX451)*

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

1. a) What do you mean by filter? Explain the operation of RC high pass filter. [1+3]
   b) Define dependent voltage source and transconductance with diagrams. [2+2]
2. A silicon junction PN junction diode with n = 1 has voltage drop 0.7 V at current of 1 mA. Find the voltage drop at current equal to 0.1 mA. [3]
3. Draw full wave bridge rectifier circuit and explain its operation. Express its equivalent average dc voltage output. [5+1]
4. Draw symbol for tunnel diode and its IV-characteristic graph. [1+2]
5. Find the values of I_{CQ} and V_{CEQ} for the given circuit. Given data are: [5]
   $V_{CC} = +20V$, $\beta = 50$.



6. Draw circuit diagram to study the dc output IV-characteristics of Enhancement type MOSFET and explain its output IV-characteristic graph. [5]
7. Explain the concept of virtual short in ideal operational amplifier. [2]
8. Deduce the output voltage for integrating amplifier and non inverting amplifier. [4]
9. State Barkhausen criteria. Draw Wien bridge oscillator circuit and express its frequency of oscillation. [1+3]
10. What is wireless communication? Draw block diagram of communication system and explain each block. [2+5]
11. What is electromagnetic wave (EMW)? Explain EMW propagation. [3]

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12. Explain the operation of D-flipflop with preset and reset facilities with necessary diagram and truth table. [5]

13. Subtract $(15)_{10}$ from $(10)_{10}$ using 2's complement method. [2]

14. What is counter? Explain with diagram the 3-bit asynchronous counter. [5]

15. Draw block diagram of digital voltmeter. And explain how it measures dc voltage. [5]

16. Describe active and passive transducers. [4]

17. Write short notes on: (any three) [3×3]

    i) Photo diode
    ii) BJT as switch
    iii) Differential amplifier
    iv) Duality Theorem

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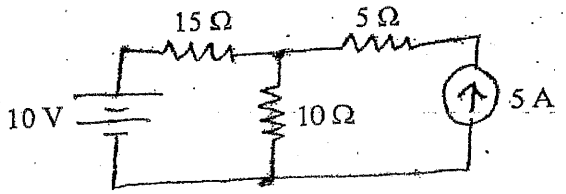
04 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2071 Bhadra

Exam.	Regular / Back		
Level	BE	Full Marks	80
Programme	All (Except B.Arch.)	Pass Marks	32
Year / Part	I / II	Time	3 hrs.

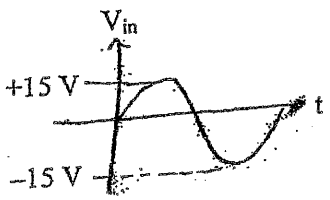
Subject: - Basic Electronics Engineering *(EX451)*

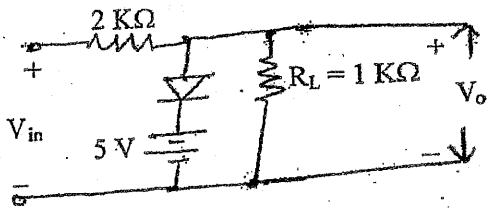
- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. Define active and passive circuit component. Determine the color code of the following resistor 75 KΩ ± 10%. [2+2]
2. Determine the current through 10 Ω resistance using Thevenin's theorem. [4]

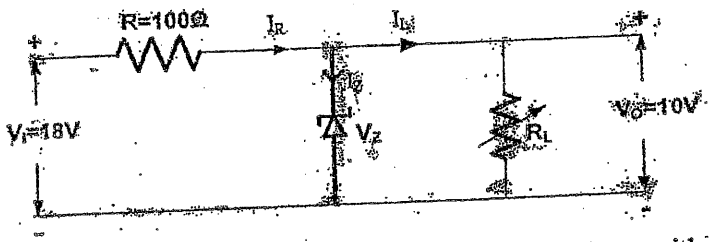


3. What is a filter? Explain the types of filter with necessary diagrams. [1+3]
4. Explain large signal models of PN junction diode. [4]
5. Define clipping circuits. Draw the output waveform of circuit shown below. Assume real silicon diode. [2+2]





6. Find the Zener current in the given circuit when $R_L = 1.2$ KΩ. Assume $V_Z = 10$ V. [4]



7. Explain the common emitter configuration circuit of npn transistor with the help of input and output characteristics. [6]

8. Explain the working principle of N channel depletion type MOSFET with necessary diagrams. [6]
9. State any four properties of an ideal op-amp. Design a summing amplifier usign Op-Amp to get the output voltage $V_0 = -V_1 + 2V_2 + 3V_3$. [2+3]
10. Explain how square wave can be generated using Op-Amp and write the relation for frequency of oscillation. [4+1]
11. Define communication system and draw the complete block diagram of communication system. [2+3]
12. What is optical fiber? Explain the advantages of optical fiber communication over traditional communication system. [2+3]
13. Simplify the expression using K-map, Y = A'BC' + ABC' + ABC. [3]
14. Explain the operation of SR-flip flop with necessary diagrams and characteristics table. [6]
15. (a) $(10101.101)_2 = (?)_{10}$. (b) $(9001180)_{10} = (?)_{BCD}$ (c) $(2AB . 5E)_{16} = (?)_8$ [1×3]
16. What is instrumentation system? Explain the instrumentation system with the help of simple block diagram. [1+3]
17. Write short notes of any two: [2×4]
    a) Data Logger
    b) DMM
    c) Strain Gauge

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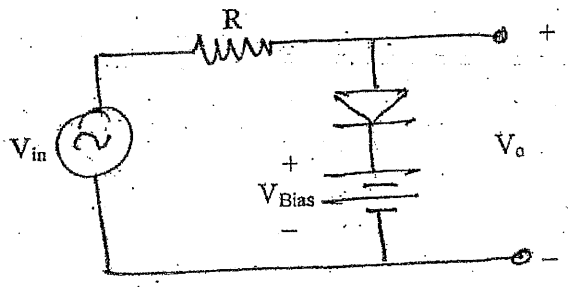
04 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2071 Magh

Exam.	New Back (2066 & Later Batch)		
Level	BE	Full Marks	80
Programme	All Except (B.Arch.)	Pass Marks	32
Year / Part	I / II	Time	3 hrs.

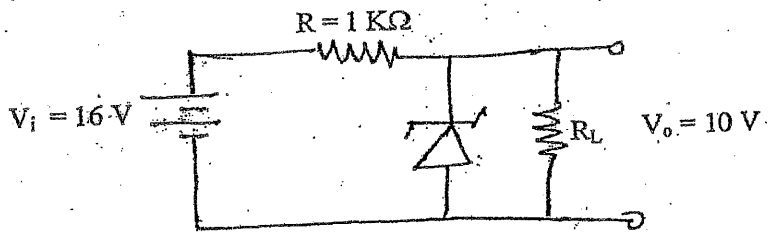
Subject: - Basic Electronics Engineering *(EX451)*

- ✓ 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.*

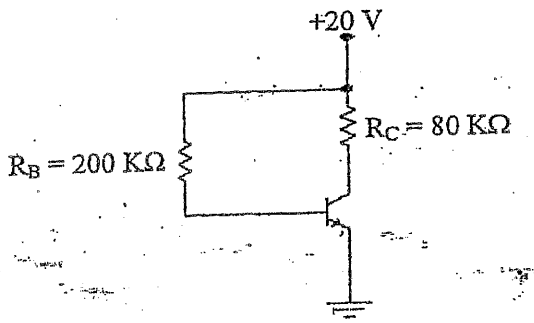
1. What do you mean by filter? Explain the RC low pass and high pass filter with corresponding transfer function and magnitude. [1+4]
2. State Thevenin's Theorem. Write down the steps for determining V_{th} and R_{th} with necessary circuit diagrams. [1+4]
3. What is rectification? Explain the operation of half wave rectifier with necessary diagrams. [1+4]
4. What are clippers? Draw the sinusoidal waveform of the following circuit and indicate the output voltage. Assume diode is ideal. [1+4]



5. Find the zener current from the given zener diode network when $R_L = 3\ K\Omega$ and $V_o = 10\ V$. [5]



6. For the given circuit with $\beta = 75$, determine I_B, I_C and V_{CE}. [2+2+2]



7. Explain the construction and working principle of enhancement type MOSFET? [6]
8. Explain the concept of feedback theory. Describe the working principal of square wave oscillator circuit using op-amp. [2+4]
9. State any 4 important properties of ideal Op-Amp. Draw the circuit diagram of differentiator using Op-Amp and show that output is the differentiation of input signal. [2+4]
10. What is modulation? Explain AM and FM modulated wave. [1+2+2]
11. What do you mean by electromagnetic waves? How are they propagated? Explain. [2+3]
12. Perform the following: [4×1]
    a) $(375.37)_8 = (?)_{16}$
    b) $(169.03125)_{10} = (?)_2$
    c) $(905)_{10} = (?)_{BCD}$
    d) Subtract $(25)_{10}$ from $(49)_{10}$ using 2'S complement method
13. Simplify the following Boolean expression using K-map and realize it by using universal gate of your interest. [3+2]

    $F(x, y, z) = xy + \bar{x}z + yz$
14. Explain SR flip-flop with circuit. [4]
15. What is instrumentation system? Describe the instrumentation system with block diagram. [4]
16. Explain briefly about remote control or digital multimeter with necessary diagrams. [4]

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04 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2070 Bhadra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	All (Expect B.Arch.)	Pass Marks	32
Year / Part	I / II	Time	3 hrs.

Subject: - Basic Electronics Engineering *(EX451)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
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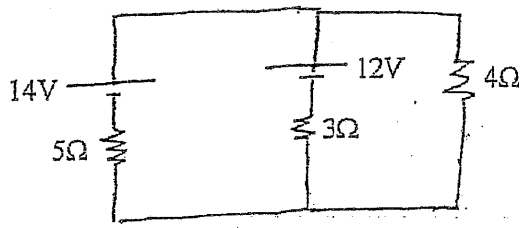
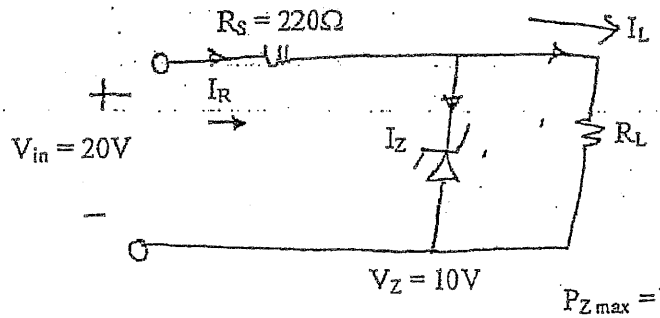
1. State superposition theorem. In the following figure find the current flow in 4 ohm resistor using superposition theorem. [2+4]



2. Explain the principle of operation of RC low pass filter with necessary diagrams and derivation. [4]
3. Explain the working principle of full wave bridge rectifier circuit with the help of necessary circuit diagrams and expressions. [6]
4. Determine V_L, I_L, I_Z and I_R for the network shown in figure below for following condition. [3+3]
   a) If $R_L = 180\ \Omega$
   b) If $R_L = 470\ \Omega$



5. Define DC load line? Explain the common emitter configuration circuit with the help of input and output characteristics curve. [2+4]
6. Explain the construction and working principle of MOSFET. [6]
7. Write the four properties of ideal operational amplifier. [2+4]
8. Explain how square wave can be generated using Op-Amp. [6]

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9. Define communication system. Explain amplitude modulation communication system with the help of necessary block diagrams. [6]

10. Discuss the role of antenna in communication system. What are the advantages and disadvantages of optical fiber communication? [2+4]

11. Draw the circuit of X-OR gate using NAND gates only. Perform the subtraction using 2's complement method. [2+2]

    $42_{(10)} - 115_{(10)}$

12. Simplify the expression using k-map [4]

    $F(x, y, z) = xyz + x'y'z + xy'z' + x'y'z' + x'yz$

13. Discuss the operation of S-R flip flop. [4]

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

    a) Clipper circuit
    b) Strain gauge transducer
    c) Data logger

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04 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2070 Magh

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Year / Part	I / II	Time	3 hrs.

Subject: - Basic Electronics Engineering *(EX451)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
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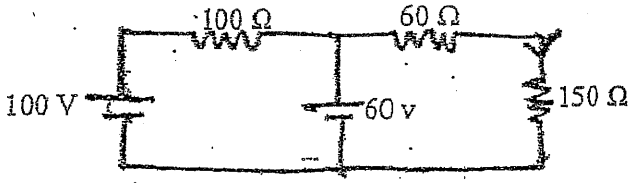
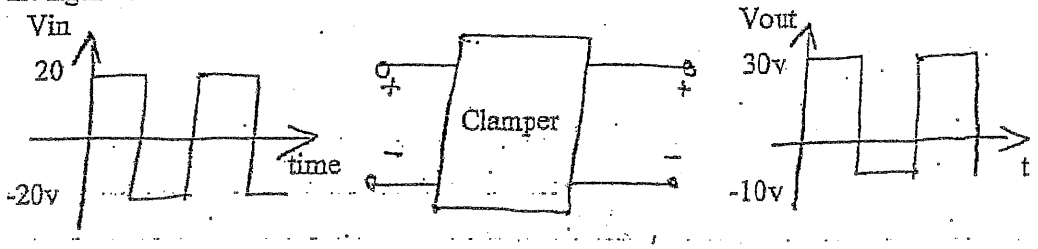
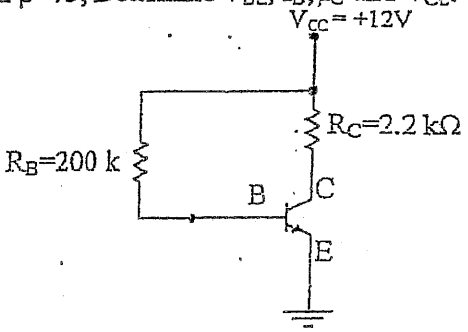
1. Find the current I in 150 Ω resistor using thevinius theorem. [6]



2. Find the value of resistor from following colour code. [2]
   a) Red Orange Green Silver b) Yellow Black Gold Gold
3. Explain the operation of RC high pass filter circuit with the help of necessary diagrams and figures. [4]
4. Describe IV characteristics of PN Junction diode. [6]
5. What is a clamper circuit? Design a clamper circuit to perform the function indicated in the figure below. [2+4]



6. For the given circuit with β=75, Determine V_{BE}, I_B, I_C and V_{CE}. [6]



7. Explain how BJT can be used as a switch. What are the difference between MOSFET and BJT? [4+2]

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8. Explain the concept of virtual ground in op-amp. Design a summer circuit using op-amp to get the output voltage as: $V_0 = -(V_1 + 10V_2 + 25V_3)$ [2+4]

9. How do you define positive feedback? Draw the circuit for Wein bridge oscillator and explain the principle of operation. [2+4]

10. What are the advantages of optical fiber communication system? Draw and label the diagram of optical fiber. [3+3]

11. Explain why modulation is needed in Communication System. Mention any three parameters of antenna. [3+3]

12. Simply the given function using K-map method. $F(A, B, C) = \Sigma(0, 1, 2, 5) + D(3, 4, 6)$ and implement the simplified circuit using NAND only. [3+3]

13. What is the difference between combinational and sequential circuit. Discuss JK flip-flop with the help of logic diagram. [2+6]

14. Write short notes on: (any two) [3×2]

    a) Data logger
    b) Regulated power supply
    c) Digital Multi-meter

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2080 Ashwin

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

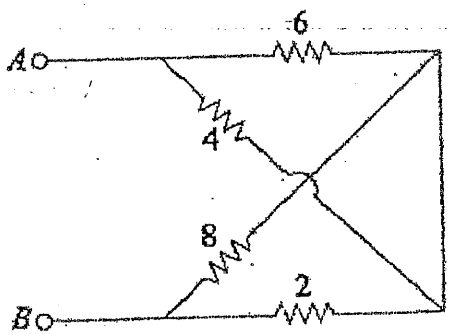
Subject: - Basic Electrical Engineering *(EE 451)*

- ✓ 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.*

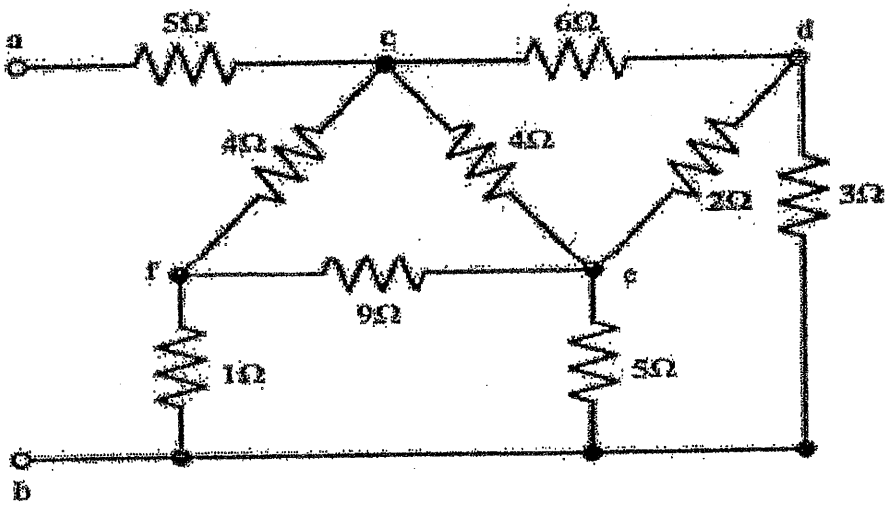
1. a) A coil is connected across a constant dc source of voltage 120V, draws a current of 12A at room temperature. After running 6 hours temperature rises to 65°C and current reduces to 8A. Calculate the current when temperature increases to 80°C and the coefficient of resistance at 30°C. [consider room temperature = 25°C]. [6]

   b) A conductor of length 40 cm has a diameter of 20 mm at its one end and a diameter of 40 mm at its other end. Determine the resistance of the conductor . Take resistivity of the material 0.0284μΩm. [6]

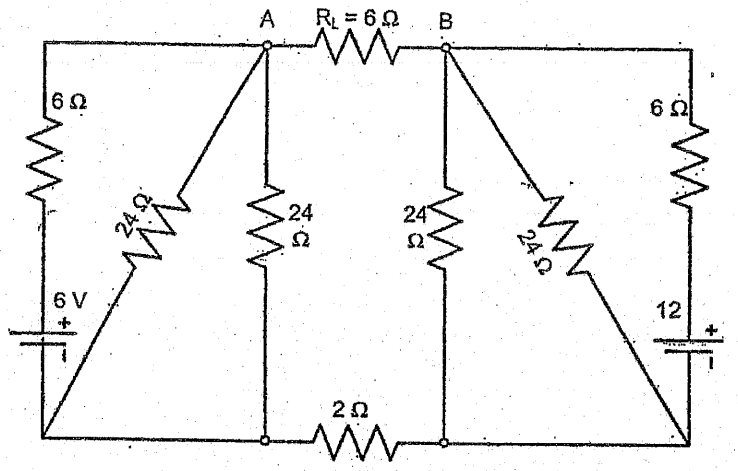
   c) Find the equivalent resistance between A and B for the given circuit. [4]



2. a) Find the equivalent resistance between a and b in the given network below using star-delta and delta-star transformation. [8]



b) Determine the current in 6Ω (AB) resistor in the circuit shown below using Superpositi theorem. [8]

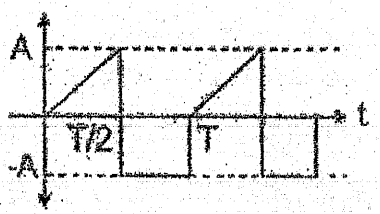


3. a) Prove that a pure Inductor supplied by sine wave AC voltage does not consumes active power. Draw power wave diagrams. [6+2]

b) V = 200+J0. Calculate magnitude and power factor of circuit current and branch currents. Also find the total active power, reactive power, apparent power and draw the phasor diagram. [8]

4. a) A series R-C circuit takes a power of 7000 W when connected to 200V, 50Hz supply. The voltage across the resistor is 130V. Calculate (i) The resistance and impedance (ii)Write equations for v(t) and i(t) (iii) Draw phasor diagram. [8]

b) Find the RMS and average values of periodic wave as shown in figure below. [8]



5. a) Three identical coils, each having a reactance of 20Ω and resistance of 20Ω are connected in (i) Star (ii) Delta across a 440V, 3phase line. Calculate the line current for each method of connection and reading of each of the two watt-meters connected to measure the power for each method of connection. [4+4]

b) A 420 V, 3-phase, 50 Hz induction motor takes 50 kW power from supply mains at 0.72 power factor lagging. Capacitors are connected in delta across the line to improve the overall power factor. Calculate the capacitance per phase in order to raise the power factor to 0.9 lagging. [8]

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2079 Chaitra

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

Subject: - Basic Electrical Engineering *(EE 451)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
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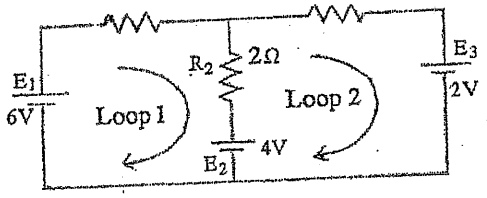
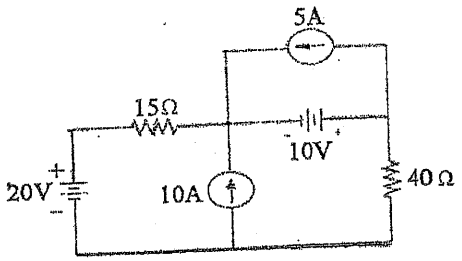
1. a) The resistance of a transformer winding is 460 ohm at room temperature of 25°C. When the transformer is running and the final temperature is reached, the resistance of the winding increases to 520 ohm. Find the average temperature rise of winding assuming that $\alpha_{20} = 1/250$ per°C. [6]

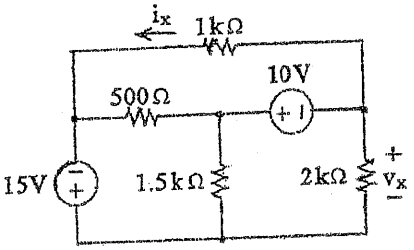
   b) Using KVL and KCL find the branch currents in the given circuit. [4]



   c) Find the current flowing through 15 Ω using the superposition theorem. [6]

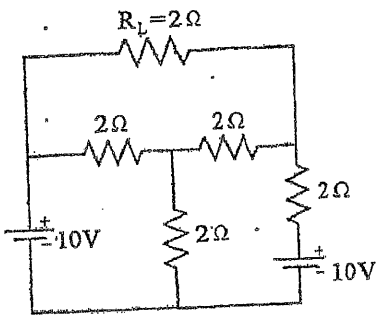


2. a) Formulate node-voltage equations for the circuit in figure below and solve for the v_x and i_x. [6]



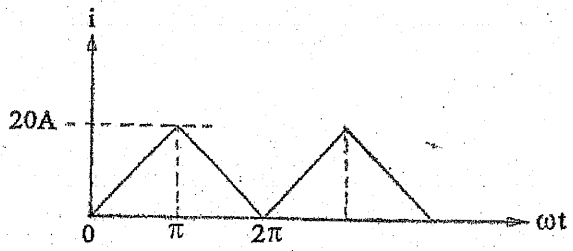
   b) State the Reciprocity Theorem. Explain with an example. [4]

   c) Use Thevenin's theorem, calculate the magnitude of current in the R_L resistor. [6]



3. a) 3 capacitors having capacitances 5μF, 10 μF and 12 μF are connected in series across 600V d.c supply. Find (i) equivalent capacitance (ii) charge on each capacitor (iii) Potential across each capacitor and (iv) energy stored in each of the capacitor. [2+2+2+2]

b) Calculate the average value, RMS value and form factor of following current waveform. [4]



c) What is power factor? Write down the drawbacks of poor power factor. Explain how capacitor on parallel to load can improve the Power Factor. [4]

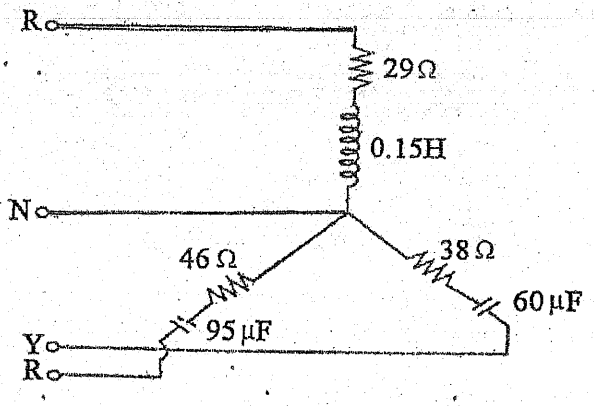
4. a) A resistance of 20 Ω, an inductance of 0.2 H and a capacitance of 100 μF are connected in series across 220 V, 50 Hz mains. Determine the following (i) Impedance (ii) Current (iii) Voltage across R, L and C (iv) Power in watt and VA (v) Power factor and angle of lag. [8]

b) The maximum values of the alternating voltage and current are 400V and 20A respectively in a circuit connected to 50 Hz supply and these quantities are sinusoidal. The instantaneous values of the voltage and current are 283V and 10A respectively at t = 0 both increasing positively:

(i) Write down the expression for voltage and current at time t.
(ii) Determine the power consumed in the circuit. [6+2]

5. a) For the given unbalanced 4 wire-star connected load with supply of 450 V, 50Hz. Calculate

(i) line currents current through neutral wire.
(ii) Power absored by the circuit and overall power factor
(iii) Construct the phasor diagram. [8]



b) Three loads of (20-j30) ohms, (30+j50) ohms and (30+j10) ohms are connected in Delta and supplied by 3-phase balance voltage source of 400V. Calculate: [8]

(i) Line current in each line
(ii) Total active power
(iii) Total Reactive power

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2079 Ashwin

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

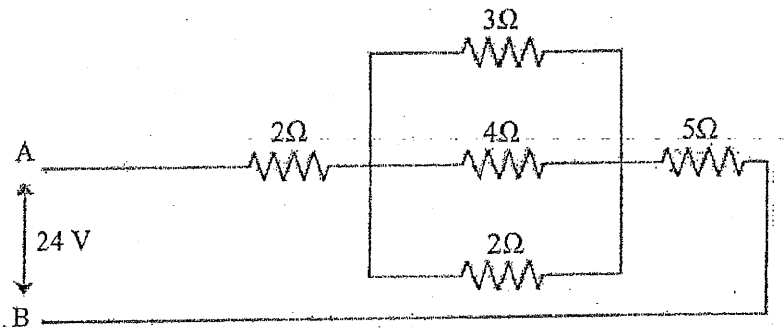
Subject: - Basic Electrical Engineering (*EE 451*)

- ✓ 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.*

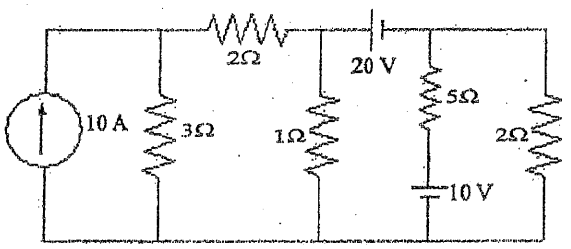
1. a) A coil is connected across a constant dc source of voltage 120V, draws a current of 12A at room temperature. After running 4 hours, temperature rises to 65°C and current reduces to 8A. Calculate the current when temperature increases to 80°C and the coefficient of resistance at 30°C and temperature coefficient of resistance at 40°C. [Consider room temperature = 25°C] [6]

   b) What are the differences between the electromotive force (Emf) and Potential difference (P.d)? [

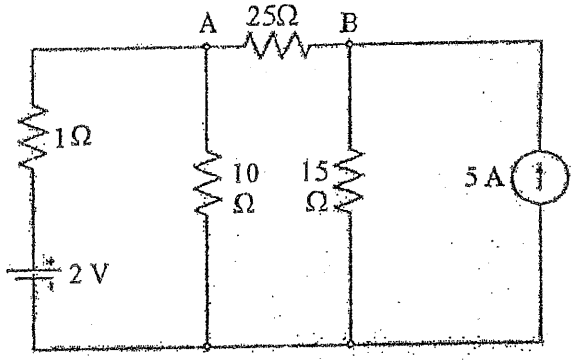
   c) Find the equivalent resistance R_{AB} in the figure shown, and power dissipated in the 3Ω resistor. [6]



2. a) Determine the power through 5 Ω resistor of the circuit given below using Nodel Analysis. [8]

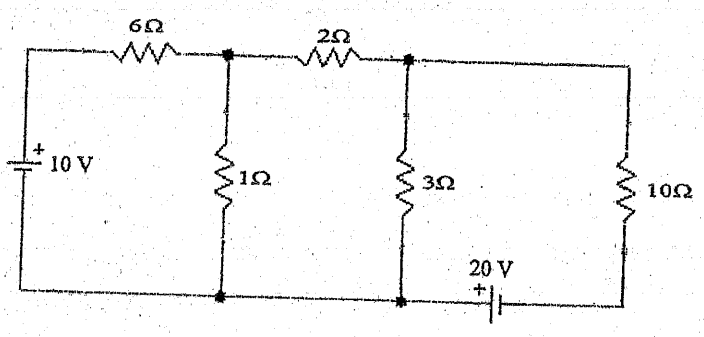


   b) Using Superposition theorem, find the voltage drop across 25 Ω resistor. [8]



3. a) Calculate the Average and rms value of the voltage signal given below. Also find the Form factor. [4]

b) Determine the current through 10 Ω resistor of the circuit given below using Thevenin's theorem. [8]

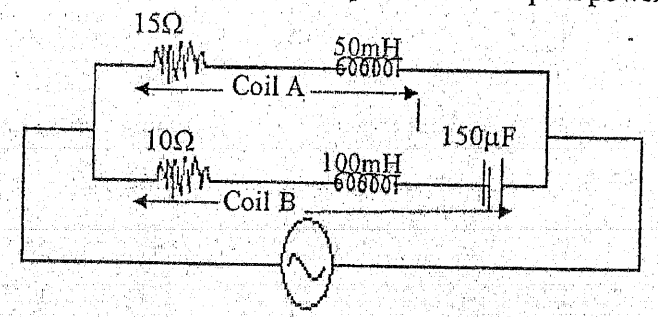


c) Define maximum power transfer theorem and derive the condition for maximum power transfer across the load resistance. [4]

4. a) A voltage v = 100 sin(377t) is applied across series circuit consisting of 5Ω resistor, 0.0318H inductor and a capacitor of 60μF. Calculate the time expression for current, phase between voltage and current, power factor and active power, reactive power and apparent power. Draw a phasor diagram. [8]

b) In the network shown in fig. below calculate.

i) Conductance, susceptance, admittance of each coil.
ii) Total current taken by the circuit.
iii) Power factor of the circuit.
iv) Active power, reactive power, apparent power and complex power of the circuit. [8]



5. a) In a 3-phase 4 wire system. the line voltage is 400 volts and pure resistive load of 10 Ω, 8Ω and 5Ω respectively are connected in each phase. Calculate

i) The current in each line.
ii) Current in the neutral conductor.
iii) Total power consumed in the load. [8]

b) Write the operating principle and of a wattmeter. Explain how it measures active power in a circuit. [4]

c) Define capacitance and capacitor. Explain the process of charging and discharging of capacitor with neat sketch. [4]

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2079 Jestha

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

Subject: - Basic Electrical Engineering (*EE 451*)

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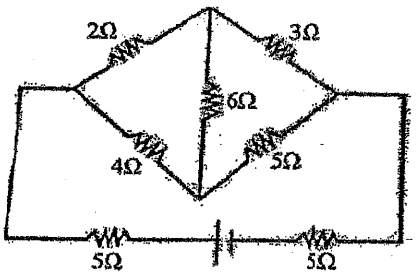
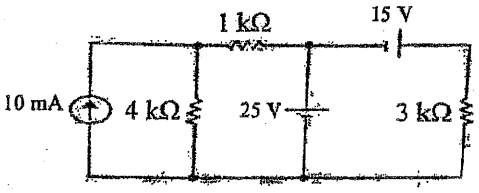
- ✓ *Assume suitable data if necessary.*

1. a) A field coil has a resistance of 173 ohms at 20°C. After working for 6 hours on full load, the resistance of the field coils increases to 215. Find the final temperature of the coil and mean rise of temperature of the coils. Take the temperature coefficient of resistance at 0°C is 0.00445/°C. [5]

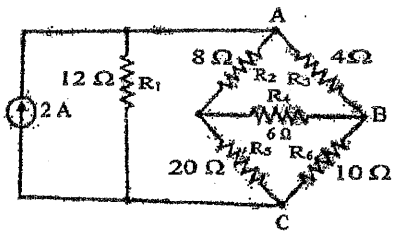
   b) Determine the equivalent resistance of the given circuit shown in figure below using KVL and KCL. [5]



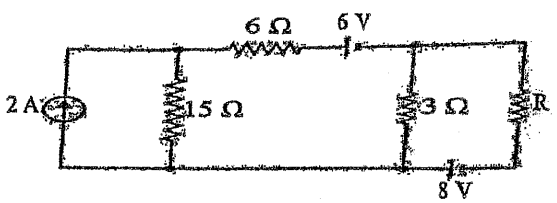
   c) Using superposition theorem find the current flowing through 1 ohm resistors as shown in figure below. [6]



2. a) Using mesh current method find the current following through resistors R_4 as shown in figure below. [8]



   b) Calculate the value of R which will absorb maximum power from the circuit as shown in figure below. Also calculate the value of this maximum power. [8]



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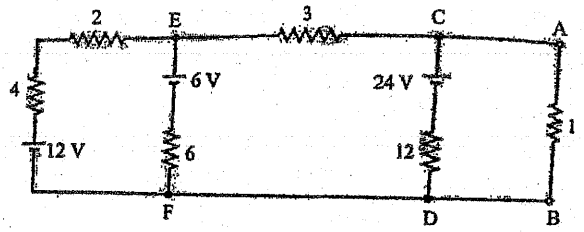
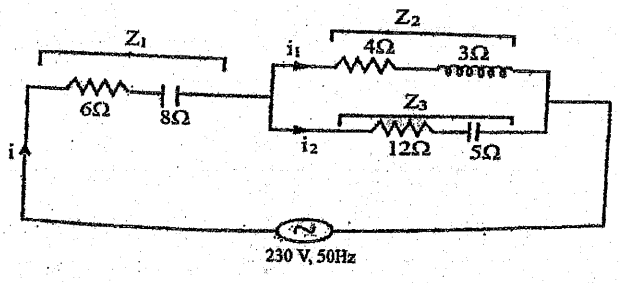
3. a) Use Norton's theorem to find the current flowing through 1 ohm resistor for the circuit shown in figure below. Given that all resistors are in ohms. [8]

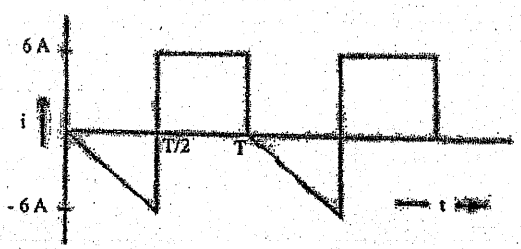


b) For the circuit shown in fig. below calculate:

i) Overall impedance of the circuit.
ii) Total current taken from supply and overall power factor of the circuit.
iii) Currents in each parallel branch.
iv) Active, reactive and apparent power of each path.
v) Construct phasor diagram for given circuit. [8]



4. a) Find the average value and rms value of periodic waveform shown in figure below. [6]



b) Find the expression for the equivalent inductance of two coils connected in series opposition. [4]

c) An alternating source of e.m.f. V = 200sin (314t) volts is applied to a practical coil with resistance 20 ohm and inductance 0.1H respectively.

i) Expression for instantaneous current and power factor.
ii) Active, reactive and apparent power of the circuit.
iii) Voltage drop in resistor and inductor. [6]

5. a) Define power factor and explain why, in general, it should be kept as high as possible in power supply systems.

The power supply to a 415V, 50Hz, 3-phase inductor motor is 50kW at 0.72 power factor lagging. A bank of capacitors is connected in delta across the line to improve the overall power factor. Calculate the capacitance per phase in order to raise the power factor to 0.9 lagging. [3+5]

b) The three arms of a three-phase load each comprise resistance of 25 ohm and of inductance of 0.15 ohm in series with a 120 μF capacitor. The supply is 415 V, 50Hz. Calculate the phase current, line current and total power consumed by the load in star connection. Take phase sequence RYB. Also draw the phasor diagram. [8]

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2078 Chaitra

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

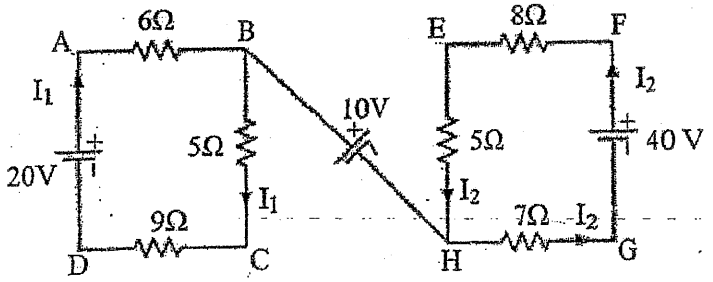
Subject: - Basic Electrical Engineering *(EE 451)*

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

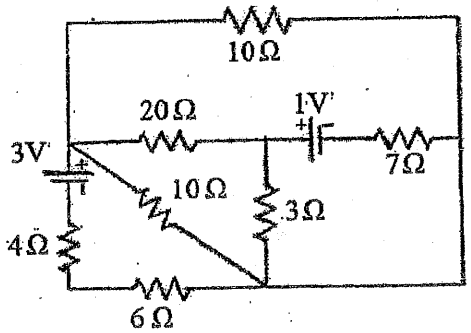
1. a) What do you mean by ideal and practical voltage source? Explain the effect of an internal resistance of a voltage source on its terminal characteristics. [4]

   b) 1 km of wire with circular cross sectional having diameter of 11.7 mm and of resistance 0.031 Ω is drawn, so that its diameter becomes 5 mm. What will be the new resistance? [6]

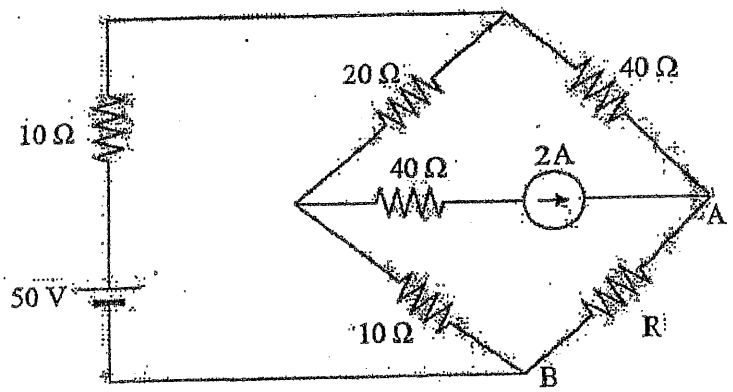
   c) Find the voltage across CE in the given circuit. [6]



2. a) Determine the current in 20 Ω resistor in the network shown below using Nodal analysis. [8]



   b) Calculate the power absorbed by R resistor using Thevenin's theorem. When (i) R = 50 Ω (ii) R = 100 Ω [8]



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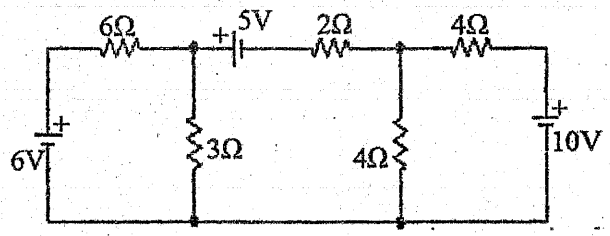
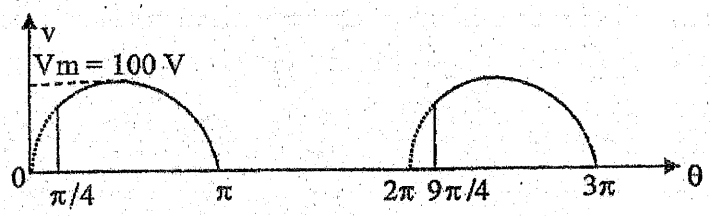
3. a) Find the current through 2Ω resistor of the circuit shown in figure given below using superposition theorem. [8]



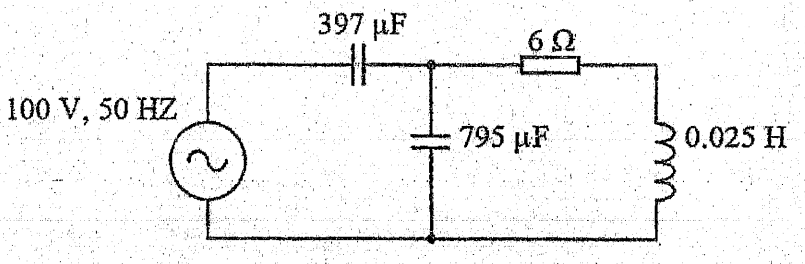
b) Define Rms value and Average value of AC. Calculate the Rms value, Average value, Peak and form factor of the voltage waveform given below. [3+5]



4. a) A series circuit consists of resistance equal to 4Ω and inductance of 0.01H. The applied voltage is 283 sin (300t)V. Calculate the following: [8]

(i) Power factor
(ii) Expression for i(t)
(iii) The power dissipated in the circuit
(iv) Voltage drop across each elements
(v) Draw a phasor diagram

b) Find the source current, power factor and total power consumed in the given circuit. [5]



c) What is power factor? Write down the drawbacks of poor power factor. Explain how connecting a capacitor across the load improves the power factor. [3]

5. a) A balanced star connected load is supplied from symmetrical 3-phase 400V system. The current in each phase is 30A and lags behind the phase voltage by 30°, Find the total power and draw phasor diagram of the current and voltages. [8]

b) What are the advantages of 3 phase AC over single phase AC system? [4]

c) Describe the method of measuring power in 3-phase circuit by two wattmeter method. [4]

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2078 Poush

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

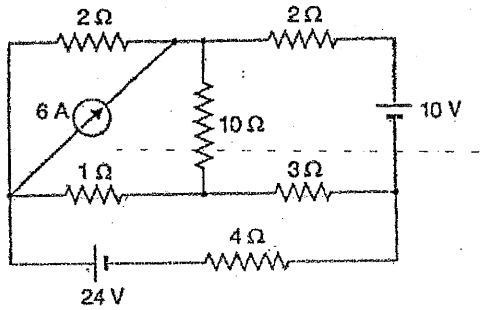
Subject: - Basic Electrical Engineering *(EE 451)*

- ✓ 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.*

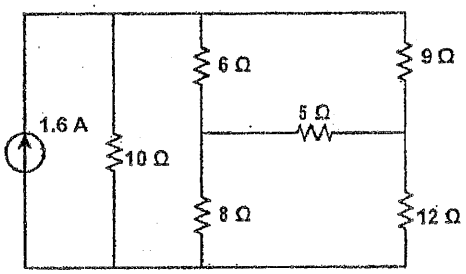
1. a) Distinguish among voltage, voltage drop, voltage rise and potential difference. [4]

   b) A 230V metal filament lamp has 60 cm long filament with cross-section $3\times10^{-6}cm^2$. Specific resistance of the filament at 20°C is 4×10^{-6} ohm-cm. If the working temperature of the filament is 2000°C, find the wattage rating of the lamp. Temperature coefficient of resistance of the filament material at 20°C is 0.0055/°C. [6]

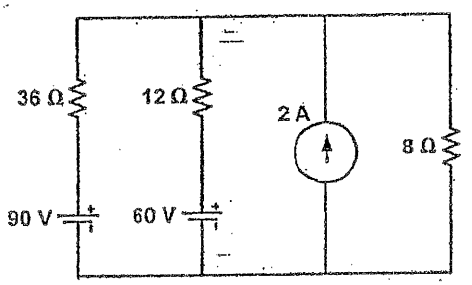
   c) Determine the current in 4Ω resistance of the circuit shown in figure below. [6]



2. a) Analysis the circuit of figure below, by the mesh method. From the results, calculate the current in the 5Ω resistance. [6]

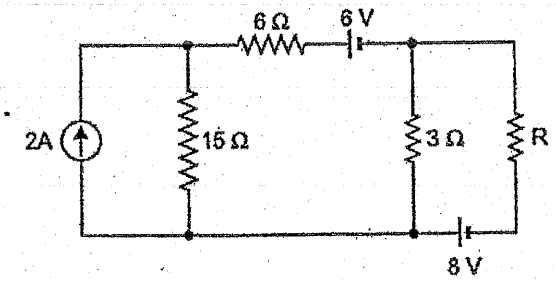


   b) Find current in 8Ω resistor of the network shown in figure below, using Superposition theorem. [6]



   c) State and explain Thevenin's theorem with example. [4]

3. a) Calculate the value of R which will absorb maximum power form the circuit of figure. Also find the value of maximum power. [8]



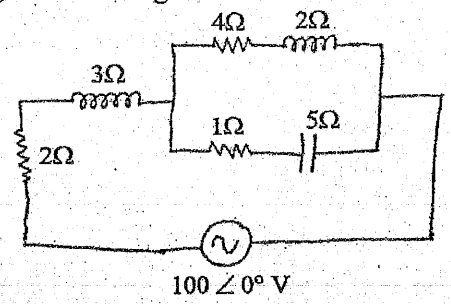
b) Derive an equation for the capacitance of a parallel-plate capacitor. [4]

c) Derive an expression for the current produced in a pure Ohmic resistance when a sinusoidal voltage is applied across it. What is the power consumed by the resistor? [4]

4. a) A capacitor 'C' is connected in series with a 40Ω resistor across supply of frequency 60 Hz. A current of 3A flows and the circuit impedance is 50Ω. Calculate

(i) the value of capacitance
(ii) the supply voltage
(iii) potential difference across the resistor and capacitor
(iv) draw the phasor diagram for R.C series circuit [8]

b) For the circuit given below find [8]
(i) Total impedance (ii) Total current (iii) Current in Parallel branches
(iv) Overall active, reactive and apparent power.
Also draw phasor diagrams showing various currents and voltage.



5. a) What are the disadvantages of low power factor and give the various methods to improve the power factor. [4]

b) What are the advantages of three-phase power system as compared to single phase system? Explain the conceptual mechanism of generation of a 3 phase supply. [4]

c) A 3-phase balanced delta connected load of phase impedance 15 + j20 ohm is connected to 220V supply. Calculate: [8]

(i) Phase Voltages
(ii) Line and Phase currents
(iii) Power consumed per phase
(iv) Phasor sum of line currents
Draw the phasor diagram.

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* TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2078 Kartik

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

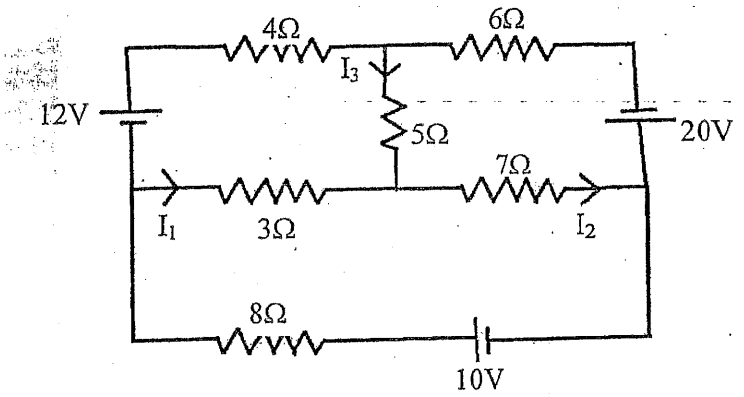
Subject: - Basic Electrical Engineering *(EE401)*

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

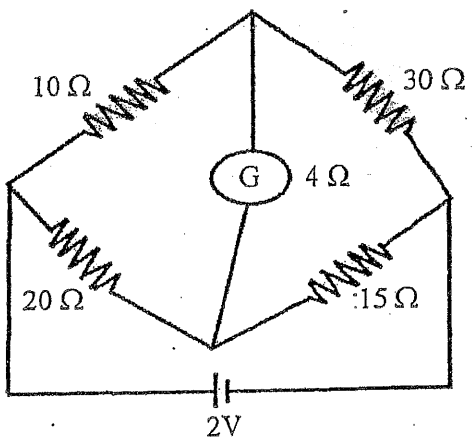
1. a) Define the temperature coefficient of resistance and explain the effect of temperature on resistance of a substance. [6]

   b) A coil has a resistance of 18 Ω when its mean temperature is 20°C and 20 Ω when its mean temperature is 50°C. Find its mean temperature rise when its resistance is 21Ω and the surrounding temperature is 15°C. [8]

2. a) Find I_1, I_2, I_3 and Mesh current in the following circuits, using kirchhoff's law. [8]



   b) Using delta/ star transformation, find the galvanometer current in the Wheatstone bridge. [8]



3. a) Determine the current in the 10Ω resistor across AB network shown below using thevenin's theorem. [8]

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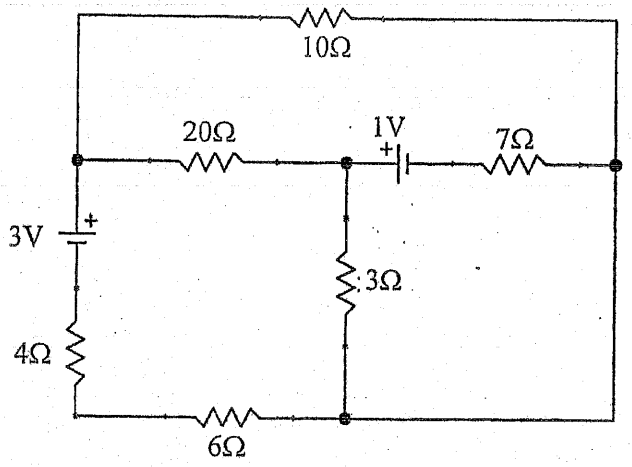
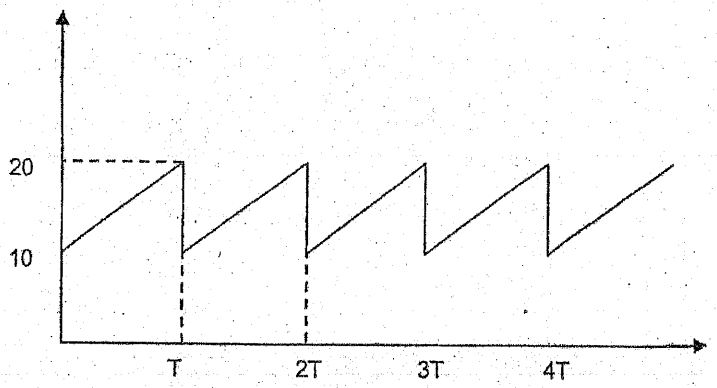


b) State and explain reciprocity theorem with a suitable examples. [5]

4. a) Drive the equation for self-inductance in terms of number of turns and reluctance. [5]

b) Calculate the form factor and peak factor of the following waveform. [6]



c) The Circuit with impedances $Z_1 = (10 + j15)\ \Omega$ and $Z_2 = (6 - j8)\ \Omega$ are connected in parallel. If the supply current is 20 A, what is the power dissipated in each branch? [6]

5. a) A 100 kW load at 0.85 lagging power factor is being supplied by a 230 V, 50Hz source. Calculate the reactive power drawn from the source. If a capacitor connected parallel to the load improves its power factor to 0.9, find the capacitance of the capacitor. Also, calculate the current drawn from the source before and after connecting the capacitor. [7]

b) A three- phase load consists of three similar inductive coils, each of resistance 50 ohm and inductance 0.3H. The supply voltage is 415 V, 50Hz.

Calculate :(i) the line current; (ii) the power factor; and (iii) the total power when the load is star – connected. [6]

c) Three loads of (31+j 59) ohm, (30-j 40) ohm and (80+ j 60) ohm are connected on delta to a 3- phase, 230V supply. Find the phase currents, line currents and power when phase sequence is RYB. Also, draw phasor diagram. [7]

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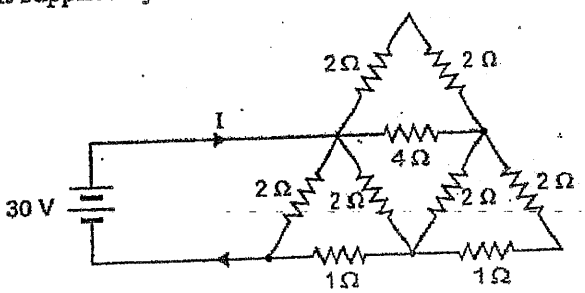
TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2078 Baishakh

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

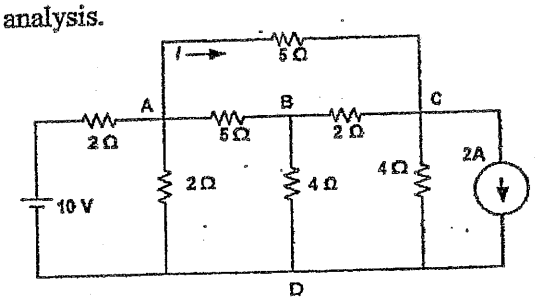
Subject: - Basic Electrical Engineering *(EE 451)*

- ✓ 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.*

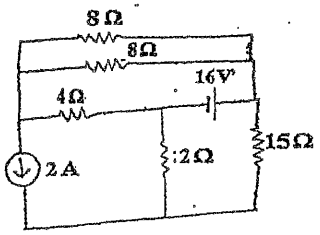
1. a) With proper mathematical equations and graphs describe ideal and practical voltage and current source. Also explain the method for converting practical voltage source into current source and vice versa. [5]
   b) Explain the effect of temperature on resistance. [5]
   c) Find the current supplied by the 30 V source in the circuit shown in figure. [6]



2. a) Wheatstone bridge ABCD is arranged as follows: AB = 1 Ω; BC = 2 Ω; CD = 3 Ω; DA = 4Ω. A resistance of 5Ω is connected between B and D. A 4-volt battery of internal resistance 1 Ω is connected between A and C. Calculate (i) the magnitude and direction of current in 5Ω resistor and (ii) the resistance between A and C by using branch current method. [6]
   b) Calculate the current flowing in the 5 Ω branch AC of the circuit shown in figure below using nodal analysis. [6]



   c) State and explain Norton's theorem with suitable example. [4]
3. a) Find the power loss in 15 ohm resistor using Thevenin's Theorem. [8]



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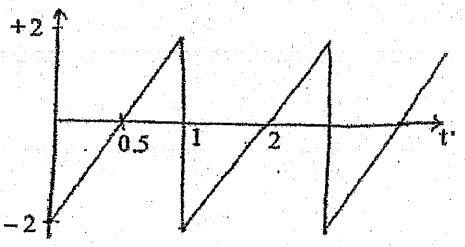
b) Derive an expression for the energy stored in the magnetic field of an inductor. [4]

c) Find the rms and average value of waveform given below in figure. [4]



4. a) Two coils A and B are connected in series across 240 V, 50 Hz supply. The resistance of A is 5 Ω and the inductance of B is 0.015 H. If the input from the supply is 3 kW and 2 kVAR. Find the inductance of A and the resistance of B. Calculate the voltage across each coil. [8]

b) Two impedances Z_1 and Z_2 are connected in parallel. The first branch takes a leading current of 16 A and has a resistance of 5Ω, while the second branch takes a lagging current at power factor 0.8. The total power supplied is 5 kW, the applied voltage being (100 + j200) V. Determine the complex expressions for branch and total currents, and for the circuit constants. [8]

5. a) A 400 V, 50 Hz 3 phase induction motor takes 60 kw power from supply mains at 0.8 power factor lagging. Calculate the capacitance per phase and kVAR rating per phase of capacitance in order to improve the power factor to 0.9 lagging using (i) star-connected capacitor bank (ii) Delta-connected capacitor bank. [8]

b) Three phase loads (31 + j59) Ω, (30 − j40) Ω and (80 + j60) Ω are connected in Delta to a 3 phase 200V, 50 Hz supply. Find the phase current, line current and power consumed. Also calculate overall power factor of the circuit. [8]

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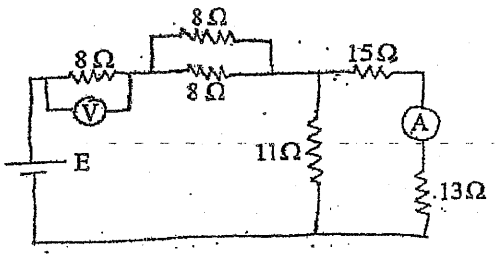
TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2077 Chaitra

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

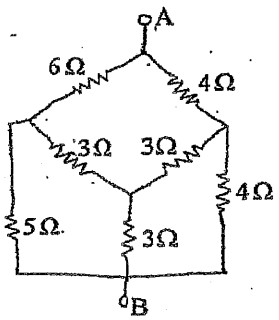
Subject: - Basic Electrical Engineering *(EE 451)*

- ✓ 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.*

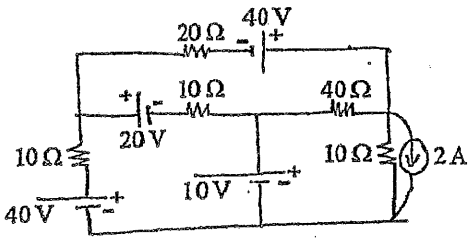
1. a) Explain constituent parts of an electric system with neat sketch. [5]
   b) A resistor coil has a resistance of 20 ohm when its mean temperature is 15°C and 24 ohm when its mean temperature is 65°C. Find its mean temperature rise when its resistance is 26 ohm and the surrounding temperature is 10°C. [5]
   c) A source of unknown emf is connected as shown in the figure. If the voltage drop across 8 ohm resistor measured by the voltmeter is 20V, what will be reading on the ammeter? Also what is the emf of the source? [6]



2. a) Find the equivalent resistance across A-B using Star/Delta Transformation. [8]



   b) Determine the power consumption of 20 ohm resistor of the given network using nodal method. [8]



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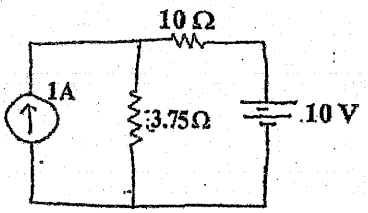
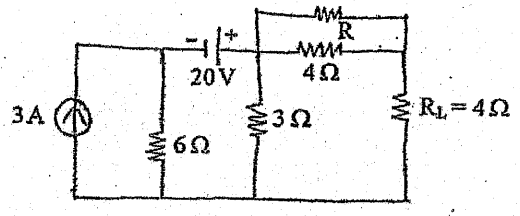
3. a) Find the voltage drop in 3.75 ohm resistor using Superposition Theorem for the following circuit. [6]



b) Find the value of resistance 'R' such that the load resistance 'R_L' which is equal to 4 ohm will deliver maximum power. Also find that maximum power for the given network below. [6]

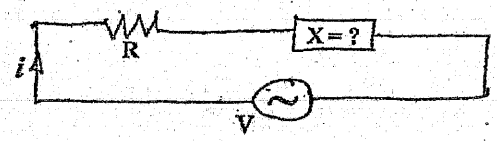


c) State and explain Reciprocity theorem with suitable example. [4]

4. a) Define Capacitance and derive the expression for equivalent capacitance when n Capacitors are connected in (i) Series (ii) Parallel [4]

b) A coil having resistance of 7Ω and an inductance of 31.8 mH is connected to 230 volts, 50 Hz supply. Calculate (i) the circuit current (ii) phase angle (iii) power factor (iv) power consumed. [4]

c) In A.C. series circuit, shown below the current and voltage are expressed as: [8]
$i = 5 \sin(314t + 2\pi/3)$ and $v = 15 \sin(314t + 5\pi/6)$. Find:
(i) Net value of X and point out that it is X_L or X_C. Why?
(ii) Value of R and L or C.
(iii)P.F of whole circuit.
(iv)Draw phasor diagram.



5. a) Define power factor of a circuit. What are the disadvantages of poor power factor? Also explain in detail how poor power factor can be improved. [4]

b) Three, 3ϕ balanced loads are connected in parallel across a 400V, 3ϕ, 3 wire balanced supply system. [8]
Load 1: 12000W, Δ-connected P.F = 1.
Load 2: 9000 VAR, Y-connected P.F = 0.866 lagging
Load 3: 6000 VAR, Δ-connected P.F = 0
Find:
(i) total Power consumption
(ii) Whole P.F.
(iii) Total current drawn from the line.

c) Explain power measurement in 3ϕ unbalanced load using 2-wattmeter method with neat sketch. [4]

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05 . TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2076 Baishakh

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

Subject: - Basic Electrical Engineering *(EE 451)*

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

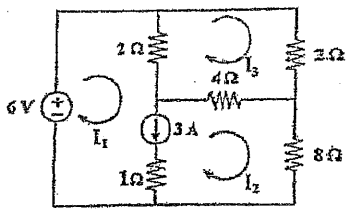
1. a) What is electric current? How the concept of electric current was originated. [4]

   b) The filament of a 60W, 230V lamp has a normal working temperature of 2000°C. Take the temperature coefficient to be 0.005 at room temperature 20°C. Find the current which flows at the instant of switching on the supply to the cold lamp. [6]

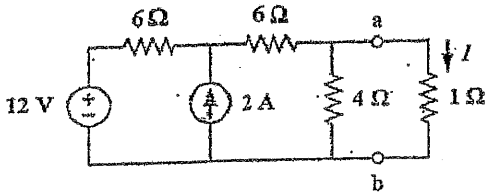
   c) Define the terms power and energy and state their practical units.
   What is monthly energy consumption and the monthly electrical charges of using the following electrical equipment at Rs 7 per kWh?

   (i) Ten 1200Watt heaters for 5 hours
   (ii) Six 50 Watt TV for 4 hrs.
   (iii)Five 400 Watt fans for 10 hours.
   (iv)4800Watt electric clothes dryer for 2 hours. [2+4]

2. a) Using mesh analysis determine the current through all the resistors. [6]

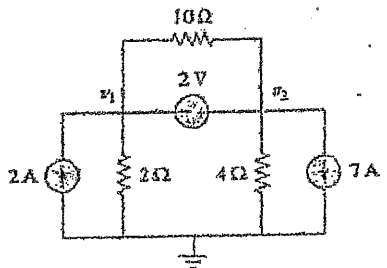


   b) Using thevenin's theorem find the current flowing through load resistance of value 1Ω connected across terminals ab for the network shown below. [6]



   c) Explain reciprocity theorem with example. [4]

3. a) Use nodal analysis to find the current through 4Ω resistor for the network shown below. [8]



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b) Prove the total equivalent inductance of two inductive coils joined in series will be Leq = L_1+L_2--2M, where L_1 and L_2 are coefficient of self-inductance of 1st and 2nd coil and M is the coefficient of mutual inductance. [4]

c) Find the form factor and peak factor of sinusoidal voltage v = 10 Sin(wt). [4]

4. a) A coil and non-inductive resistor are connected in series across a 200V, 50Hz supply. The voltages across the coil and resistor are 120V and 140V respectively. If the supply current is 0.5A, calculate (i) the resistance and inductance of the coil; (ii) the power dissipated in the coil; (iii) the power factor of the coil; (iv) the power factor of the circuit. [8]

b) A RC series circuit (R_1 = 40Ω, C = 10μF) and RL series circuit (R_2 = 50Ω, L = 0.2Ω) are connected in parallel to each other and a source of 100V, 50Hz is applied across the overall circuit. Calculate (i) current drawn by each branch and overall current taken from supply (ii) power factor of circuit (iii) Active , Reactive and Apparent power [8]

5. a) Three impedances of (10+j10)Ω, (12+j12)Ω and (2+j2)Ω are connected in delta to a 3-phase system with line voltage 400V. Calculate all the phase currents, line currents, active powers, reactive powers and apparent power. [8]

b) How can we measure the power factor angle of the circuit using two wattmeter power measurement method? [8]

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05 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2075 Bhadra

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

Subject: - Basic Electrical Engineering *(EE451)*

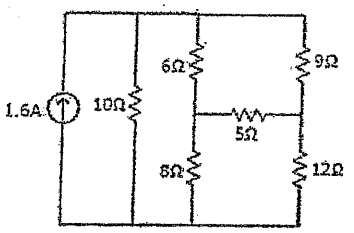
- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt <u>All</u> questions.*
- ✓ *The figures in the margin indicate <u>Full Marks</u>.*
- ✓ *Assume suitable data if necessary.*

1. a) Differentiate between electro motive force and potential difference. [4]

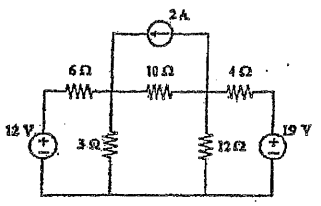
   b) The current in the field winding of a motor at 20°C is 2A. After running the motor for 6 hours at full load the current falls to 1.75A. If voltage applied across the field winding is 240V, determine the temperature rise of the winding. The temperature coefficient of resistance of the copper winding 0°C is 0.00428/°C. [6]

   c) A d.c circuit comprises two resistors, A of value 25 ohms, and B of unknown value, connected in parallel, together with a third resistor C of value 5 ohms connected in series with the parallel group. The potential difference across C is found to 90V. If the total power in the circuit is 4320 watt. Calculate (a) the value of resistor B, (b) the voltage applied to the ends of the whole circuit, (c) the current in each resistor. [6]

2. a) Use loop current method to calculate the current through the 5Ω resistance for the Network shown below. [6]

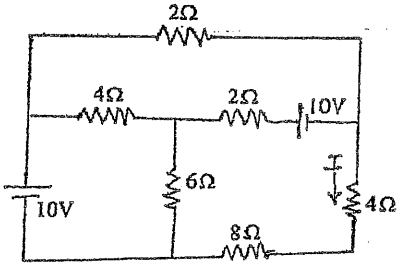


   b) Find the current through 10 Ω resistor using superposition theorem. [6]



   c) State maximum power transfer theorem and also derive the condition at which maximum power is delivered to the load. [4]

3. a) Determine the value of 'I' shown in figure below, by using Norton's theorem. [6]



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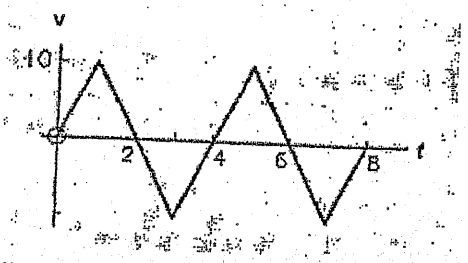
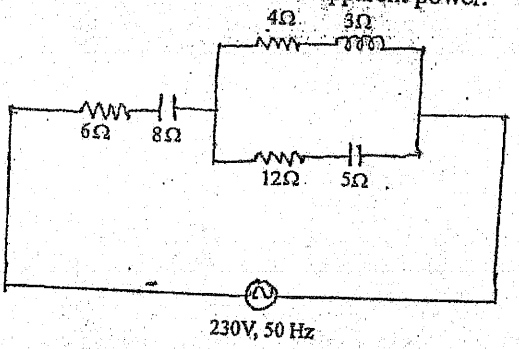
b) Derive the equivalent inductance when two inductors are connected in series aiding connection considering the mutual inductance. [6]

c) A generator produces a voltage wave as a function of time as shown in figure below. The voltage is impressed across 10Ω resistor. How much energy is delivered to resistor in 2 second? [4]



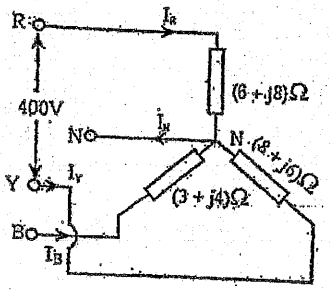
4. a) Three filament bulbs A, B, C when connected separately to v = 326 sin (314t), takes currents of 5A, 10A and 15A respectively whereas power absorbed by those bulbs are 40 watt, 60 watt and 100 watt respectively. When these three bulbs are connected in series with the same source, calculate (i) total power factor of the circuit (ii) Expression for instantaneous current (iii) power absorbed by this combination [8]

b) For the circuit shown in figure below, calculate (i) overall impedance of circuit. (ii) Total current taken from supply and overall power factor of circuit. (iii) current in each parallel branch (iv) Active, reactive and apparent power. [8]



5. a) For the following unbalanced system with balanced three phase supply of 400 V, 50 Hz, calculate [8]

i) the line currents and neutral current
ii) active and reactive power per phase



b) How power factor is improved in three phase system. What value of Capacitance must be connected in parallel with a load drawing 1kW at 70% lagging power factor from a 208V, 60Hz Source in order to raise the overall power factor to 91%. [4+4]

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05 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2075 Baishakh

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

Subject: - Basic Electrical Engineering *(EE451)*

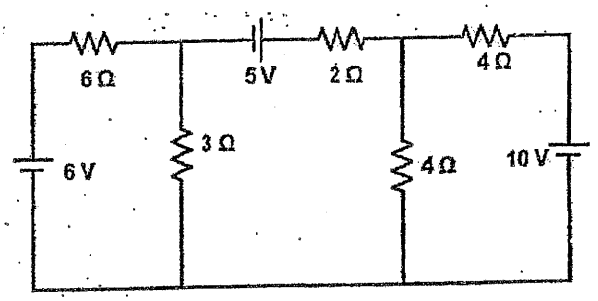
- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. a) Derive a relation between the known resistance R_1 at t_1 °C and the unknown resistance R_2 at t_2 °C, when α_0 is not known. [6]

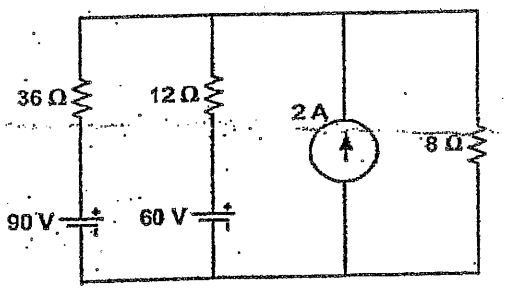
   b) Explain the process of source conversion. How is it helpful in solving electrical networks? [4]

   c) A circuit, containing of three resistances 12 Ω, 18 Ω, and 36 Ω respectively jointed in parallel, is connected in series with a fourth resistance. The whole is supplied at 60 V and it is found that the power dissipated in the 12 Ω resistance is 36 W. Determine the value of the fourth resistance and the total power dissipated in the group. [6]

2. a) Find the branch currents in the circuit of given figure below by using nodal analysis? [6]



   b) Find current in 8 Ω resistor of the network shown in figure below using superposition theorem. [6]



   c) State and explain Thevenin's theorem with suitable example. [4]

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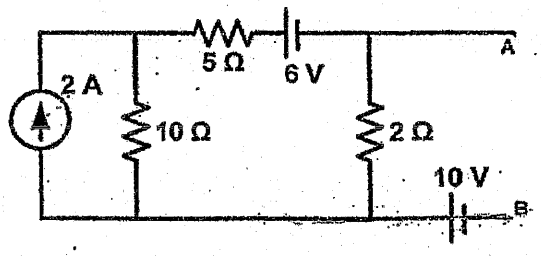
3. a) In the network shown in figure below, find resistance R_L connected between terminals A and B so that maximum power is develop across R_L. What is the maximum power? [6]



b) Derive an expression for the energy stored in the magnetic field of an inductor. [4]

c) Derive an expression for the current drawn by a pure capacitor when connected across a voltage. Explain with the help of a power diagram that the value of average power drawn by the capacitor during one cycle is zero. [6]

4. a) A resistance of 20 Ω, an inductance of 0.2 H and a capacitance of 100 μF are connected in series across a 220 V, 50 Hz supply. Determine the following (a) impedance (b) Current (c) Voltage across R, L and C and (d) Power factor. Also calculate the total power consumed by the circuit. [6]

b) A coil resistance 50 Ω and inductance 0.318 H is connected in parallel with a circuit comprising a 75 Ω resistor in series with a 159 μF capacitor. The resulting circuit is connected to a 240 V, 50 Hz ac supply. Calculate: (a) The supply current (b) The circuit impedance, resistance and reactance (c) Power factor and (d) Total power consumed by the circuit. [6]

c) Describe the method of measuring power in 3-Φ circuit by using two watt meters. [4]

5. a) A 220 V, 50 Hz single phase ac motor draws a power of 10 kW at a power factor of 0.75 lagging. Calculate the change in current taken from the supply and the new power factor when a 250 μF capacitor is connected in parallel with the motor. If the motor is supplied through a cable of 0.05 Ω resistances, calculate the power loss in the cable before and after connecting the capacitor. [8]

b) A three-phase Δ-connected load consists of three similar coils, each of resistance 50 Ω and inductance 0.3 H. The supply is 415 V, 50 Hz. Calculate (i) The line currents (ii) The power factor (iii) Total active and reactive powers when the load is Δ-connected. Draw the phasor diagram. [8]

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05 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2074 Bhadra

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

Subject: - Basic Electrical Engineering *(EE451)*

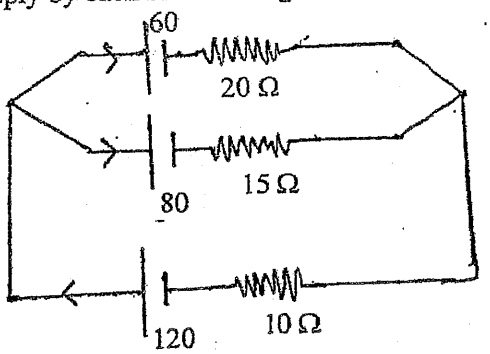
- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. a) Define the terms of source transformation with suitable example. [4]

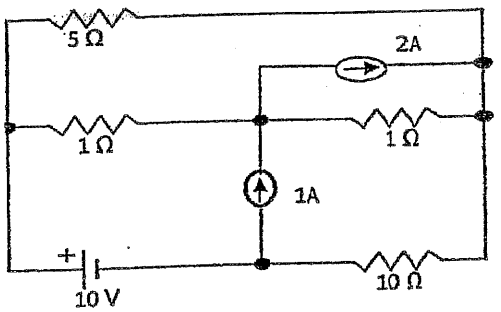
   b) The current in the field winding of a motor at 20°C is 2 A. After running the motor for 6 hrs at full load the current falls to 1.75 A. If the voltage applied across the field winding is 240 V, determine the temperature rise of the winding. The temperature coefficient of resistance of the copper winding at 0°C is 4.28×10^{-3}/K [6]

   c) A direct current circuit comprises two resistors, A value of 25Ω and B of unknown in series with the parallel group. The potential difference across C is found to 90V. If the total power in the circuit is 4320 w, Calculate value of unknown resistor. B, the voltage applied to the ends of the whole circuit and the current in each resistor. [6]

2. a) Find the current supply by each source using Kirchhoff's law. [6]



   b) Find the current in the 10 Ω resistor in the circuit below using Superposition theorem. [6]



   c) Define capacitance and find the expression for capacitance in terms of physical dimension of capacitor also deduce energy stored in capacitor. [4]

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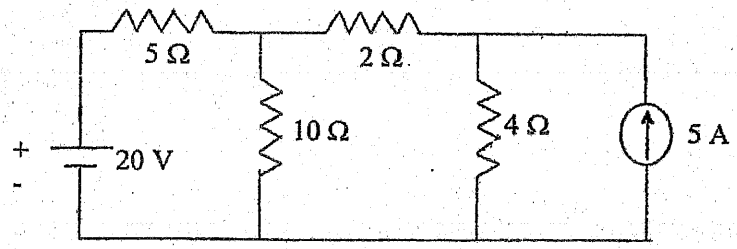
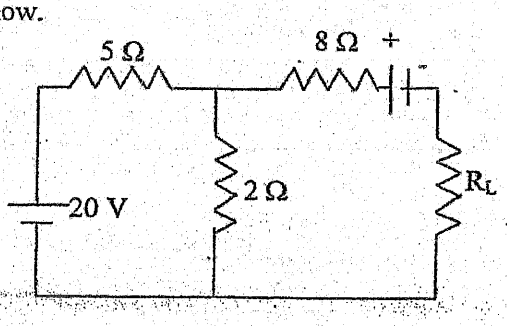
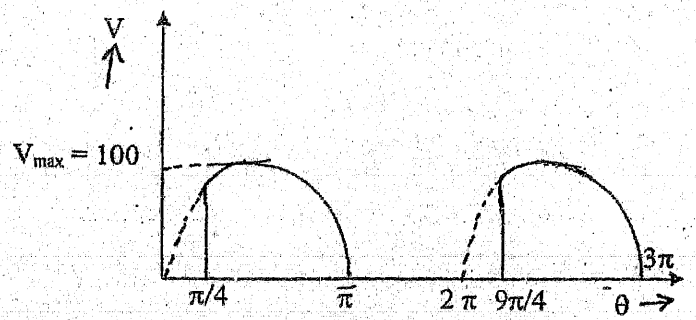
3. a) Use Norton's theorem to find the current through 10 ohm resistor for the network shown below. [8]



b) State the maximum power transfer theorem and find the value of R_L to obtain the maximum in R_L power and also find the value of this maximum power for the network shown below. [8]



4. a) Calculate the peak factor and form of the waveform shown below. [4]



b) A coil and non-inductive resistor are connected in series across a 200 V, 50 Hz supply. The voltage across the coil and resistor are 120 V and 140 V respectively. If the supply current is 0.5 A, calculate : (i) the resistance and inductance of the coil; (ii) the power dissipated in the coil; (iii) the power factor of the coil; (iv) the factor of the circuit. [6]

c) Two impedances given by $Z_1 = (10+j5)$ and $Z_2 = (8+j6)$ are joined in parallel across a voltage of $v = (200+j0)$ volts. Calculate the circuit its phase and the branch currents, total power consumed by the circuit. Draw the phasor diagram. [6]

5. a) Three phase loads $(6+j8)\Omega$, $(8+j6)\Omega$ and $(4-j3)\Omega$ are connected in delta to a 3 phase 110 V supply. Find the phase currents, line currents and total power consumed. [6]

b) Derive the relation between tan ϕ and the two wattmeter reading w1 and w2 for a balanced three-phase load having leading power factor. [6]

c) Show, with the aid of a phasor diagram, how the power factor of a load can be improved by connecting a capacitor in parallel with it. [4]

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5 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2073 Bhadra

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

Subject: - Basic Electrical Engineering *(EE451)*

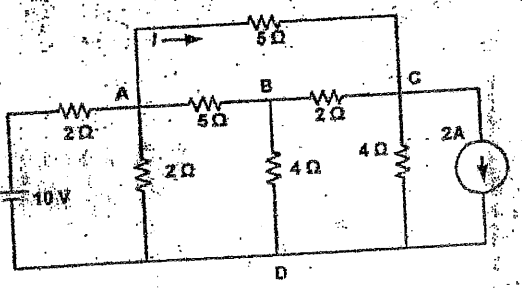
- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. a) What do you mean by ideal and practical voltage source? Explain the effect of an internal resistance of a voltage source on its terminal characteristic. [4]

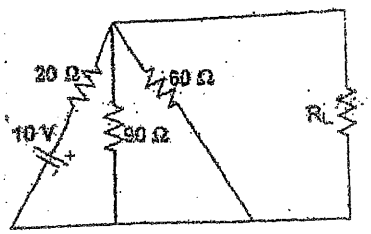
   b) Define temperature co-efficient of resistance. The field winding of a dc motor connected across 230 V supply takes 1.15 A at room temperature of 20°C. After working for some hours the current falls to 0.96 A, the supply voltage remaining constant. Calculate the final working temperature of field winding. Resistance temperature co-efficient of copper at 20°C is 1/254.5. [6]

   c) A direct current circuit comprises two resistors, A of value 25 Ω, and B of unknown value, connected in parallel, together with a third resistor C of value 5 Ω connected in series with the parallel group. The potential difference across C is found to 90 V. If the total power in the circuit is 4320 W, calculate value of unknown resistor B, the voltage applied to the ends of the whole circuit and the current in each resistor. [6]

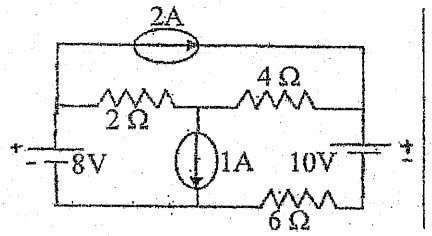
2. a) Calculate the current flowing in the 5Ω branch AC of the circuit shown in figure below using nodal analysis. [8]



   b) Calculate the value of R to receive maximum power and maximum power received by it for the circuit shown below. [8]



3. a) Use loop current method to calculate the current through the 4 Ω resistance for the network shown below. [8]



b) State and explain Norton Theorems with the help of suitable example. [4]

c) What is a parallel-plate capacitor? How do you define its capacitance? [4]

4. a) Derive the equation for inductance in terms of its physical dimensions. [4]

b) Derive the equation for instantaneous current flowing through a pure inductor when excited by AC sinusoidal voltage V = Vm Sinwt. Draw the waveform of voltage, current and power. Show analytically and graphically that it does not consume real power. [6]

c) A series circuit consists of a resistance equal to 4Ω and inductance of 0.01 H. The applied voltage is v = 283 sin (300t+90°) volts. Find [6]

(i) the power dissipated in the circuit,
(ii) the expression for i(t)
(iii) power factor

5. a) Define power factor and explain its significance. A single phase load of 5Kw operates at a power factor 0.6 lagging. It is proposed to improve the power factor to 0.95 lagging by connecting a capacitor across the load. Calculate the KVAr rating of the capacitor. [2+6]

b) A star connected alternator supplies a delta connected load. The impedance of the load branch is (8+j6) Ω. The line voltage is 230 volt. Determine [8]

(i) Current in the load branch
(ii) Power consumed by load
(iii) Power factor of the load
(iv) Reactive power of the load

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05 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2073 Magh

Exam.	[redacted]		
Level	BE	Full Marks	80
Programme	BCE, BGE, BME	Pass Marks	32
Year / Part	I / II	Time	3 hrs.

Subject: - Basic Electrical Engineering *(EE451)*

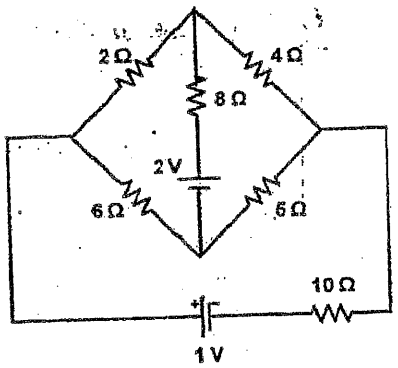
- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. a) Differentiate between electromotive force and potential difference. What do you mean by ideal and practical current and voltage sources? [2+2]

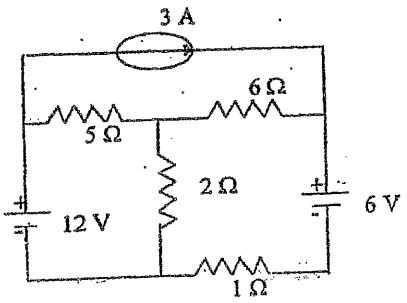
   b) Two resistors, made of different materials having temperature coefficients of resistance $\alpha_1 = 0.004$ / °C and $\alpha_2 = 0.005$ / °C, are connected in parallel and consume equal power at 15°C. What is the ratio of power consumed in resistance R_2 to that in R_1 at 70°C? [6]

   c) Define the terms power and energy and state their practical units.
   What is the total cost of using the following at Rs. 7 per kWh?
   (i) A 1200 Watt toaster for 30 minutes.
   (ii) Six 50 Watt bulbs for 4 hrs.
   (iii) A 400 Watt washing machine for 45 minutes.
   (iv) 4800 Watt electric clothes dryer for 20 minutes. [6]

2. a) Find Current in 1 V source of the network shown in figure below, using Superposition theorem. [8]



   b) Use nodal analysis to find the current through 6Ω resistor for the network shown below. [8]



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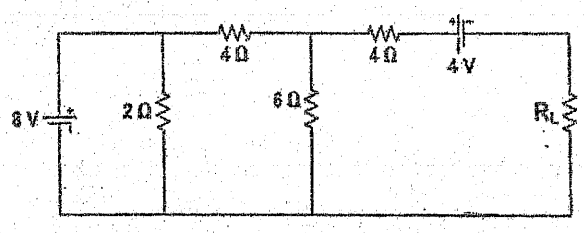
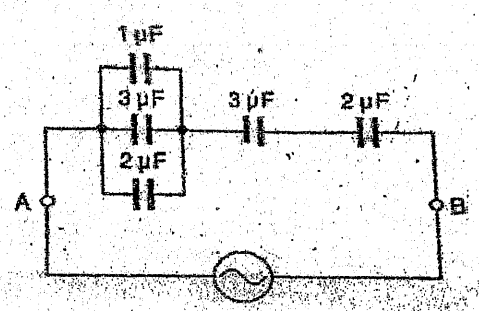
3. a) Find the value of R_L for which the maximum power is transferred in the load resistance R_L. Also find the maximum power that can be transferred to the load resistance R_L circuit shown in figure below. [8]



b) Calculate the equivalent capacitance of the circuit shown below across the point AB. [4]



c) Define average value and rms value of voltage in 1-phase sinusoidal a.c. system. [4]

4. a) An inductive coil with impedance $Z_1 = (8+j4)\ \Omega$ is connected in parallel with a capacitive circuit having an impedance of $Z_2 = (6-j7.5)\ \Omega$, is connected in series with an inductive coil $Z_3 = (2.8+j6.1)\ \Omega$. Find (i) total impedance, (ii) total circuit current and branch currents, (iii) power taken by each impedance and the total power, (iv) overall power factor and (v) voltage drop across each impedance. [8]

b) A single phase a.c. voltage of 100 s in (314t-30°)v is supplying a circuit consisting of two parallel branches. Current through the parallel branches are 10sinwt A and 15sin (wt-60°)A. determine rms value of current drawn from the circuit and construct phasor diagram of current and voltages. What is the equivalent impedance of the circuit? [3+3+2]

5. a) Three non-inductive loads of 8 kW, 6 kW and 4 kW are connected between the neutral and the red, yellow and blue phase respectively of a 3 phase 4 wire system with line voltage of 400 V. Find out (i) current in each line and (ii) the current in neutral conductor. [8]

b) A single phase 50 Hz motor takes 20 A at 0.75 power factor lagging from a 230 V sinusoidal supply. Calculate the kVar and capacitance of capacitor to be connected in parallel to raise the power factor to 0.9 lagging. What is the new supply current? [8]

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06 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2072 Ashwin

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

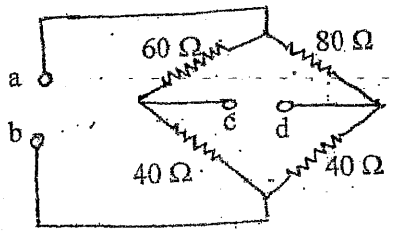
Subject: - Basic Electrical Engineering (EE451)

- ✓ 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 resistance on the basis of Ohm's law and discuss different laws of resistance to define resistivity. Also explain how does the resistance of a conductor depend upon temperature. [6]

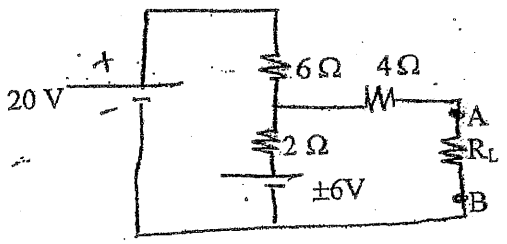
   b) In the resistive network shown in the figure below, find the: [4]

   (i) equivalent resistance between terminals 'a' and 'b' when
   (a) terminals 'c' and 'd' are open
   (b) terminals 'c' and 'd' are shorted.
   (ii) equivalent resistance between terminals 'c' and 'd' when
   (a) terminals 'a' and 'b' are open
   (b) terminal 'a' and 'b' are shorted.

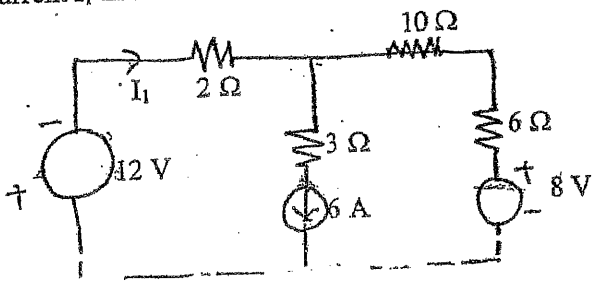


   c) What is internal resistance of source? Explain the significance of internal resistance of various sources with suitable examples. [6]

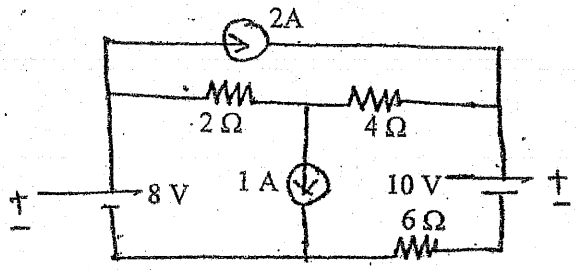
2. a) Find the Venin's equivalent circuit across AB for the following figure below and find the value R_L to obtain maximum power in R_L. Also determine the maximum power. [8]



   b) Determine the current I_1 in the circuit shown below using superposition theorem. [8]

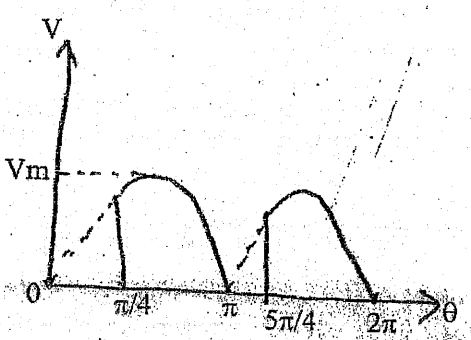


3. a) Obtain the current flowing through the 2 ohm resistor of the network shown below using mesh analysis. [8]



b) State and explain the maximum power transfer theorem for dc networks and derive the expression for maximum power delivered by source. [8]

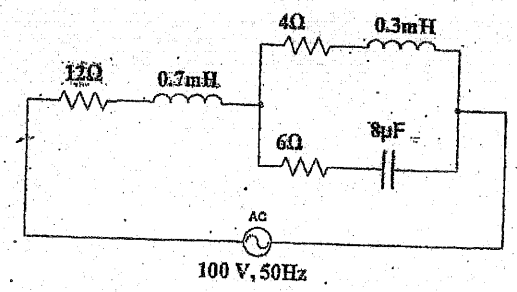
4. a) Calculate the average and rms value of voltage of full rectified sine wave shown in figure below. [6]



b) A coil has an inductance of 0.05 H and a resistance of 10Ω. It is connected to a sinusoidal 200 V, 50 Hz supply. Calculate the impedance, current, power factor and power consumed. [6]

c) What do you mean by power factor of an ac circuit? What are the causes and effects of low power factor? Why should it be corrected, describe the method of its correction. [4]

5. a) Determine the total impedance, power factor and current in each branch of the circuit below. Also draw the phasor diagram showing all the currents and voltages. [8]



b) A three-phase load consists of three similar inductive coils each of resistance 8Ω and inductance 20 mH. The supply voltage is 100 V, 50 Hz. Calculate the line current and total power consumed by the load in star connection. Take phase sequence RYB. [8]

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06 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2072 Magh

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

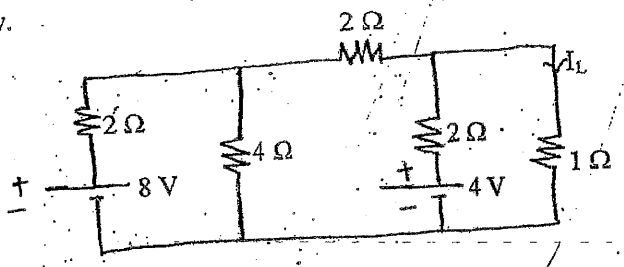
Subject: - Basic Electrical Engineering *(EE451)*

- ✓ 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) At room temperature of 20°C, the current flowing at the instant of switching of a 40W filament lamp with 220V supply is 2A. The filament material has a resistance temperature coefficient of 0.005/°C at 20°C. Calculate the working temperature of filament and current taken by it during normal working condition. [6]

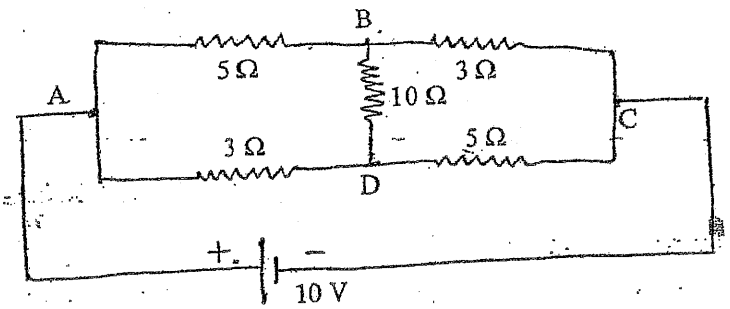
   b) Derive the formula I = n.A.e.V where the symbols used have their usual meaning. [5]

   c) Apply KVL and KCL to determine current I_L through 1Ω resistor in the network shown below. [5]



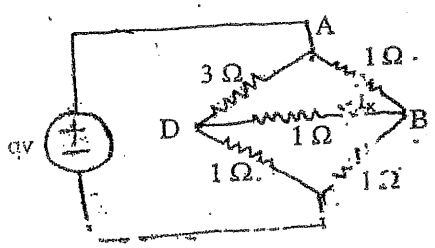
2. a) Define maximum power transfer theorem and derive the condition for maximum power transfer across the load resistance. [8]

   b) Find the current in t he branch BD of the circuit given below by using Thevenin's. [8]



3. a) Derive the equation for instantaneous current flowing through a pure inductor when excited by an ac sinusoidal voltage $v = v_m \sin wt$. Draw the wave form of voltage and current and also show analytically and graphically that it does not consume real power. [8]

   b) Find the value of I_x in the circuit shown below by the method of nodal analysis. [8]



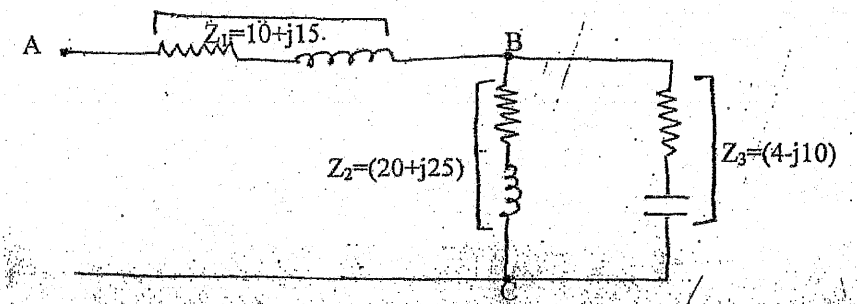
4. a) What do you understand by dynamically and statically induced emfs? Hence define self and mutually induced emf and magnetic coupling between two coils. [4]

   b) Derive an expression for the equivalent inductance of two inductors when they are connected in series (i) adding combination (ii) Opposing combination [6]

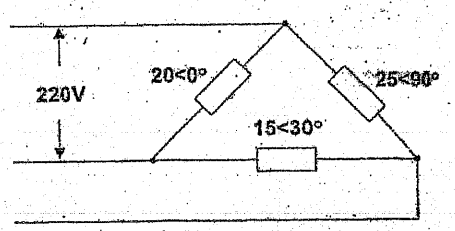
   c) A 10 Ω resistor is connected in series with a 100μF capacitor to a 230 V, 50 Hz supply. Find (i) The impedance (ii) Current (iii) Power factor (iv) Phase angle (v) Voltage across the resistor and the capacitor. [6]

5. a) Three elements, a resistance of 100 Ω, an inductance of 0.1H and a capacitance of 150 μF are connected in parallel to a 230 V, 50 Hz supply. Calculate the : (i) Current in each element (ii) Supply current (iii) Phase angle between the supply voltage and the supply current with the help of a phasor diagram. [6]

   b) In the circuit shown in figure below, determine the equivalent impedance that appears across the terminals AC. [4]



   c) For the 3-phase delta connected circuit below. Determine the line currents and total active, reactive and apparent power. [6]



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05 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2071 Magh

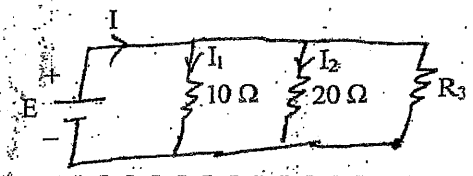
Exam.	New Back (2066 & Later Batch)		
Level	BE	Full Marks	80
Programme	BCE, BGE, BME	Pass Marks	32
Year / Part	I / II	Time	3 hrs.

Subject: - Basic Electrical Engineering *(EE451)*

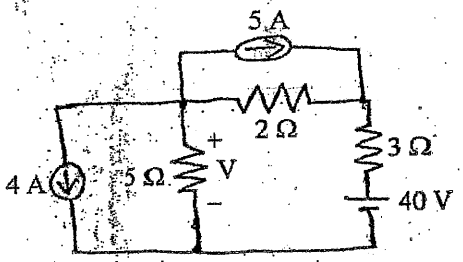
- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt <u>All</u> questions.*
- ✓ *The figures in the margin indicate **<u>Full Marks</u>**.*
- ✓ *Assume suitable data if necessary.*

1. a) A coil connected to a constant DC supply of 100 V drew a current of 13 A at room temperature of 25°C. After some time, its temperature increased to 70°C and current fell to 8.5 A. Find the current it will draw when its temperature will further rise to 80°C. Also find the temperature coefficient of resistance of the coil at 20°C. [6]

   b) Given the information provided in figure, calculate R_3, E, I and I_2. Equivalent resistance of the circuit is 4 Ω. [5]

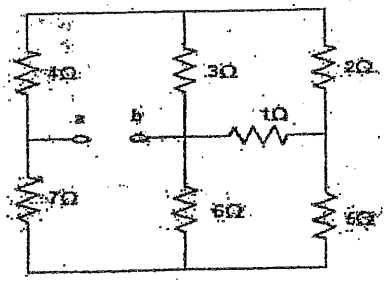


   c) Apply superposition theorem to the circuit shown below to find the voltage drop V across the 5 Ω resistor. [5]



2. a) Why does the terminal voltage of a real voltage source decrease with increase in load current? Explain how a practical voltage source can be converted into a practical current source. [6]

   b) Using star-delta transformation, find the equivalent resistance between terminals 'a' and 'b'. [6]



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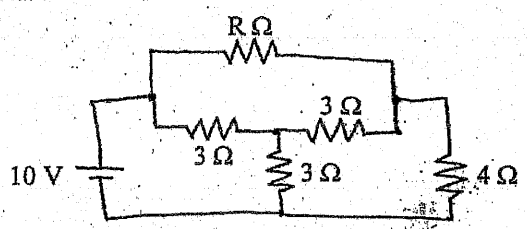
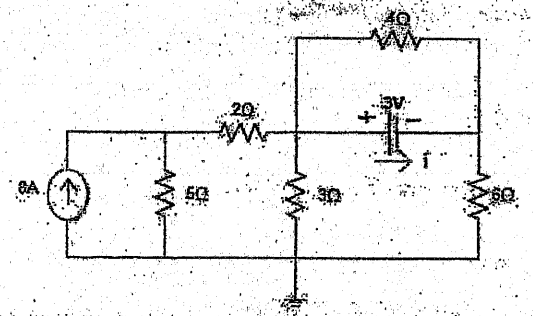
c) A capacitor with capacitance of 2 μF is connected in series with another capacitor whose capacitance is C_x. If the equivalent capacitance of the combination is 1.5 μF, calculate the value of C_x. What would be the equivalent capacitance if they were connected in parallel? [4]

3. a) Determine the value of R in the given network such that 4 Ω resistor consumes maximum power. [5]



b) Find the value of 'I' through the voltage source using Nodal analysis. [8]



4. a) An alternating current of frequency 50 Hz has a maximum value of 120 A. Write down the equation for its instantaneous value. Find also the instantaneous value after 1/360 sec and the time taken to reach 96 A for the first time. [6]

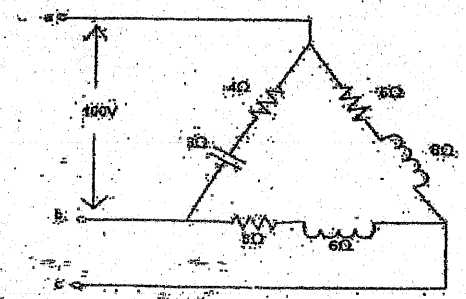
b) A coil is connected in series with a resistance of 30 Ω across 240 V, 50 Hz power supply. The reading of a voltmeter across coil is 180 V and across resistor is 130 V. Calculate resistance and reactance of coil. Also find power factor of whole circuit. [6]

c) Construct a phasor diagram of currents and voltages in a R-L-C series circuit. Assume $R = |0.8X_L| = |X_C|$. [4]

5. a) Explain disadvantages and causes of low power factor. [4]

b) A series combination resistor R and inductance L is driven by 25 V, 50 Hz supply. The power delivered to R and L are 100 W and 75 VAR. Determine the value of capacitance of a capacitor to be connected in parallel with source to improve its power factor to 0.9 (lagging). [5]

c) Discuss the advantages of three phase ac system over single phase ac system. For the given unbalanced delta connected load, find the phase currents, line currents and total power consumed by the load when phase sequence is abc. Construct the phasor diagram of currents and voltages in the load. [2+6+2]



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05 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2071 Bhadra

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

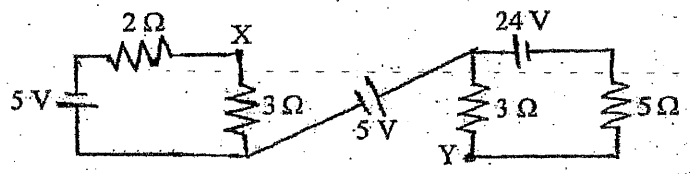
Subject: - Basic Electrical Engineering *(EE451)*

- ✓ 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.*

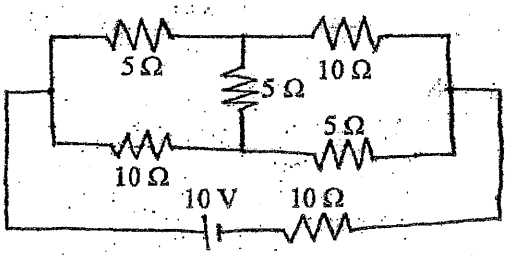
1. a) Define ideal current source. Show that if α_1 is the resistance temperature coefficient of a conductor at temperature t_1 °C then resistance temperature coefficient at t_2 °C is given by $\frac{\alpha_1}{1+\alpha_1(t_2-t_1)}$. [5]

   b) A coil has a resistance of 18 Ω when its mean temperature is 20°C and of 20 Ω when its mean temperature is 50°C. Find its mean temperature rise when its resistance is 21 Ω and the ambient temperature is 15°C. [5]

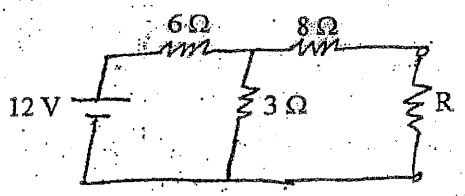
   c) Find V_{XY} in the figure. [5]



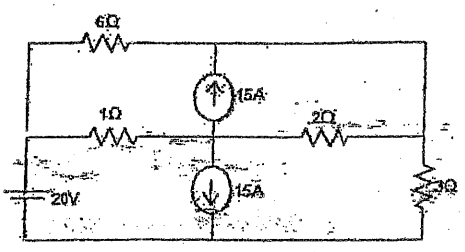
2. a) Find equivalent resistance of the given network. [5]



   b) Determine the value of R for maximum power to R and calculate the power delivered under this condition. [4]



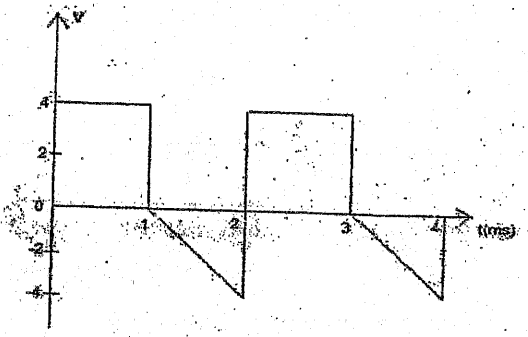
   c) Calculate the voltage drop across 3 Ω resistor using Superposition Theorem in the circuit given below. [6]



3. a) Explain super node and needs with suitable example. [4]

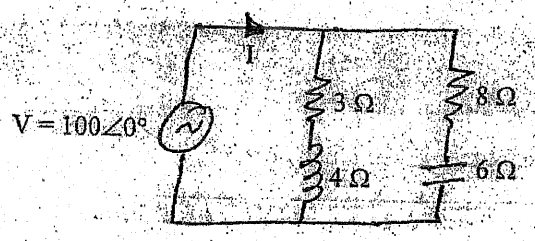
b) Define capacitance and inductance. Also classify the capacitors on the basis of geometrical shapes. [4]

c) Calculate the Rms value and Average value of the voltage wave given below and hence compute the form factor. [8]

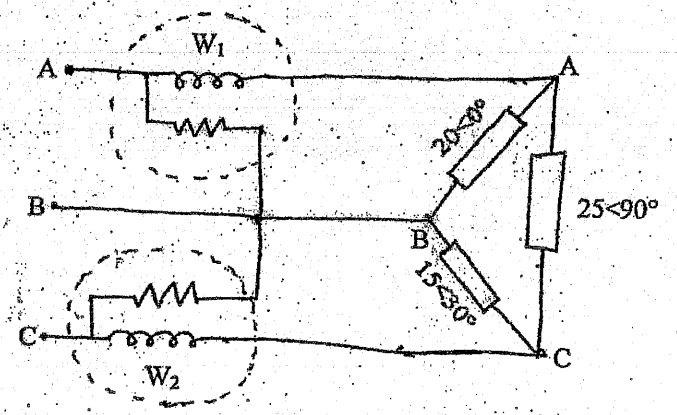


4. a) Explain the operation of purely capacitive circuit excited by a sinusoidal source and hence prove that average power consumed by such circuit is zero. Draw necessary waveforms. [6]

b) For the circuit given below, calculate the current I. Draw the phasor diagram of the circuit. [6]



c) The supply system is 230 V, 3-phase, 50 Hz. Determine the readings of wattmeters W_1 and W_2. Phase sequence is AB-BC-CA. [7]



5. a) Derive the equation for the instantaneous current when A.C. voltage is supplied to a series R-L circuit. Draw phasor diagrams and analyze power in the circuit. [6]

b) Calculate the amount of current through the neutral of a balanced 3-phase star connected circuit. Also verify with the phasor diagram. [3]

c) An electric circuit is being supplied by an a.c. source of 100 V rms. The circuit has a resistance of 10 Ω, inductor of 12 Ω reactance and capacitance of 8 Ω reactance connected in series. Compute the active power and power factor of the circuit. [6]

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division

2080 Ashwin

Exam.	Back		
Level	BE	Full Marks	80
Programme	All (Except BAR)	Pass Marks	32
Year / Part	I / II	Time	3 hrs.

Subject: - Engineering Mathematics II *(SH 451)*

- ✓ 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. State Euler's theorem for homogenous function of two variables of degree n.

   If $u = \sin^{-1}\left(\frac{\sqrt{x}-\sqrt{y}}{\sqrt{x}+\sqrt{y}}\right)$, show that $x\frac{\partial u}{\partial x}+y\frac{\partial u}{\partial y}=0$

2. Find the extreme value of $x^2+y^2+z^2$, subject to the conditions: $x+z=1$, $2y+z=2$

3. Evaluate $\int_0^a \int_0^{\sqrt{a^2-x^2}} y^2\sqrt{x^2+y^2}\,dydx$ by changing it into polar form.

4. Using multiple integral find the volume bounded by the cylinder $x^2+y^2=4$ between the planes $y+z=8$ and $z=1$.
5. Find the image of the point (2,-1,3) in the plane $3x-2y-z=9$.
6. Define Coplanar lines and Skew lines.

   Show that the lines $\frac{x}{1}=\frac{y-2}{2}=\frac{z+3}{3}$ and $\frac{x-2}{2}=\frac{y-6}{3}=\frac{z-3}{4}$ are coplanar and also find their point of intersection and the equation of the common plane.
7. Obtain the equation of the sphere through the circle

   $x^2+y^2+z^2=9, x-2y+2z=5$

   As the great circle also determined its centre and radius.
8. Obtain the equation of the right circular of radius 4 and axis the lines $x=2y=-z$.
9. Define the power series. Apply it to solve the differential equation $y''+xy'+y=0$.
10. Express the function: $f(x)=x^3+5x^2+4x+1$ as Legendre's polynomials.
11. Prove that Bessel's function.

    $J_{\frac{5}{2}}(x)=\sqrt{\frac{2}{\pi x}}\left\{\frac{3-x^2}{x^2}\sin x-\frac{3}{x}\cos x\right\}$, where the symbols have their usual meanings.

12. Define Scalar Triple Product and Vector Triple Product for vectors.

    Prove that $\left[\vec{a}+\vec{b} \quad \vec{b}+\vec{c} \quad \vec{c}+\vec{a}\right]=2\left[\vec{a} \quad \vec{b} \quad \vec{c}\right]$

13. Prove that the necessary and sufficient condition for a vector function $\vec{a}$ in variable 't' to have constant direction is $\vec{a} \times \frac{d\vec{a}}{dt} = 0$

14. Find the directional derivative of $\phi = x^2 - y^2 + z^2$ at the point A (1,-3,2) in the direction of $\vec{AB}$, where B is the point (4,5,7).

15. Test for the convergence of the series;

$$1 + \frac{1}{2^2} + \frac{2^2}{3^3} + \frac{3^3}{4^3} + \frac{4^4}{5^5} + \ldots\ldots\ldots$$

16. Find the interval and radius of convergence of Power Series: $\sum_{n=1}^{\infty} \frac{(-1)^n (2x+1)^n}{3^n}$

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2079 Chaitra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	All (Except BAR)	Pass Marks	32
Year / Part	I / II	Time	3 hrs.

Subject: - Engineering Mathematics II *(SH 451)*

- ✓ 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. State Euler's Theorem for a homogenous function in two variables.

   If $u = \cos^{-1}\left(\frac{x+y}{\sqrt{x}+\sqrt{y}}\right)$ prove that: $x\frac{\partial u}{\partial x}+y\frac{\partial u}{\partial y}=-\frac{1}{2}\cot u$.

2. Find the extreme value of $x^2+xy+y^2+3z^2$ connected by the relation $x + 2y + 4z = 60$.

3. Evaluate: $\iint_R ydydx$ where R is the region bounded by parabola $y^2 = 4x$ and $x^2 = 4y$.

4. Find the volume of ellipsoid $\frac{x^2}{a^2}+\frac{y^2}{b^2}+\frac{z^2}{c^2}=1$ using triple integration.

5. Show that the lines $\frac{x-5}{4}=\frac{y-7}{4}=\frac{z+3}{-5}$; $\frac{x-8}{7}=\frac{y-4}{1}=\frac{z-5}{3}$ are coplanar. Find the plane in which they lie.

6. Find the magnitude and the equation of the shortest distance between the lines $\frac{x}{2}=\frac{y}{-3}=\frac{z}{1}$ and $\frac{x-2}{3}=\frac{y-1}{-5}=\frac{z+2}{2}$.

7. Define the term 'Great Circle'. Find the equation of the sphere having the circle $x^2+y^2+z^2+10y-4z-8=0$, $x+y+z=3$ as a Great Circle.

8. Find the equation of the cone with vertex at (1, 2, 3) and guiding curve $y^2 = 16x$, $z = 1$.

9. Find a power series solution for $y''-4y=0$.

10. Express $f(x) = 5x^3 + x$ in terms of Legendre's Polynomials.

11. Prove that $J_{\frac{3}{2}}(x)=\sqrt{\frac{2}{\pi x}}\left(\frac{\sin x}{x}-\cos x\right)$.

12. Define vector triple product. Prove that $\vec{i}\times\left(\vec{a}\times\vec{i}\right)+\vec{j}\times\left(\vec{a}\times\vec{j}\right)+\vec{k}\times\left(\vec{a}\times\vec{k}\right)=2\vec{a}$

    where $\vec{i}$, $\vec{j}$, $\vec{k}$ are mutually unite vectors along the co-ordinates axes.

13. The necessary and sufficient condition for the vector function of a scalar variable t have a constant magnitude is $\vec{a}.\frac{d\vec{a}}{dt}=0$.

14. Find the directional derivative of $\phi = x^2yz + 4xz^2$ at (1, -2, -1) in the direction of $2\hat{i}-\hat{j}-2\hat{k}$.

15. Test the convergence of the series: $\sum_{n=1}^{\infty}\frac{x^n}{n.(n+1)}$ where $x > 0$.

16. Find the interval and radius of convergence of the power series: $\sum_{n=1}^{\infty}\frac{2^n(x-3)^n}{(n+4)}$.

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2079 Ashwin

Exam.	Back		
Level	BE	Full Marks	80
Programme	All (Except B.Arch)	Pass Marks	32
Year / Part	I/ II	Time	3 hrs.

Subject: - Engineering Mathematics II (*SH 451*)

- ✓ 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. State Euler's theorem on homogeneous function of two independent variable.
   Verify it for $u = x^n \tan^{-1}\left(\frac{y}{x}\right)$. [1+4]
2. Find the minimum value of $x^2 + xy + y^2 + 3z^2$ under the condition $x+2y+4z = 60$. [5]
3. Evaluate $\int_0^a \int_y^a \frac{x}{x^2+y^2} dxdy$ by changing the order of integration. [5]
4. Evaluate $\iint xy(x+y)\, dx\, dy$ over the area between $y = x^2$ and $y = x$. [5]
5. Find the distance of the point (1, - 2,3) from the plane $x - y + z = 5$ measured parallel to the line $\frac{x}{2} = \frac{y}{3} = \frac{z}{-6}$. [5]
6. Find the magnitude and equation of the line of shortest distance between $\frac{x-3}{1} = \frac{y-5}{2} = \frac{z-7}{-3}$ and $\frac{x+1}{3} = \frac{y+2}{-4} = \frac{z+3}{1}$ [5]
7. Find the equation of the sphere through the circle $x^2 + y^2 + z^2 = 1, 2x + 4y + 5z = 6$ and touching the plane $z = 0$. [5]
8. Obtain the equation of the right circular cylinder of radius 4 and axis the lines $x = 2y = -z$. [5]
9. Solve the differential equation $\frac{d^2y}{dx^2} + x\frac{dy}{dx} + y = 0$ by power series method. [5]
10. Express in terms of Legendre's Polynomials $f(x) = x^3 - 5x^2 + 6x + 1$. [5]
11. Prove the Bessel's function. [5]
    $$J_{-\frac{5}{2}}(x) = \sqrt{\frac{2}{\pi x}}\left\{\frac{3-x^2}{x^2}\sin x - \frac{3}{x}\cos x\right\}.$$
12. Show that $(\vec{b}\times\vec{c})\times(\vec{c}\times\vec{a}) = [\vec{a}\,\vec{b}\,\vec{c}]\vec{c}$ and deduce that $[\vec{b}\times\vec{c}\ \ \vec{c}\times\vec{a}\ \ \vec{a}\times\vec{b}] = [\vec{a}\,\vec{b}\,\vec{c}]^2$ [5]
13. Prove that necessary and sufficient condition for a vector function $\vec{f}$ of scalar variable t to have constant direction is $\vec{f}\times\frac{d\vec{f}}{dt} = 0$. [5]
14. Find angle between the normal to the surface at $xy = z^2$ at the points (1,4,2) and (-3,-3,3). [5]
15. Test the convergence or divergence of the following series:
    $$\frac{1}{2} + \frac{1}{2^2} + \frac{2^2}{3^3} + \frac{3^3}{4^4} + \frac{4^4}{5^5} + \ldots\ldots\ldots$$
16. Find the interval of convergence, radius of convergence and centre of convergence for
    $$\sum_{n=1}^{\infty} \frac{2^n(x-3)^n}{n+3}$$ [5]

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2079 Jestha

Exam.	Back		
Level	BE	Full Marks	80
Programme	All except BAR	Pass Marks	32
Year / Part	I / II	Time	3 hrs.

Subject: - Engineering Mathematics (*SH 451*)

- ✓ 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. If $u = \sin^{-1}\frac{x}{y} + \tan^{-1}\frac{x}{y}$, *show that* $x\frac{\partial u}{\partial y} + y\frac{\partial u}{\partial y} = 0$.
2. Find the extreme value of $x_2+y_2+z_2$ connected by the relations $x+z=1$ and $2y+z=2$.
3. Evaluate $\iint_R xydxdy$ over the area bounded by the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ in the first quadrant.
4. Evaluate $\int_0^a \int_x^a \frac{x}{x^2+y^2}$ dxdy by changing the order of integration.
5. Find the equation of the plane through the points (1,0,-1) and (3,2,2) and parallel to the line $\frac{x-1}{1} = \frac{y-1}{2} = \frac{z-2}{3}$.
6. Find the magnitude of the line of the shortest distance between the lines
   $\frac{x}{4} = \frac{y+1}{3} = \frac{z-2}{2}$; $5x - 2y - 3z + 6 = 0, x - 3y + 2z - 3 = 0$.
7. Find the radius and center of the circle
   $x^2+y^2+z^2+x+y+z=4, \quad x+y+z=0$.
8. Define right circular cylinder. Find the equation of the right circular cylinder whose guiding curve is the circle $x^2+y^2+z^2-x-y-z=0, \quad x+y+z=1$.
9. Solve the differential equation $(1-x^2)y'' = y$ by power series method.
10. Prove the Legendre's function $x^4 = \frac{1}{35}[8P_4(x)+20P_2(x)+7P_0(x)]$.
11. Define Bessel function and show that
    $J_{-\frac{1}{2}}(x) = \sqrt{\frac{2}{\pi x}}\cos x$.
12. Find the volume of the parallelopiped whose edge are
    $\vec{i}+2\vec{j}-\vec{k}, \quad \vec{i}-\vec{j}+\vec{k}, \quad \vec{i}+\vec{j}+\vec{k}$.
13. A partical moves along the curve x = a cost, y = a sint, z = bt. Find its velocity and acceleration at $t = 0$ and $t = \frac{\pi}{2}$.
14. Find the constants a,b,c so that the vector $\vec{v} = (x+2y+az)\vec{i} + (bx-3y-z)\vec{j} + (4x+cy+2z)\vec{k}$ is irrotational.

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15. Test the convergence of the series

$$2x + \frac{3x^2}{8} + \frac{4x^3}{27} + \text{----} + \frac{(n+1)}{n^3}x^4 + \text{---}$$

16. Find the radius of convergence of the infinite series $\sum_{n=1}^{\infty} \frac{n^n x^n}{n!}$. Also find centre of the interval of convergence.

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2078 Chaitra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	All (Except B.Arch.)	Pass Marks	32
Year / Part	I / II	Time	3 hrs.

Subject: - Engineering Mathematics II *(SH 451)*

- ✓ 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. State Euler's Theorem for Homogeneous function of two variables. If $u = \sec^{-1}\left(\frac{x^3+y^3}{x+y}\right)$ then show that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = 2\cot u$ [1+4]

2. What are the criteria for a function f(x,y) to have local maximum and minimum value? Using the criteria, evaluate the extreme value of $x^2+y^2+z^2$ subject to the condition $x+y+z=1$. [5]

3. What advantage do we get by changing Cartesian integrals into polar form? Change the following integral into Polar and hence evaluate $\int_0^a \int_0^{\sqrt{a^2-x^2}} \sqrt{x^2+y^2}\,dydx$ [1+4]

4. Find by triple integration, the volume of the sphere $x^2+y^2+z^2=a^2$ [5]

5. Find the image of the point (1, 3, 4) in the plane $2x-y+z+3=0$. [5]

6. Find the magnitude and equations of shortest distance between the lines $\frac{x-1}{2}=\frac{y-2}{3}=\frac{z-3}{4}$ and $\frac{x-2}{3}=\frac{y-4}{4}=\frac{z-5}{5}$ [5]

7. What is the cross section of an intersecting sphere and a plane? How many spheres pass through their intersection?
Obtain the centre and radius of the circle $x^2+y^2+z^2+x+y+z-4=0, x+y+z=0$. [1+4]

8. Find the equation of the right circular cylinder of radius 2 and whose axis is the line $\frac{x-1}{2}=\frac{y-2}{1}=\frac{z-3}{2}$. [5]

9. Apply the power series method to solve the differential equation $y''+xy'+y=0$. [5]

10. Express x^3-5x^2+6x+1 in terms of Legendre's polynomials. [5]

11. Prove that $x J'_n(x) = n J_n(x) - x J_{n+1}(x)$ where the symbol Jn denote Bessel's function. [5]

12. Find the set of reciprocal system to the set vectors $2\hat{i}+3\hat{j}-\hat{k}$, $-\hat{i}+2\hat{j}-3\hat{k}$ and $3\hat{i}-4\hat{j}+2\hat{k}$ [5]

13. The necessary and sufficient condition for the vector function of a scalar variable t have a constant magnitude is $\vec{a}\cdot\frac{d\vec{a}}{dt}=0$. [5]

14. Find the angle between the surfaces $xy^2z = 3x + z^2$ and $3x^2 - y^2 + 2z = 1$ at the point (1, -2, 1). [5]

15. Test the series for convergence or divergence [5]
$$\frac{x}{1.2}+\frac{x^2}{2.3}+\frac{x^3}{3.4}+\ldots\ , (x>0)$$

16. Find the radius and interval of convergence of the power series: [5]
$$\sum_{n=1}^{\infty}\frac{(-1)^n(x+1)^n}{2^n}.$$

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2078 Poush

Exam.	Back		
Level	BE	Full Marks	80
Programme	All (Except BAR)	Pass Marks	32
Year / Part	I / II	Time	3 hrs.

Subject: - Engineering Mathematics II *(SH 451)*

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

1. If $z=f(x,y)$ and $x=e^{u}+e^{-v}$, $y=e^{-u}-e^{v}$, prove that $\frac{\partial z}{\partial u}-\frac{\partial z}{\partial v}=x\frac{\partial z}{\partial x}-y\frac{\partial z}{\partial y}$. [5]

2. Write the condition for f(x,y) to be maximum or minimum. Examine and find the maximum and minimum value of: x^3+y^3-3axy [5]

3. Show the region of integration of the following integral: $\int_0^2\int_0^{\sqrt{2x-x^2}}\frac{x}{\sqrt{x^2+y^2}}dydx$. Also evaluate the integral using the polar coordinates. [5]

4. Evaluate $\int_0^a\int_0^x\frac{\cos y dydx}{\sqrt{(a-x)(a-y)}}$ by changing order of integration. [5]

OR

The plane $\frac{x}{a}+\frac{y}{b}+\frac{z}{c}=1$ meets the plane in A, B, C. Applying Dirichlet's integral to find the volume of tetrahedron OABC.

5. Find the distance of the point (1, -2, 3) form the plane $x-y+z=5$ measured parallel to the line line $\frac{x}{2}=\frac{y}{3}=\frac{z}{-6}$ [5]

6. Show that the lines $\frac{x-5}{4}=\frac{y-7}{4}=\frac{z+3}{-5}$ and $\frac{x-8}{7}=\frac{y-4}{1}=\frac{z-5}{3}$ are coplanar and find the equation of plane in which they lie. [5]

7. Find the center and radius of the circle: $x^2+y^2+z^2+x+y+z=4,\ x+y+z=0$. [5]

8. Find the equation of cone whose vertex is origin and guiding curve is $\frac{x^2}{4}=\frac{y^2}{9}=\frac{z^2}{1}$, $x+y+z=1$. [5]

OR

Obtain the equation of right circular cylinder of radius 4 and axis the line $x=2y=-z$.

9. Apply the power series method to solve the following differential equations: [5]

$$y''-4xy'+(4x^2-2)y=0$$

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10. Express $f(x)=x^3-5x^2+x+2$ in terms of Legendre's polynomials. [5]

11. Prove that Bessel's function. [5]

$$J_4(x)=\left(\frac{48}{x^3}-\frac{8}{x}\right)J_1(x)+\left(1-\frac{24}{x^2}\right)J_0(x)$$

12. Give the geometrical interpretation of scalar triple product. Find 'p' such that the vectors $2\vec{i}-\vec{j}+\vec{k}, \vec{i}+2\vec{j}+3\vec{k}$ and $3\vec{i}+p\vec{j}+5\vec{k}$ are coplaner. [5]

13. If $\vec{a},\vec{b},\vec{c}$ and $\vec{a}',\vec{b}',\vec{c}'$ are reciprocal system of vectors then show that [5]

$$\vec{a}.\vec{a}'+\vec{b}.\vec{b}'+\vec{c}.\vec{c}'=3$$

14. Find angle between the normal to the surface at $xy=z^2$ at the points (1,4,2) and (-3,-3,3). [5]

15. Test for the convergence of the series: [5]

$$1+\frac{x}{2}+\frac{x^2}{5}+\frac{x^3}{10}+\ldots\ldots\ldots+\frac{x^n}{n^2+1}+\ldots\ldots$$

16. Find the radius and interval of convergence of the power series: $\sum_{n=1}^{\infty}\frac{(-3)^n x^n}{\sqrt{n+1}}$ [5]

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2078 Baishakh

Exam.	Back		
Level	BE	Full Marks	80
Programme	All (Except B.Arch.)	Pass Marks	32
Year / Part	I / II	Time	3 hrs.

Subject: - Engineering Mathematics II *(SH 451)*

- ✓ 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. State Euler's theorem of the homogeneous function and use it to show that $x\frac{\partial u}{\partial x}+y\frac{\partial u}{\partial y}=3\tan u$ where $u=\sin^{-1}\frac{x^2y^2}{x+y}$.
2. Find the minimum value of $x^2+y^2+z^2$ subjected to the condition $x+y+z-1=0$ and $xyz+1=0$.
3. Evaluate $\int_0^a \int_{\sqrt{ax}}^a \frac{y^2 dydx}{\sqrt{y^4-a^2x^2}}$ by changing the order of integration.
4. Find by triple integration, volume of sphere: $x^2+y^2+z^2=a^2$.
5. Find the equation of the line through the point (-2, 3, 4) and parallel to the planes $2x+3y+4z=5$ and $4x+3y+5z=6$.
6. Find the magnitude and equation of the S. D between the lines $\frac{x-1}{2}=\frac{y-2}{3}=\frac{z-3}{4}$ and $\frac{x-2}{3}=\frac{y-4}{4}=\frac{z-5}{5}$
7. Obtain the equation of the sphere through the circle: $x^2+y^2+z^2=9$, $x-2y+2z=5$ as a great circle.
8. Find the equation of cone whose vertical angle is $\frac{\pi}{2}$ with vertex at the origin and its axis along the line $x=-2y=z$.
9. Solve the differential equation: $(1-x^2)y''=y$ by the power series method.
10. Express the polynomial $f(x)=2x^3+6x^2+5x+4$ in terms of Legendre's polynomials.
11. Define Bessel function and Prove that: $J_{\frac{-1}{2}}(x)=\sqrt{\frac{2}{\pi x}}\cos x$.
12. If possible find a set of vectors reciprocal to the vectors $2\vec{i}-3\vec{j}+4\vec{k}$, $\vec{i}+2\vec{j}-\vec{k}$ and $3\vec{i}-\vec{j}+2\vec{k}$.
13. A particle moves along the curve $x=a\cos t$, $y=a\sin t$, $z=bt$. Find the velocity and acceleration at $t=0$ *and* $t=\frac{\pi}{2}$.
14. If $\vec{a}$ is a constant vector and $\vec{r}$ be the position of vector, then prove that $\nabla\times(\vec{a}\times\vec{r})=2\vec{a}$.
15. Test the infinite series $\frac{1^2}{3^1}+\frac{2^2}{3^2}+\frac{3^2}{3^3}+\ldots$ whether it is divergent or convergent.
16. Find the radius and interval of convergence of the power series: $\sum_{n=1}^{\infty}\frac{(-1)^n}{n.2^n}x^n$

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2077 Chaitra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	All (Except B.Arch.)	Pass Marks	32
Year / Part	I / II	Time	3 hrs.

Subject: - Engineering Mathematics II *(SH 451)*

- ✓ 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. Give an example of Homogenous function. State Euler's theorem on Homogenous function for two independent variable x and y. Verify Euler's theorem for $u=x^n \sin\left(\frac{y}{x}\right)$.
2. Find the extreme value of $x^2+y^2+z^2$ connected by the relation $x+z=1$ and $y+z=2$
3. Evaluate the double integration $\int_0^1\int_x^{\sqrt{2-x^2}} \frac{xdydx}{\sqrt{x^2+y^2}}$.
4. Find the volume bounded by the cylinder $x^2+y^2=4$ and the planes $y+z=4$ and $z=0$.
5. Prove that the lines $x=\frac{y-2}{2}=\frac{z+3}{3}$ and $\frac{x-2}{2}=\frac{y-6}{3}=\frac{z-3}{4}$ are coplanar and find their plane and point of intersection.
6. Find the equation of shortest distance between the lines
   $\frac{x}{2}=\frac{y}{-3}=\frac{z}{1}$ and $\frac{x-2}{3}=\frac{y-1}{-5}=\frac{z+2}{2}$.
7. Find the radius and centre of the circle
   $x^2+y^2+z^2-8x+4y+8z-45=0,\ x-2y+2z-3=0$
8. Find the equation of the cone with vertex (1, 1, 0) and guiding curve is $y=0, x^2+z^2=4$.
9. Solve by the power series method of the differential equation $y''-y=0$.
10. Test whether the solutions of $y'''-2y''-y'+2y=0$ are linearly independent or dependent.
11. Show that
    $4J''_n(x)=J_{n-2}(x)-2J_n(x)+J_{n+2}(x)$
12. Prove that
    $\vec{i}\times(\vec{a}\times\vec{i})+\vec{j}\times(\vec{a}\times\vec{j})+\vec{k}\times(\vec{a}\times\vec{k})=2\vec{a}$ where $\vec{i}, \vec{j}, \vec{k}$ are the mutually unite vectors along the coordinates axes.
13. The necessary and sufficient condition for the function $\vec{a}$ of a scalar variable t to have a constant direction is $\vec{a}\times\frac{d\vec{a}}{dt}=0$.
14. Find the directional derivatives of $\varphi(x, y, z) = xy^2+yz^3$ at the point (2, -1, 1) in the direction of vector $\vec{i}+2\vec{j}+2\vec{k}$.
15. Test the convergence of the series
    $\frac{2}{1^3}x+\frac{3}{2^3}x^2+\frac{4}{3^3}x^3+\ldots.+\frac{(n+1)^n}{n^3}x^n+\ldots.$
16. Find the interval and radius of convergence of the power series $\sum\frac{(-1)^n(x-3)^n}{n+1}$.

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2076 Bhadra

Exam.	[redacted]		
Level	III	Full Marks	80
Programme	[redacted]	Pass Marks	32
Year / Part	I / II	Time	3 hrs.

Subject: Engineering Mathematics III (SH451)

- ✓ 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. State Euler's theorem for homogenous function of two variables. If $Z=\sin^{-1}\left(\frac{x^2+y^2}{x+y}\right)$, then show that $x\frac{\partial z}{\partial x}+y\frac{\partial z}{\partial y}=\tan\left\{\sin^{-1}\left(\frac{x^2+y^2}{x+y}\right)\right\}$. [1+4]
2. Find the extreme values of the function $f(x,y,z)=xy+yz+zx$ subject to $x+y+z=120$. [5]
3. Evaluate the double integration $\iint_R \frac{dxdy}{x^4+y^2}$ over the region R bounded by $x=1$, $y=x^2$, and x-axis. [5]
4. Find the volume of the region V bounded by $x^2+y^2=4$, $z=2$ and $z=x+y$. [5]
5. Show that the lines $\frac{x+5}{3}=\frac{y+4}{1}=\frac{z-7}{-2}$ and $3x+2y+z-2=0$, $x-3y+2z-13=0$ are coplanar and find the equation to the plane in which they lie. [5]
6. Find the length and equation of shortest distance between the lines $\frac{x-3}{3}=\frac{y-8}{-1}=\frac{z-3}{1}$, $2x-3y+27=0$, $2y-z+20=0$. [5]
7. Find the equation of the sphere having circle $x^2+y^2+z^2+10y-4z-8=0$; $x+y+z=3$ as a great circle. [5]
8. Find the equation of cylinder whose axis is parallel to the line $\frac{x-1}{3}=\frac{y-2}{4}=\frac{z-3}{5}$ and whose guiding curve is $y^2+z^2=4$, $x=2$. [5]
9. Solve the equation by power series method. $x^2y''+y=0$. [5]
10. Find the general solution of $(1-x^2)y''-2xy'+n(n+1)y=0$. [1+4]
11. Prove that $J_{5/2}(x)=\sqrt{\frac{2}{\pi x}}\left\{\frac{3-x^2}{x^2}\sin x-\frac{3\cos x}{x}\right\}$. [5]
12. If $\vec{a}',\vec{b}',\vec{c}'$ form reciprocal system of vectors $\vec{a},\vec{b},\vec{c}$, then prove that $[\vec{a}'\vec{b}'\vec{c}'][\vec{a},\vec{b},\vec{c}]=1$. [5]
13. A particle is moving with a constant angular speed ω around a circle $x=R\cos\omega t$, $y=R\sin\omega t$ where R be the radius of the circle. Show that, for all t, i) the velocity vector is perpendicular to the displacement vector and ii) magnitude of centripetal acceleration is proportional to the radius of the circle. [5]
14. Define gradient of a scalar field. Find the angle between the surface $x\log z=y^2-1$ and $x^2y+z=0$ at the point (1,1,1). [5]
15. Test whether the series $\sum_{n=1}^{\infty}\left(\sqrt[3]{n^3+1}-n\right)$ is convergent or not. [5]
16. Find the interval and radius of convergence of power series: $\sum_{n=1}^{\infty}\frac{(x+2)^n}{3^n n}$. [5]

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02 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2076 Baishakh

Exam.			
Level	BE	Full Marks	80
Programme	All (Except BAR)	Pass Marks	32
Year / Part	I / II	Time	3 hrs.

Subject: - Engineering Mathematics II *(SH 451)*

- ✓ 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. State and prove Euler's theorem for a homogeneous function of two variables.
2. Find the extreme value of $x^2+y^2+z^2$ subject to the conditions:
   $x+y+z=1$ and $xyz+1=0$.
3. Evaluate $\int_0^a \int_y^a \frac{xdxdy}{x^2+y^2}$ by changing order of integration.
4. Find the volume of $\frac{x^2}{a^2}+\frac{y^2}{b^2}+\frac{z^2}{c^2}=1$ using Drichelet's integral.
5. Prove that the lines $\frac{x-1}{2}=\frac{y-2}{3}=\frac{z-3}{4}$ and $4x-3y+1=0$, $5x-3z+2=0$ are coplanar.
   Also find the point of intersection.
6. Find the magnitude and equation of shortest distance between the lines:
   $\frac{x}{2}=\frac{y}{-3}=\frac{z}{1}$ and $\frac{x-2}{3}=\frac{y-1}{-5}=\frac{z+2}{2}$.
7. Find the radius and centre of the circle:
   $x^2+y^2+z^2-8x+4y+8z-45=0$, $x-2y+2z-3=0$
8. Find the equation of cone with vertex (1, 2, 3) and the base $9x^2+4y^2=36$, $z=0$.
9. Find the reciprocal system of vector of the set of vectors:
   $-\vec{i}+\vec{j}+\vec{k}$, $\vec{i}-\vec{j}+\vec{k}$ and $\vec{i}+\vec{j}-\vec{k}$.
10. For the curve $x=3t$, $y=6t^2$, $z=4t^3$, prove that $\left[\dot{\vec{r}}\ \ddot{\vec{r}}\ \dddot{\vec{r}}\right]=864$
11. If $\vec{r}=x\vec{i}+y\vec{j}+z\vec{k}$ and $\vec{a},\vec{b}$ are constant vectors, then prove that
    $\text{curl}\left(\vec{b}\times\left(\vec{r}\times\vec{a}\right)\right)=\vec{a}\times\vec{b}$.
12. Solve by the power series method the differential equation: $y''-4xy'+(4x^2-2)y=0$.
13. Solve the Legendre's equation: $(1-x^2)\frac{d^2y}{dx^2}-2x\frac{dy}{dx}+n(n+1)y=0$.
14. Prove that $\frac{d}{dx}[x^nJ_n(x)]=x^nJ_{n-1}(x)$.
15. Test the convergence of the series: $\frac{x}{1.2}+\frac{x^2}{2.3}+\frac{x^3}{3.4}+\ldots\ldots$ $(x>0)$.
16. Find the interval and radius of convergence of power series:
    $\sum_{n=1}^{\infty}\frac{(-1)^n(3x-2)^n}{4^n}$

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02 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2075 Bhadra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	All (Except B.Arch.)	Pass Marks	32
Year / Part	I / II	Time	3 hrs.

Subject: - Engineering Mathematics II *(SH451)*

- ✓ 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. State Euler's theorem of homogeneous function and use it to show $x\frac{\partial u}{\partial x}+y\frac{\partial u}{\partial y}=-\frac{1}{6}\tan u$ where $u=\text{cosec}^{-1}\left(\frac{x^{1/2}+y^{1/2}}{x^{1/3}+y^{1/3}}\right)$.
2. Find the maximum value of $f(x, y, z)=xyz$ when $x+y+z=9$.
3. Show the region of integration of the following integral:

$$\int_0^1\int_x^{\sqrt{2-x^2}}\frac{xdydx}{\sqrt{x^2+y^2}}$$

Also evaluate the integral using polar coordinates.

4. Evaluate $\iiint_V x\,dxdydz$ where V is the region in the first octant bounded by the surface $x^{2/3}+y^{2/3}+z^{2/3}=a^{2/3}$.
5. Find the distance from the point (3, 4, 5) to the point where the line $\frac{x-3}{1}=\frac{y-4}{2}=\frac{z-5}{2}$ meets the plane $x+y+z=2$.
6. Find the magnitude and equation of shortest distance between the lines $\frac{x-3}{1}=\frac{y-5}{2}=\frac{z-7}{-3}$ and $\frac{x+1}{3}=\frac{y+2}{-4}=\frac{z+3}{1}$.
7. Find the equation of the sphere having the circle $x^2+y^2+z^2+10y-4z-8=0,\ x+y+z=3$ as a great circle. Also determine its center and radius.
8. Prove that the equation $2x^2+y^2+3z^2+4x+2y+6z+d=0$ represents a cone if $d=6$.
9. Define scalar triple product of three vectors. State its geometrical meaning and hence find the volume of the parallelopiped whose concurrent edges are:

$\vec{i}+2\vec{j}-\vec{k}$, $\vec{i}-\vec{j}+\vec{k}$ and $\vec{i}+\vec{j}+\vec{k}$.

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10. Prove that the necessary and sufficient condition for the vector function $\vec{a}(t)$ of scalar variable t to have constant direction is $\vec{a} \times \frac{d\vec{a}}{dt} = 0$.

11. Find the directional derivative of $\phi(x, y, z) = x^2 + yz + 4xz^2$ at the point (1, -2, -1) in the direction of vector $2\vec{i} - \vec{j} - 2\vec{k}$.

12. Apply Power series method to solve the following differential equation:

$$(2 - x^2)\frac{d^2y}{dx^2} + 2x\frac{dy}{dx} - 2y = 0$$

13. Express the polynomial $f(x) = 2x^3 + 6x^2 + 5x + 4$ in terms of Legendre's polynomials.

14. Show that $J_{-5/2}(x) = \sqrt{\frac{2}{n\pi}}\left[\frac{3}{x}\sin x + \frac{3 - x^2}{x^2}\cos x\right]$

15. Test the convergence of the series:

$$\sum_{n=0}^{\infty} \frac{x^n}{n^2 + 2} \text{ where } x > 0.$$

16. Find the internal and radius of convergence of power series:

$$\sum_{n=1}^{\infty} \frac{(-1)^n (2x + 1)^n}{3^n}$$

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02 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2075 Baishakh

Exam.	Back		
Level	BE	Full Marks	80
Programme	ALL (Except B. Arch.)	Pass Marks	32
Year / Part	I / II	Time	3 hrs.

Subject: - Engineering Mathematics II *(SH451)*

- ✓ 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. State Euler's Theorem for homogeneous function of two variables. If $u = \tan^{-1}\left(\frac{x^3+y^3}{x+y}\right)$ then show that $x\frac{\partial u}{\partial x}+y\frac{\partial u}{\partial y}=\sin 2u$. [1+4]
2. Obtain the maximum value of xyz such that $x+y+z=24$. [5]
3. Evaluate: $\int_0^a\int_{\sqrt{ax}}^{a}\frac{y^2}{\sqrt{y^4-a^2x^2}}dydx$ by changing order of integration. [5]
4. Evaluate: $\iiint_R(2x+y)dx\,dy\,dz$ where R is closed region sounded by cylinder $z=4-x^2$ and planes $x=0,\ y=0,\ y=2,\ z=0$. [5]
5. Show that $\frac{x+4}{3}=\frac{y+6}{5}=\frac{z-1}{-2}$ and $3x-2y+z+5=0=2x+3y+4z-4$ are coplanar lines and find the point of intersection. [5]
6. Show that the shortest distance between the lines $x+a=2y=-12z$ and $x=y+2a=6z-6a$ is 2a. [5]
7. Obtain the equation of tangent plane to sphere $x^2+y^2+z^2+6x-2z+1=0$ which passes through the line $3(16-x)=3z=2y+30$ [5]
8. Find the equation of cone with vertex at $(3,1,2)$ and base $2x^2+3y^2=1,\ z=1$ [5]

OR

Find the equation of the right circular cylinder whose guiding curve is the circle: $x^2+y^2+z^2-x-y-z=0,\ x+y+z=1$ [5]

9. Solve the initial value problem: $y''-4y'+3y=10e^{-2x},\ y(0)=1,\ y'(0)=3$ [5]
10. Solve the differential equation by power series method: $y''-y=0$ [5]

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11. Solve in series, the Legendre's equation $(1-x^2)y''-2xy'+n(n+1)y=0$ [5]

OR

Prove the Bessel's function $J_{\frac{3}{2}}(x)=\sqrt{\frac{2}{\Pi x}}\left(\frac{\sin x}{x}-\cos x\right)$

12. Prove that $\left[\vec{a}\times\vec{b}\ \ \vec{c}\times\vec{d}\ \ \vec{e}\times\vec{f}\right]=\left[\vec{a}\,\vec{b}\,\vec{d}\right]\left[\vec{c}\,\vec{e}\,\vec{f}\right]-\left[\vec{a}\,\vec{b}\,\vec{c}\right]\left[\vec{d}\,\vec{e}\,\vec{f}\right]$ [5]

13. Prove that the necessary and sufficient conditions for the vector function $\vec{a}$ of scalar variable t to have constant direction is $\vec{a}\times\frac{d\vec{a}}{dt}=0$ [5]

14. Find the angle between the normal to the surfaces given by: $x\log z=y^2-1$ and $x^2y+z=2$ at the point $(1,1,1)$ [5]

15. Test the convergence of the series: [5]

$$x+\frac{3}{5}x^2+\frac{8}{10}x^3+\frac{15}{17}x^4+.....+\frac{n^2-1}{n^2+1}x^n+.....,x>0.$$

16. Find the interval and radius of convergence of power series: [5]

$$\frac{1}{1.2}(x-2)+\frac{1}{2.3}(x-2)^2+\frac{1}{3.4}(x-2)^3+.....+\frac{1}{n(n+1)}(x-2)^n+.....$$

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02 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2074 Bhadra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	ALL (Except B. Arch.)	Pass Marks	32
Year / Part	I / II	Time	3 hrs.

Subject: - Engineering Mathematics II *(SH451)*

- ✓ 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. If $u = \log\frac{x^2+y^2}{x+y}$, then show that $x\frac{\partial u}{\partial x}+y\frac{\partial u}{\partial y}=1$
2. Find the minimum value of $x^2+y^2+z^2$ when $x+y+z=3a$.
3. Evaluate $\iint xy(x+y)\,dxdy$ over the area between $y=x^2$ and $y=x$
4. Evaluate $\int_0^a\int_y^a \frac{x\,dx\,dy}{x^2+y^2}$ by changing order of integration.

OR

Evaluate $\iiint_v x^2 dx\,dy\,dz$ over the region v boundary by the planes x = 0, y =0, z = 0 and x+y+z=a

5. Obtain the equation of the plane passing through the line of intersection of two planes $7x-4y+7z+16=0$ and through the line of intersection of two planes $4x-3y-2z+13=0$ and perpendicular to plane $x-y-2z+5=0$
6. Find the length and equation of the shortest distance between the lines $\frac{x-3}{3}=\frac{y-8}{-1}=\frac{z-3}{1}$, $2x-3y+27=0$; $2y-z+20=0$
7. Find the equation of the sphere having the circle $x^2+y^2+z^2+7y-2z+2=0$, $2x+3y+4z-8=0$ as a great circle.
8. Find the equation of right circular cone whose vertex at origin and axis is the line $\frac{x}{1}=\frac{y}{2}=\frac{z}{3}$ with vertical angle 30°

   OR

   Find the equation of the right circular cylinder of radius 2 whose axis is the line $\frac{x-1}{2}=\frac{y-2}{1}=\frac{z-3}{2}$
9. Solve by power series method the differential equation $y''+xy'+y=0$
10. Express the following in terms of legendre's Polynomials $f(x)=5x^3+x$

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11. Prove the Bessel's function $J_{-\frac{5}{2}}(x)=\sqrt{\frac{2}{\pi x}}\left[\frac{3}{x}\sin x+\frac{3-x^2}{x^2}\cos x\right]$

12. Find the set of reciprocal system to the set of vectors $2\vec{i}+3\vec{j}-\vec{k}, -\vec{i}+2\vec{j}-3\vec{k}$ and $3\vec{i}-4\vec{j}+2\vec{k}$

13. Prove that the necessary and sufficient condition for the vector function of scalar variable 't' have constant magnitude is $\vec{a}.\frac{d\vec{a}}{dt}=0$

14. Find the directional derivative of $\phi(x, y, z) = xy^2+yz^3$ at the point (2, -1, 1) in the direction of vector $\vec{i}+2\vec{j}+2\vec{k}$

OR

If $\vec{a}$ is a constant vector and $\vec{r}$ be the position vector then prove that $\left(\vec{a}\times\nabla\right)\times\vec{r}=-2\vec{a}$

15. Test convergent or divergent of the series $1+\frac{x}{2}=\frac{2!}{3^2}x^2+\frac{3!}{4^3}x^3+.....\infty$

16. Find the interval and radius of convergence of the power series $\sum_{n=1}^{\infty}\frac{2^n(x-3)^n}{n+3}$

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2080 Baishakh

Exam.	Back		
Level	BE	**Full Marks**	40
Programme	BCE	**Pass Marks**	16
Year / Part	II / I	**Time**	1 ½ hrs.

Subject: - Civil Engineering Materials *(CE 506)*

- ✓ 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 factors that affect selection of construction materials? Explain. Define first resistance and permeability. [2+2]
2. What is dressing of stone? Explain roles of building stone in engineering. [2+2]
3. What are bricks extensively used as building material in the construction industry? Explain briefly. Differentiate between earthenware and stoneware. [2+2]
4. Differentiate between fat lime and hydraulic lime. [3]
5. List out the ingredients of Portland cement with their function. [4]
6. Describe the function of mortar. Define surkhi mortar and gauged mortar. [2+1]
7. Write down the different commercial products of timber. Explain various methods of seasoning. [2+3]
8. Explain commercial forms of steel. How quenching differs from annealing? [2+2]
9. Explain the ingredients of paints. What is the function of varnishes? [3+1]
10. Explain in brief about the types of bitumen. Write the requirements of sound insulating materials with examples. [3+2]

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2079 Bhadra

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

Subject: - Civil Engineering Materials *(CE 506)*

- ✓ 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. Enlist the criteria for selection of suitable engineering materials at a site. Define Hygroscopicity and Fatigue. [1+2]
2. Why is dressing carried out on the quarry site? Write down the factors that damage the stones of structures. [2+2]
3. What are the qualities of good floor tiles? Describe properties of over burnt brick. [2+2]
4. What is pozzolanic material? Explain the manufacture process of lime. [1+2]
5. Explain the manufacturing process of 53 grade OPC cement. What is the 7 and 28 days crushing strength of this cement? [4+2]
6. State stepwise procedure of preparing cement mortar for construction works. Mention the uses of mortar. [2+2]
7. Explain in brief about the defects in timber due to natural forces. Differentiate between natural and artificial seasoning. [2+2]
8. Define quenching and tempering. What is the role of Cobalt, Manganese, Chromium and Nickel in the respective alloy of steel? [2+2]
9. Define ingredients of varnish. How is knot treated for painting in wood works? [2+2]
10. What is insulating materials? Differentiate bitumen and asphalt. [2+2]

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2079 Baishakh

Exam.	Back		
Level	BE	Full Marks	40
Programme	BCE	Pass Marks	16
Year / Part	II / I	Time	1½ hrs.

Subject: - Civil Engineering Materials (*CE 506*)

- ✓ 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 properties of material with suitable examples. Toughness, Ductility, Hardness. [3]
2. What are the considerations to be made while selecting the building stones? What do you mean by natural bed of stone? [3+1]
3. Describe classification of bricks with uses. Define Earthen ware. [3+1]
4. Define calcination & slaking of lime. What the uses of pozzolanic materials. [1+1]
5. Describe Bogue's Compound. What is meant by initial setting time and final setting time of cement? [3+2]
6. What are the functions and qualities of a good mortar? [3]
7. Describe any two defects of timber during growth of tree. List out different types of seasoning of timber. [2+2]
8. Define ferrous and non-ferrous metals with examples. Illustrate different types of commercial products of steel with sketches. [2+4]
9. What are emulsion paint and enamel paint? Write the functions of varnish. [2+2]
10. What are the differences between asphalt, bitumen and tar? Define insulating materials and composite materials. [3+2]

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2078 Kartik

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

Subject: - Civil Engineering Materials *(CE 506)*

- ✓ 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 factors to be considered for selecting appropriate material for construction works? Define the terms: Creep and Permeability. [2+1]
2. Write down the characteristics of good building stones. What do you mean by dressing of stone? [2+2]
3. Explain briefly the operations involved in preparation of clay for manufacturing process of brick? What is function of glazing in clay product? [3+1]
4. Define pozzolanic materials and illustrate different types of lime with their uses. [1+2]
5. Write down the main constituents of cement. Draw the flow chart of manufacturing of cement by dry process. [1+4]
6. State stepwise procedure of preparing cement mortar for construction works. Mention the types of mortar. [2+1]
7. What do you mean by seasoning of timber and why need to do seasoning? List out the commercial product of timber available in market. [2+2]
8. Differentiate between cast iron and wrought iron. What are the purposes of heat treatment process of metal? [3+2]
9. What is the significance of paint in construction works? Mention the process of applying distemper. [1+3]
10. Write down different types of glass and their uses in construction field. Define Bitumen, tar and Asphat. [3+2]

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2078 Bhadra

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

Subject: - Civil Engineering Materials *(CE 506)*

- ✓ 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 briefly the properties: Porosity, Creep and Brittleness. State the scope of construction materials in transportation. [3+1]
2. Differentiate between sedimentary and igneous stones. How stone can be preserved? [2+2]
3. Write briefly the brick manufacturing process. How do you classify the brick? Explain. [3+1]
4. What is pozzolanic materials? Why they can be added to a lime? Explain different types of hydraulic lime. [1+1+2]
5. Briefly illustrate the procedure to determine the compressive strength of cement in laboratory. Why hydration of cement takes place? [3+1]
6. State any two merits and demerits of lime mortar. What is a gauged mortar? Describe functions of good mortar. [1+1+2]
7. What are the merits of timber over steel in civil engineering construction works? Explain any four defects in timber caused due to seasoning to it. [2+2]
8. Differentiate between mechanical and heat treatment of steel. How will you define annealing and red shortness of steel? [3+2]
9. What do you understand by distemper? Explain any four defects in paints. [1+2]
10. Why are plastic materials used extensively as construction materials? What is epoxy and adhesive? [2+2]

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2076 Chaitra

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

Subject: - Civil Engineering Materials *(CE 506)*

- ✓ 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 factors affecting the selection of civil engineering materials. [3]
2. Write down the requirements of stone to be used for the structural purpose. What are the causes of deterioration of stones? [2+2]
3. What are the essential constituents of good brick earth? Write with their percentage composition. Define glazing of ceramic materials with its objectives. [1+1+2]
4. Explain different types of lime with its properties and suitable uses. [3]
5. Draw a flow chart for wet process of cement manufacture. Explain different constituents of cement clinker with their function. [2+3]
6. State stepwise procedure of preparing cement mortar for construction works. Also, mention the functions of mortar used in building construction. [2+1]
7. Why seasoning of timber is important prior to use? Explain different methods of preserving the timber. [2+2]
8. Explain various ferrous and non-ferrous products used in construction and explain their merits and demerits. What are the purposes of heat treatment process of steel? [3+2]
9. Compare paints and varnishes. Write the steps of preparing the older surface for painting. [2+2]
10. Define asphalt. Write down the properties and uses of asphalt. Why tar is preffered in parking lot construction. [2+2+1]

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2076 Ashwin

Exam.	Back		
Level	BE	Full Marks	40
Programme	BCE	Pass Marks	16
Year / Part	II / I	Time	1½ hrs.

Subject: - Civil Engineering Material *(CE 506)*

- ✓ 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 importance of study of Civil Engineering Materials for engineers. Define the terms: creep, hygroscopicity, specific heat capacity and tenacity. [1+2]
2. Describe briefly the characteristics of good building stones. How the stones are deteriorate and pressured? [2+2]
3. What is efflorescence in brick? Explain briefly the manufacturing process of bricks. [1+3]
4. Define pozzolanic materials. Differentiate between fat lime and hydraulic lime. [1+2]
5. Explain functions of compounds present in cement clinker. Explain any three types of cement. [3+2]
6. Define mortar and explain its engineering characteristics. Differentiate between cement and lime mortar. [2+1]
7. What are the uses of Timber? Why it is essential seasoning before using and also highlights the new modified timber. Which are extensively used in our building? [1+3]
8. What are the types of metal that are used in modern Civil Engineering works? Why they are popular in using in the form of Alloys? [5]
9. What are the ingredients of paints, explain? Describe types of paints with their uses. [2+2]
10. Why are plastic materials used extensively as building material nowadays? Differentiate between asphalt and tar with respect of their properties and uses. [3+2]

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2075 Chaitra

Exam.	Regular / Back		
Level	BE	Full Marks	40
Programme	BCE	Pass Marks	16
Year / Part	II / I	Time	1½ hrs.

Subject: - Civil Engineering Material *(CE 506)*

- ✓ 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 scope of Civil Engineering Material for controlling a project quality? Explain any two mechanical properties. [2+1]
2. Why is dressing carried out on stones? Segregate stones into different categories based on Geological classification: [4]
   a) Prophyry b) Surpentine c) Pegmatite d) Laterite
3. How do you determine the quality of good brick Earth? Explain different classes of brick with their properties. [1+3]
4. Define the terms Slaking and Calcination of lime. Explain the properties and uses of different types of hydraulic lime. [1+2]
5. Define the terms cement clinker and cement water proofer. Explain constituents of OPC with their correct proportions and benefits in a sound cement. [1+4]
6. What are the types of mortar? How the mortar is selected for particular work? Describe its properties and uses. [1+2]
7. State merits and demerits of timber used as civil engineering material. Also, mention the objectives of seasoning of timber. What is the reason behind creosoting a timber? [2+1+1]
8. Why heat treatment of steel is done? Explain different alloys of steel. [1+4]
9. Discuss about varnish with its types. Explain any six defects of paints in brief. [2+2]
10. Answer **any two** of following: [5]
    a) What are specific field of using Aspalt, Bitumin and Tar.
    b) Why the ACP is so popular in mordern building material?
    c) Give the various types and reasons of using glass in building.
    d) What are the uses of plastic material?

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04 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2075 Ashwin

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

Subject: - Civil Engineering Materials *(CE506)*

- ✓ 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. As a civil engineer, what are the major factors which you consider most for the selection of material in civil engineering project in Nepal? Write short notes on significant mechanical properties of civil engineering materials. [2+2]
2. Write down the purposes of dressing of stones. What are the methods to preserve the stone from deterioration? [2+2]
3. Why bricks are commonly used material in construction work? Elaborate briefly the properties of harmful ingredient in bricks. [2+2]
4. Classify the lime on the basis of purity and functions with their suitability in engineering field. [4]
5. Sketch out the graph related to the contribution of clinker compound to strength with respect to time of cement compound. Define Admixtures and cement water proofers. [3+2]
6. State stepwise procedure of preparing cement mortar for construction works. Also, mention the functions of mortar used in building construction. [2+2]
7. Define timber and its seasoning. Elaborate macrostructure and microstructure study of exogenous timber. [1+3]
8. What is the prime importance of carbon present in steel? Distinguish between Plain carbon steel and Alloy steel. [1+3]
9. What are the functions of paint? Explain in detail anti-termite treatment procedure to be applied in foundation? [1+2]
10. Why are plastic materials used extensively as building material nowadays? Write down gypsum products available in market and their applications. [2+2]

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04 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2074 Chaitra

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

Subject: - Civil Engineering Materials *(CE506)*

- ✓ 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 is civil engineering materials classified? Define the terms: fatigue and resilience. [2+4]
2. What are the selection critaria of good building stone? Explain about importance of natural bed of stone. [2+2]
3. Why the drying of brick is extremely important steps in manufacturing brick? Describe about standard test of brick. [1+3]
4. Define pozzolanic agents used as admixtures and explain manufacturing process of lime. [1+2]
5. Explain about manufacture flow diagram of cement. Briefly illustrate the procedure to determine the compressive strength of cement in laboratory. [1+3]
6. Write down the properties of mortar? Write down the steps of applying cement mortar? [1+2]
7. What are the commercial forms of timber which are being widely used in the market? Draw a clear sketch of cross section of timber log and show the each components of growth. [1+3]
8. What are the commercial Product of Metal? What are the purposes of heat treatment process of metal? [2+2]
9. What do you understand about distemper? State the basic ingredients of paints. [2+2]
10. Distinguish the tar with bitumen? Define borosilicate glass and thermoplastic. [2+2]

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04 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2074 Ashwin

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

Subject: - Civil Engineering Materials *(CE506)*

- ✓ 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 briefly the following properties of civil engineering materials: Creep, Malleability and Hardness. [3]
2. Explain the characteristics of good building stone. Explain the factors which deteriorate the stone. [2+2]
3. What is efflorescence in brick? Explain the manufacturing process of bricks. What is glazing? [1+2+1]
4. Explain the properties and uses of lime. [2]
5. Describe the manufacturing process of cement with the help of suitable flow diagrams. What is cement water proofer? Explain. [1+4]
6. List the function of mortar. Also describe the characteristics of good cement mortar to be used in different civil engineering works. [1+2]
7. Describe with the help of sketches, growth and structure of tree. Also describe the suitability of timber in the design of civil engineering structures. List the engineering properties of timber. [3+2+1]
8. Describe the importance of steel as a civil engineering material according to their composition and properties. Write down the properties and uses of non-ferrous metals. [3+2]
9. Write down, in brief, the procedure of using emulsion on the wall surface. [3]
10. What are the specific uses of asphalt, bitumen and tar? Explain briefly about insulating materials used in construction. [3+2]

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94 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2073 Chaitra

Exam.		**Regular**	
Level	BE	**Full Marks**	40
Programme	BCE	**Pass Marks**	16
Year / Part	II / I	**Time**	1 ½ hrs.

Subject: - Civil Engineering Materials *(CE506)*

- ✓ 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 criteria for the selection of the materials in the Civil Construction projects? Define the terms resilience and creep. [2+1]
2. What are the objectives of surface dressing of stone? How does the deterioration of stone take place? [2+2]
3. What are the different types of field test of brick? Explain the role of clay and alumina in brick production. [2+2]
4. List the properties and uses of Pozzolanic material. [2]
5. Define the terms cement clinker and admixtures. What are the major ingredients of cement, explain with functions. [1+4]
6. How mortar can be formed? How do you select mortar according to civil engineering construction? [1+2]
7. Why seasoning of timber is important prior to use? Explain different methods of preserving the timber. What are the characteristics of good timber? [1+3+2]
8. What are upper critical and lower critical points of metal in heat treatment process? On the basis of these points, explain normalizing process of heat treatment with neat sketches. [2+2]
9. Why paints are used in the civil structures? Explain types of paints with their uses. [2+2]
10. Define the terms asphaltic materials and gypsum products. Explain types of plastics and their uses. [2+3]

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07 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2073 Shrawan

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

Subject: - Civil Engineering Materials *(CE506)*

- ✓ 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 briefly the factors which influence the selection of civil engineering material? What are the significant properties to be considered while using engineering materials? [2+1]
2. Define cataclastic metamorphism and plutonic metamorphism of rock formation. Explain about importance of natural bed stone. [2+1]
3. What are the qualities of good bricks? Why we should be careful about the harmful ingredients in brick earth? [2+2]
4. Differentiate quick lime with hydraulic lime. What do you mean by calcination and slaking of lime? [2+2]
5. Describe the manufacturing process of 53 Grade OPC with the help of flow diagram. [5]
6. Write down the functions of mortar in civil engineering units? What are the precautions to be observed while applying cement mortar? [1+2]
7. Why seasoning of timber is important prior to use? Explain the macrostructure elements of exogenous tree with neat sketch. [1+4]
8. What is the difference between Ferrous and Non Ferrous materials? Why the modern engineering world is very much willing to use the composite materials? [2+3]
9. Write down, in brief, the procedure of using emulsion on the wall surface. [4]
10. Distinguish Asphalt with Tar. Nowadays use of composite materials are predominant compare to conventional natural building material in engineering. Why? Give reasons. [2+2]

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04 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2072 Chaitra

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

Subject: - Civil Engineering Materials *(CE506)*

- ✓ 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 a subject Civil Engineering Materials is supposed to be essential part of the science and technology? Define materials properties; hydroscopecity, soundness, hardness and creep. [1+2]
2. What is the deterioration of stone and how it is preserved? [4]
3. What are the different types of field test of brick? Explain the role of clay and alumina in brick production. [2+2]
4. Why the uses of lime could not be neglected in this modern age? Highlight the properties and uses of lime. [1+2]
5. Define clinker. What are the chemical compounds present in the clinker? Explain the functions of any two compounds present in clinker. [1+2+2]
6. How mortar can be formed? How do you select mortar according to civil engineering construction? [1+2]
7. Why and how the timber is being widely used in all engineering works? Describe briefly the method of seasoning the timber. [4]
8. What do you mean by quenching of steel? Distinguish between Cast iron and Mild steel. [2+2]
9. What do you mean by paint and Varnishes? What is the purpose of using it? [4]

OR

Give the reasons of using anti-termite treatment.

10. Define asphalt, bitumen and tar with their best applications in civil engineering field. [2+2+2]

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04 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2072 Kartik

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

Subject: - Civil Engineering Materials *(CE506)*

- ✓ 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 civil engineering materials. How do you select the appropriate material? [1+2]
2. Define dressing of stone. Mention the different methods of stones preservation. Explain one of them. [1+1+2]
3. What are earthen ware and glazing? Write down the types of tiles to be used in Civil Engineering. [2+2]
4. What is lime as a construction material? Write down their properties. [1+2]
5. What are cement water proofers? Draw the flowchart showing the manufacturing process of cement? [2+3]
6. What are the different types of mortar? Write down their functions. [1+2]
7. Why is seasoning of timber done? Explain the seasoning process of timber. [1+3]
8. Why are Aluminum Alloys so important in modern engineering practice? Write down the difference between iron and steel. [3+2]
9. Define distempers. How will you apply paint on wood? Describe briefly. [1+3]
10. What is glass as a construction material? Write down their uses in Civil Engineering. [1+4]

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01/03

04 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2071 Chaitra

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

Subject: - Civil Engineering Materials *(CE506)*

- ✓ 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 properties of civil engineering materials? Highlight the importance of the subject. [1+2]
2. What is natural bed of stone? What are the different technical parameters for selecting good building stones? [1+3]
3. Explain briefly the harmful ingredients in good brick earth, stating their effects on the properties of the brick. Write down characteristics of good brick. [2+2]
4. What do you mean by calcination and hydration of lime? Explain Hydraulic lime and fat lime with its properties. [1+2]
5. Define initial and final setting time of cement. What are the ingredients of cement, explain its functions in cement. [1+4]
6. What is mortar? How is an appropriate type of mortar selected? [1+2]
7. What are the characteristics of good timber? Write down the defects of timbers. [2+2]
8. Define heat treatment. Explain its objective. How will you define annealing, Explain it. [1+2+2]
9. Distinguish between the paint and varnishes. Write down the uses of antitermite treatment. [2+2]
10. Define bitumen and tar. Explain different types of glasses and its uses. [2+3]

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4/17 Morning.

071 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2071 Shawan

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

Subject: - Civil Engineering Materials *(CE506)*

- ✓ 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 do you classify the civil engineering materials? Give the list only. [3]
2. What is building stone? Describe the characteristics of good building stones. [1+3]
3. Explain the procedure to determine the compressive strength of brick. [4]
4. Distinguish between Fat lime and Hydraulic lime. [3]
5. What are the different compounds present in cement clinker and explain its role in cement with the relative graph. What is meant by grade C - 43 cement? [4+1]
6. Describe the properties of good mortar. [3]
7. Draw net cross sections of an exogenous tree and show its various components. [4]
8. What do you mean by heat treatment process? List out the objectives of heat treatment.. [5]
9. What are the main function of a point and varnish? [4]
10. What do you understand by bituminous material? Write down the properties and uses of asphalt? [1+4]

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071/01/15

07 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2070 Chaitra

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

Subject: - Civil Engineering Materials *(CE506)*

- ✓ 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 factors affecting the selection of construction material? [3]
2. What are the qualities of a good building stone? [4]
3. Write down the field tests to find the suitability of bricks for construction? [4]
4. What are the properties and uses of lime? [3]
5. Show the manufacturing process of cement with the help of flow diagram. [5]
6. What is mortar? How can the appropriate type of mortar be selected? [3]
7. What are the advantages of seasoning of timber? State the various defects in timber. [2+2]
8. Write down the differences between Ferrous and Non Ferrous metal . [5]
9. Describe different types of paints and varnishes. [4]
10. What are the specific uses of Asphalt, Bitumin and Tar? [5]

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3/23

01 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2070 Ashad

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

Subject: - Civil Engineering Material *(CE506)*

- ✓ 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 ductile materials different from brittle ones? [3]
2. What stones are said to be good in civil engineering construction? Write down the process of stone deterioration? [2+2]
3. What are the field tests on brick quality? Mention the steps for efflorescence test of brick. [2+2]
4. Write down properties and uses of lime. [1+2]
5. What is meant by 43-grade cement? Write down the engineering application of admixtures? [2+3]
6. What are the properties and uses of good mortars? [3]
7. Draw cross sections of hard and soft wood with detail elements. [4]
8. What are Aluminum and its Alloys? Write down the differences between ferrous and non ferrous materials. [6]
9. Write short notes on: [2×4]
   a) Distemper
   b) Tar
   c) Types of paint
   d) Gypsum product

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