Code No: R231201 | R23 | SET - 1

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY GURAJADA VIZIANAGARAM**
**I B. Tech II Semester Supplementary Examinations January-2025**
**Differential Equations and Vector Calculus**
(Common to all branches)

Time: 3 hours | Max. Marks: 70

***Question paper consists of Part A & Part B.***
***Part A is compulsory, Answer all questions.***
***In Part B, Answer any one question from each unit.***
*****

**PART-A** **(20 Marks)**

1 a) Find the order and degree of the D.E $\frac{dy}{dx} + xy = 0$ [2]
b) Write the RL circuit and define the terms in the circuit [2]
c) Solve the D.E $(D^2 + 4D + 4)y = 0$ [2]
d) Find the P.I of $(D^2 - 4D + 4)y = e^{2x}$ [2]
e) Verify whether $\left(\frac{\partial^2 z}{\partial x^2}\right)^3 - \frac{\partial^2 z}{\partial y^2} = e^x \, siny$ is linear PDE [2]
f) Solve the PDE $(D^2 - a^2 D^{1^2})z = 0$ [2]
g) Find grad $\varphi$ *where* $\varphi = x^3 + y^3 + 3xyz$ [2]
h) Find the maximum value of the directional derivative of $\varphi = 2x^2 - y - z^4$ at $(2,-1,1)$ [2]
i) Define surface integral [2]
j) State stoke's theorem [2]

**PART-B** **(50 Marks)**

**Unit-1**

2 a) Solve the D.E $(x^2y^2 + xy + 1)ydx + (x^2y^2 - xy + 1)xdy = 0$ [5]
b) If the air is maintained at 30°C and the water at the temperature 100°C cools down to 80°C in 10 min. Then find when the temperature of water will become 40°C [5]

(OR)

3 a) Solve the D.E $\frac{dy}{dx} + x.sin\,2y = x^3 cos^2 y$ [5]
b) Solve the D.E $(3x^2 - y^3)dx - (2x^2y - xy^2)dy = 0$ [5]

**Unit-2**

4 Solve the D.E $(D^2 + 4)y = xsin2x$ [10]

(OR)

5 a) Solve the D.E $(D^2 + 2D + 1)y = x^2 + 2x + 1$ [5]
b) Solve the D.E $(D^2 + 5D + 6)y = sin2x$ [5]

**Unit-3**

6 a) Form the PDE $z = \left(\sqrt{x+a}\right)\left(\sqrt{y+b}\right)$ by eliminating the constants a &b [5]
b) Solve the PDE $xp - yq = y^2 - x^2$ [5]

(OR)

7 a) Form the PDE by eliminating arbitrary function from $z = f(2x + 3y) + g(3x - y)$ [5]

b) Solve the PDE $(y - zx)p + (x + yz)q = x^2 + y^2$ [5]

**Unit-4**

8 a) Find the directional derivative of $\phi = xyz$ in the directional of $\bar{i} + \bar{j} + \bar{k}$ at $(1,2,3)$ [5]

b) Verify whether $(y + z)\bar{i} + (x + z)\bar{j} + (y + x)\bar{k}$ is solenoidal [5]

(OR)

9 a) show that the vector [5]

$\bar{f} = (\log y + z)\bar{i} + \left(\frac{x}{y} - z\right)\bar{j} + (x - y)\overline{k}$ is irrotational

b) Prove that $curl\,grad\phi = 0$ [5]

**Unit-5**

10 a) If $\bar{F} = (x - y)\,\bar{i} + (x + y)\,\bar{j}$Evaluate $\int_C \bar{F}.d\bar{r}$ around the curve [5]

$y = x^2$ and $y^2 = x$

b) Evaluate $\int_c (x^2 + y^2)\,dx + 3xy^2\,dy$ where $c$ is the circle $x^2 + y^2 = 4$ in $xy$ plane using Green's theorem [5]

(OR)

11 Verify Gauss Divergence theorem for $\bar{F} = (x^2 - yz)\bar{i} + (y^2 - zx)\bar{j} + (z^2 - xy)\bar{k}$ taken over the rectangular parallelepiped [10]

$0 \le x \le a\,;\ 0 \le y \le b\,;\ 0 \le z \le c.$

*****

Code No: R231202

R23

SET - 1

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY GURAJADA VIZIANAGARAM**
**I B. Tech II Semester Supplementary Examinations January-2025**
**Communicative English**
**(Common to CE, EEE, AME, MECH, ECE)**

Time: 3 hours

Max. Marks: 70

***Question paper consists of Part A & Part B.***
***Part A is compulsory, Answer all questions.***
***In Part B, Answer any one question from each unit.***

*****

PART-A (20 Marks)

| | | | |
|---|---|---|---|
| 1 | a) | Why do you think the story title is appropriate for "The Power of the Plate of Rice"? | [2] |
| | b) | Write a note on the appearance and character of Mr. Aziza. | [2] |
| | c) | What is the central theme of "Night of the Scorpion"? | [2] |
| | d) | How does the poet portray the mother's reaction to the scorpion sting? | [2] |
| | e) | Where did Jobs' interest in design arise from? How did it shape his career? | [2] |
| | f) | Write about a few of Jobs' inventions after he was fired from Apple. | [2] |
| | g) | Why did Harvey think elementary education needed to be rethought? | [2] |
| | h) | Name some of the peace toys bought by Harvey. | [2] |
| | i) | Define self-conceptualization. | [2] |
| | j) | Explain the role of intrapersonal communication in understanding and processing emotions. | [2] |

(50 Marks)

PART-B

Unit-1

| | | | |
|---|---|---|---|
| 2 | a) | "The Power of the Plate of Rice" explores issues related to class divisions. How does the story critique social expectations and how the wealthy or privileged treat the poor? | [5] |
| | b) | Compare Skimming and Scanning with relevant examples. | [5] |

**(OR)**

| | | | |
|---|---|---|---|
| 3 | a) | In "The Power of the Plate of Rice," a small act of generosity catalyzes change. How does sharing the plate of rice affect the relationship between the main characters? | [5] |
| | b) | Write a minimum of two words for each following Prefix. | [5] |

i. mis
ii. pre
iii. in
iv. non
v. under

Unit-2

4 a) Discuss how the poem "Night of the Scorpion" portrays conflict and analyze how it reflects the cultural setting of the poet's community. [5]

b) Construct a paragraph on 'Life before and after Smartphones'. [5]

**(OR)**

5 a) Discuss the tone of "Night of the Scorpion" and how it shifts throughout the poem. [5]

b) Select an appropriate Preposition given in the brackets. [5]

1. The cat jumped ____ (onto/into) the table when it heard a loud noise.
2. She sat____ (besides/beside) her friend during the movie.
3. The book is_____(along/in) the chair, next to the window.
4. They walked _____(from/through) the park to get to the museum.
5. The keys are _____(in/with) the kitchen counter, next to the coffee maker.

Unit-3

6 a) Describe how Steve Jobs' contributions changed the landscape of the tech industry. [5]

b) Summarize the following Passage. [5]

The sun was setting over the village, casting a warm orange glow across the fields. People began to return to their homes after a long day of work, with the sound of distant voices and the occasional clink of tools being put away. The children, tired but happy, played near the riverbank, their laughter echoing through the air. In the quiet of the evening, the village seemed peaceful and content, with families gathering together for dinner. The simple beauty of everyday life in the village was a reminder of the slower pace of life, where time seemed to stand still.

**(OR)**

7 a) Steve Jobs is often celebrated for his innovative ideas and approach to technology. Discuss how his creativity and vision for product development contributed to Apple Inc.'s success. [5]

b) Fill in the blanks with the correct Verb forms. [5]

i. She_____ (write) a letter to her friend when I called her.
ii. By the time I arrived, they ____(finish) their dinner.
iii. Yesterday, we_____ (go) to the market and bought fresh vegetables.
iv. He _____(be) studying for the exam when I saw him last night.
v. They_____ (play) soccer in the park every weekend.

Code No: R231203 | R23 | SET - 1

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY GURAJADA VIZIANAGARAM**
**I B. Tech II Semester Supplementary Examinations January-2025**
**ENGINEERING PHYSICS**
(Common to CE, EEE, AME, MECH, ECE)

Time: 3 hours | Max. Marks: 70

***Question paper consists of Part A & Part B.***
***Part A is compulsory, Answer all questions.***
***In Part B, Answer any one question from each unit.***
*****

PART-A (20 Marks)

| | | | |
|---|---|---|---|
| 1 | a) | State and explain superposition theorem. | [2] |
| | b) | State Brewster's law and explain the concept of polarization by reflection. | [2] |
| | c) | What is a space lattice? | [2] |
| | d) | Explain briefly working mechanism of an X-ray diffractometer. | [2] |
| | e) | Differentiate between **E** and **D**. | [2] |
| | f) | Give any four properties of diamagnetic materials. | [2] |
| | g) | State the Heisenberg's uncertainty principle. | [2] |
| | h) | Write the significance of Fermi Dirac distribution function. | [2] |
| | i) | How are electron-hole pairs formed? Explain. | [2] |
| | j) | What are semiconductors? Explain their energy band diagram. | [2] |

PART-B (50 Marks)

Unit-1

| | | | |
|---|---|---|---|
| 2 | a) | Discuss the practical applications of thin-film interference in producing colours. | [5] |
| | b) | Explain how Newton's Rings are used to determine the refractive index of a given material. | [5] |

(OR)

| | | | |
|---|---|---|---|
| 3 | a) | What is double refraction? Explain the concept with a neat ray diagram. | [5] |
| | b) | How does the slit width affect the diffraction pattern? Determine the width of the central spot in the case of Fraunhofer diffraction at a single slit. | [5] |

Unit-2

| | | | |
|---|---|---|---|
| 4 | a) | Explain the concept of lattice parameters and their role in defining a crystal structure. | [5] |
| | b) | What are Miller Indices? Give stepwise procedure for its determination. | [5] |

(OR)

| | | | |
|---|---|---|---|
| 5 | a) | State and derive Bragg's law for X-ray diffraction. Explain its significance in determining crystal structures. | [5] |
| | b) | Describe Laue's method for determination of crystal structure. | [5] |

Unit-3

| | | | |
|---|---|---|---|
| 6 | a) | Explain how polar and non-polar dielectrics are polarized. | [5] |
| | b) | What is ionic polarization? Derive expression for ionic polarizability. | [5] |

(OR)

| | | | |
|---|---|---|---|
| 7 | a) | Explain the origin of magnetic moments in magnetic materials. | [5] |
| | b) | What is meant by magnetic domain? Explain the origin of domains in ferromagnetic materials. | [5] |

Unit-4

8 a) What is de Broglie hypothesis? Discuss the concept of the dual nature of matter. [5]

b) Analyze the quantum behavior of a particle in a one-dimensional infinite potential well. [5]

(OR)

9 a) In a solid, consider the energy level lying 0.01 eV below Fermi level. What was the probability of this level not being occupied by an electron. [5]

b) What are the postulates of quantum free electron theory? Explain how this theory addressed the drawbacks of classical free electron theory. [5]

Unit-5

10 a) Derive an expression for carrier concentration of electron in an intrinsic semiconductor. [5]

b) Obtain an expression for carrier concentration in an N-type semiconductor. [5]

(OR)

11 a) Derive Einstein's equation relating to the diffusion coefficient and mobility of charge carriers. [5]

b) Distinction between the valence band, conduction band, and bandgap with appropriate diagrams. [5]

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Code No: **R231204** | **R23** | SET - 1

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY GURAJADA VIZIANAGARAM**
**I B. Tech II Semester Supplementary Examinations January-2025**
**CHEMISTRY**
(Common to CSE, IT, CSE(DS), CSE(AI), CSE(CS), CSE(AI&ML), AI&DS, AI&ML)

Time: 3 hours | Max. Marks: 70

***Question paper consists of Part A & Part B.***
***Part A is compulsory, Answer all questions.***
***In Part B, Answer any one question from each unit.***
*****

PART-A (20 Marks)

| | | | |
|---|---|---|---|
| 1 | a) | What are the bonding and antibonding molecular orbitals? | [2] |
| | b) | Define the bond order. What is the bond order of benzene? | [2] |
| | c) | Write a short note on the super capacitor. | [2] |
| | d) | List two applications of carbon nanotubes. | [2] |
| | e) | What is the primary battery? Give an example. | [2] |
| | f) | What is a fuel cell? Give any two examples. | [2] |
| | g) | How do biodegradable polymers degrade? | [2] |
| | h) | Write two applications of Bakelite. | [2] |
| | i) | What is the electromagnetic spectrum? | [2] |
| | j) | Write two deviations of lamberts-beers law. | [2] |

PART-B (50 Marks)

Unit-1

| | | | |
|---|---|---|---|
| 2 | a) | Illustrate the molecular orbital diagram of a $O_2$ molecule and calculate its bond order and explain its magnetic property. | [5] |
| | b) | Derive Schrodinger wave equation? | [5] |

(OR)

| | | | |
|---|---|---|---|
| 3 | a) | Write a note on Fundamentals of Quantum mechanics. | [5] |
| | b) | Draw energy level diagrams of CO. And calculate its bond order. | [5] |

Unit-2

| | | | |
|---|---|---|---|
| 4 | a) | Write the properties of nano materials. | [5] |
| | b) | Explain the basic principle and classifications of Super Conductors. | [5] |

(OR)

| | | | |
|---|---|---|---|
| 5 | a) | Write a note on applications of Graphines nanoparticles. | [5] |
| | b) | Explain in detail about the basic concept and classification of semiconducting materials. | [5] |

Unit-3

| | | | |
|---|---|---|---|
| 6 | a) | Discuss about potentiometric sensors with examples. | [5] |
| | b) | What is primary Battery? Write about construction, cell reactions and applications of Zinc-Air battery. | [5] |

(OR)

| | | | |
|---|---|---|---|
| 7 | a) | What is EMF? Calculate the emf of iron-copper voltaic cell [Fe/Fe+2//Cu+2/Cu] with standard potential of copper and iron as + 0.34 V and – 0.44 V respectively. | [5] |
| | b) | Discuss the construction and working of the conductivity cell. | [5] |

Unit-4

| | | | |
|---|---|---|---|
| 8 | a) | Discuss preparation, properties and applications of Teflon. | [5] |
| | b) | Distinguish between Thermoplastics and Thermosetting plastics. | [5] |

(OR)

| | | | |
|---|---|---|---|
| 9 | a) | Describe the preparation, properties and uses of Nylon-6, 6. | [5] |
| | b) | Write about synthesis, properties and applications of Poly Lactic Acid. | [5] |

Unit-5

| | | | |
|---|---|---|---|
| 10 | a) | What is meant by Chromatography? Write about principle and instrumentation of HPLC chromatography with a neat diagram. | [5] |
| | b) | Give an account on principle and instrumentation of IR spectroscopy. | [5] |

(OR)

| | | | |
|---|---|---|---|
| 11 | a) | Discuss the basic components of UV -Visible spectroscopy. | [5] |
| | b) | Explain the different regions of the electromagnetic spectrum. | [5] |

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Code No: R231205

R23

SET - 1

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY GURAJADA VIZIANAGARAM**
**I B. Tech II Semester Supplementary Examinations January-2025**
**DATA STRUCTURES**

(Common to CSE, IT, CSE(DS), CSE(AI), CSE(CS), CSE(AI&ML), AI&DS, AI&ML)

Time: 3 hours

Max. Marks: 70

***Question paper consists of Part A & Part B.***
***Part A is compulsory, Answer all questions.***
***In Part B, Answer any one question from each unit.***

*****

**PART-A** **(20 Marks)**

| | | | | |
|---|---|---|---|---|
| 1 | a) | Write the algorithm for bubble sort? | [2] |
| | b) | Define linear data structures and list types of linear data structures. | [2] |
| | c) | Explain malloc() function. | [2] |
| | d) | List any two applications of linked list. | [2] |
| | e) | What are the primary operations of a stack? | [2] |
| | f) | Difference between stack overflow and stack under flow. | [2] |
| | g) | What is the primary advantage of using a circular queue over a linear queue? | [2] |
| | h) | What is the key difference between queue and double ended queue? | [2] |
| | i) | List tree traversal techniques? | [2] |
| | j) | Describe collision in hash table construction? | [2] |

**PART-B** **(50 Marks)**

**Unit-1**

| | | | |
|---|---|---|---|
| 2 | a) | Explain the algorithm for selection sort. Highlight its time complexity for best, worst, and average cases. | [5] |
| | b) | Demonstrate binary search algorithm. | [5] |

(OR)

| | | | |
|---|---|---|---|
| 3 | a) | What is Abstract Data Types (ADTs)? Explain their implementation with an example. | [5] |
| | b) | Describe time complexity with example algorithm. | [5] |

## Unit-2

4 a) Create a single linked list and display the content of created linked list. [5]

b) Distinguish between arrays and linked list. [5]

(OR)

5 a) Create a double linked list and display the content of double linked list. [5]

b) Write an algorithm to reverse the single linked list. [5]

## Unit-3

6 a) Demonstrate basic operations of the stack. [5]

b) Construct an algorithm to convert infix expression to postfix expression. [5]

(OR)

7 a) Explain the differences between implementing a stack using an array and a linked list. Highlight the advantages and disadvantages of each approach. [5]

b) Explain how backtracking can use the stacks. [5]

## Unit-4

8 a) Construct a C program to implement a queue using arrays, including enqueue, dequeue, and display operations. [5]

b) Describe the double ended queues. [5]

(OR)

9 a) Demonstrate circular queue with neat diagram. [5]

b) Discuss the role of queues in Breadth-First Search (BFS). Provide an algorithm and explain with an example. [5]

## Unit-5

10 a) Construct a binary search tree with the following data 47,12,75,88,90,73,57,85,50,62 [5]

b) Explain delete operation in binary search tree with example. [5]

(OR)

11 a) Illustrate any four types of hash functions with examples. [5]

b) Construct a hash table whose keys in order are 7, 24, 18, 52, 36, 54, 11, and 23 into a hash table of size 9 using $h(k) = 2k+3 \bmod m$. [5]

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Code No: R231207

R23

SET - 1

# JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY GURAJADA VIZIANAGARAM
## I B. Tech II Semester Supplementary Examinations January-2025
## BASIC CIVIL AND MECHANICAL ENGINEERING
(Common to CE, EEE, AME, MECH & ECE)

Time: 3 hours

Max. Marks: 70

. Question paper consists of Part A & Part B
All the questions in Part-A is Compulsory
Answer ONE Question from Each Unit in Part-B

*In Part A – Q.No. 1.a) to e) and in Part B Q.No. 2 to 7 should be answered at one place (may be upto page no. 17).*
*In Part A – Q.No. 1.f) to j) and in Part B Q.No. 8 to 13 should be answered at one place (may be from page no.18 to 32) in answer script.*

*****

**PART –A** **(10 Marks)**

1 a) What is the role of cement in Concrete? [1]
b) Explain the scope of Structural engineer. [1]
c) Convert $N30^0W$ to Prismatic Bearing. [1]
d) List any two components of Permanent way. [1]
e) What is the difference between a Dam and a reservoir? [1]
f) List any two technologies used in manufacturing? [1]
g) What is a Composite material? [1]
h) What is Smart manufacturing? [1]
i) What are the types of gear drives? [1]
j) Write the applications of robotics. [1]

**PART – B** **(60 Marks)**

**Basic Civil Engineering**

**Unit-I**

2 Explain the role of Civil Engineers in Society. [10]

**(OR)**

3 Write a brief note on Prefabricated Construction Techniques. [10]

**Unit-II**

4 Explain how the horizontal measurements are done at site? [10]

(OR)

5 The following readings were observed on a leveling staff with an Auto-level 1.11, 2.22, 3.33, 4.44, 5.55, 6.66, 7.77, 8.88, 9.99, 10.10, 11.11, 12.12m. The instrument was shifted after every third reading. It was found that the RL of first point was 123.45m. Find the RLs of remaining points. [10]

**Unit-III**

6 Explain the Components of Harbour with a neat sketch [10]

(OR)

7 Describe the concept of Rain Water Harvesting with a neat sketch? [10]

## Basic Mechanical Engineering

### Unit-I

| | | |
|---|---|---|
| 8 | Illustrate the role of Mechanical Engineering in Industries and Society? | [10] |
| | **(OR)** | |
| 9 | Write the classification of ceramics and composites? Explain with examples. | [10] |

### Unit-II

| | | |
|---|---|---|
| 10 | Discuss the concept of 3D printing and Smart manufacturing and list the applications. | [10] |
| | **(OR)** | |
| 11 | Explain in detail on the key components of Electric and Hybrid Vehicles. | [10] |

### Unit-III

| | | |
|---|---|---|
| 12 | Discuss the principle and main features of different types of power plants. | [10] |
| | **(OR)** | |
| 13 | Define robotics? Explain in detail on various configurations of robotic systems. | [10] |

******

Code No: R231208 | R23 | SET - 1

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY GURAJADA VIZIANAGARAM**
**I B. Tech II Semester Supplementary Examinations January-2025**
**Basic Electrical & Electronics Engineering**
**(Common to CSE, IT, CSE(DS), CSE(AI), CSE(CS), CSE(AI&ML), AI&DS, AI&ML)**

Time: 3 hours | Max. Marks: 70

***Question paper consists of Part A & Part B.***
***Part A is compulsory, Answer all questions.***
***In Part B, Answer any one question from each unit.***

*****

## PART-A (10 Marks)

### Basic Electrical Engineering

1 a) Distinguish between Conductance and Resistance [1]
b) State and explain Super position theorem [1]
c) Distinguish between a DC Generator and Motor [1]
d) Explain the working principle of an Alternator or three phase Generator [1]
e) Distinguish between conventional and Non-Conventional Energy resources [1]

### Basic Electronics Engineering

f) List the characteristics of Semiconductors [1]
g) Distinguish between Intrinsic and Extrinsic Semiconductors [1]
h) Draw the block diagram of public address system [1]
i) Draw the V- I characteristics of a P-N Junction Diode [1]
j) Convert 101010101 to decimal [1]

## PART-B (60 Marks)

### Basic Electrical Engineering

### Unit-1

2 Find the current in each resistance of the following circuit as shown in Figure.1. [10]

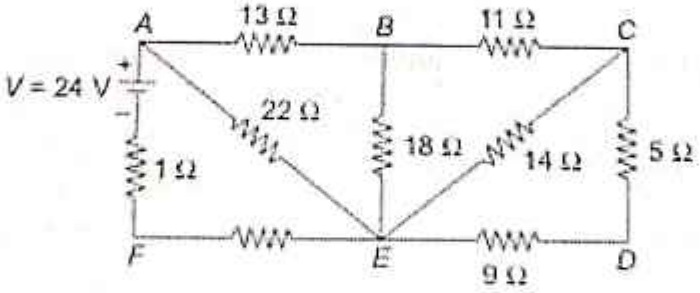



Figure:1

(OR)

3 a) Explain the following terms with respect to AC circuits: [5]
i) Phase difference ii) RMS Value iii) Form factor

b) A coil having a resistance of 24 Ω and an inductance of 0.2 H is connected across a 200 V, 50 Hz supply. Calculate the (i) reactance and impedance of the coil, (ii) current, (iii) phase difference between the current and the applied voltage, and (iv) power factor. [5]

Unit-2

4 a) What is a transformer? Explain the function it fulfils as an element of a power system. [5]

b) Explain the working of a Three Phase induction motor. [5]

(OR)

5 a) Analyze the constructional aspects of a DC Machine? [5]

b) Explain the working of a permanent magnet moving coil (PMMC) meter with a neat diagram. [5]

Unit-3

6 a) Draw and explain the layout of a Hydel Power Plant. [5]

b) What is a Two -part tariff and explain it in detail. [5]

(OR)

7 a) Explain the working principle of a Fuse and Miniature Circuit breaker. [5]

b) List the precautions to be taken to avoid Electric Shock during working conditions? [5]

**Basic Electronics Engineering**

**Unit-1**

8 a) Explain in detail about N - Type Semiconductor and P - Type Semiconductor. [5]

b) Describe the performance / operation of a Zener Diode and list its applications? [5]

(OR)

9 a) Explain about the potential barrier and biasing of p-n Junction Diode along with necessary diagrams and characteristics. [5]

b) Illustrate the working of a P-N-P transistor with a neat diagram? [5]

**Unit-2**

10 a) Explain in detail about the common collector configuration. [5]

b) Explain about the regulated dc power Supply with a neat block diagram. [5]

(OR)

11 a) Describe the operation of a Full Wave bridge rectifier with a neat circuit and corresponding waveforms? [5]

b) Explain how Zener diode can be used as a Voltage regulator. [5]

**Unit-3**

12 Explain the functionality of the following Logic Gates: [10]
i) XOR Gate ii) NOR Gate iii) NAND Gate
iv) XNOR gate v) AND Gate

(OR)

13 a) Describe the following combinational circuits: [5]
i) half adder and ii) Full adder

b) Explain any one flip flop circuit with a neat diagram and corresponding truth table. [5]

*****

Code No: R231209 | R23 | SET - 1

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY GURAJADA VIZIANAGARAM**
**I B. Tech II Semester Supplementary Examinations January-2025**
**Electrical Circuit Analysis - I**
(Only EEE)

Time: 3 hours | Max. Marks: 70

***Question paper consists of Part A & Part B.***
***Part A is compulsory, Answer all questions.***
***In Part B, Answer any one question from each unit.***
***Provide graph sheet to the students if required.***

*****

## PART-A (20 Marks)

1 a) Determine V in the circuit shown in figure-1. [2]

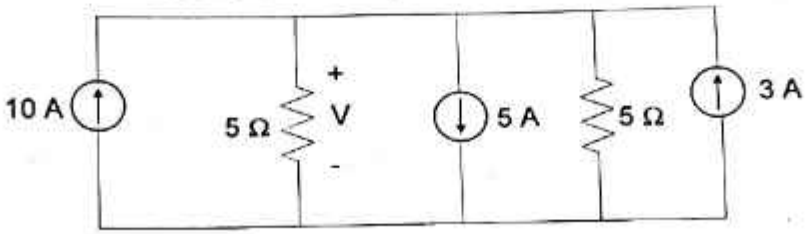



Figure:1

b) State Kirchhoff's laws. [2]

c) Define the term coefficient of coupling w.r.t magnetic circuits. [2]

d) Explain the concept of Mutual Inductance. [2]

e) What is the significance of power factor in AC Circuits? [2]

f) The instantaneous value of emf is $V = 300 \sin\left(80\frac{\pi}{4}\, t\right) volts$. Determine average value and periodic time. [2]

g) What is the resonance frequency in a series RLC circuit. [2]

h) What is the significance of Locus Diagrams? [2]

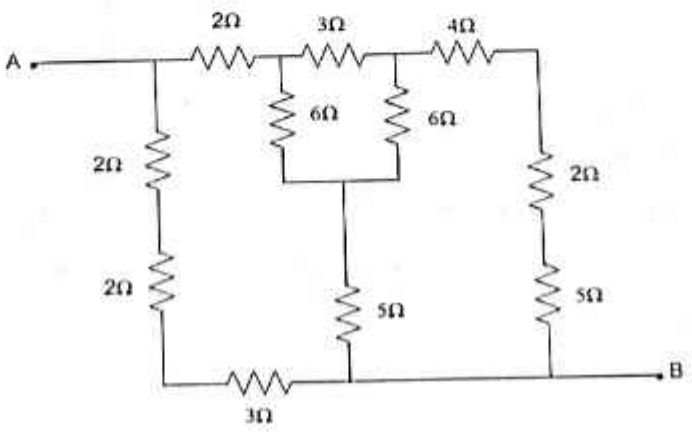
i) State Reciprocity theorem. [2]

j) Draw the equivalent circuit of Norton's theorem and Thevenin's theorem. [2]

## PART-B (50 Marks)

### Unit-1

2 a) Calculate the effective resistance between the points A and B in the circuit shown in figure.2. [5]



b) Determine the mesh currents $I_1$, $I_2$ and $I_3$ in the circuit shown in the figure. 3. [5]

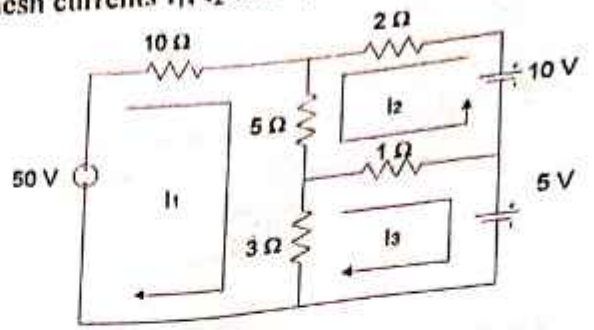



Figure:3

(OR)

3 a) Explain about Source transformation technique. [5]

b) Using nodal analysis, determine the voltage between the points, P and Q shown in figure.4. [5]

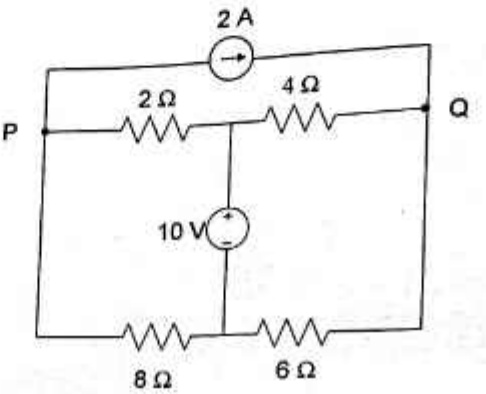



Figure:4

**Unit-2**

4 a) Find the effective value of the inductance for the following connection shown in figure.5 [5]

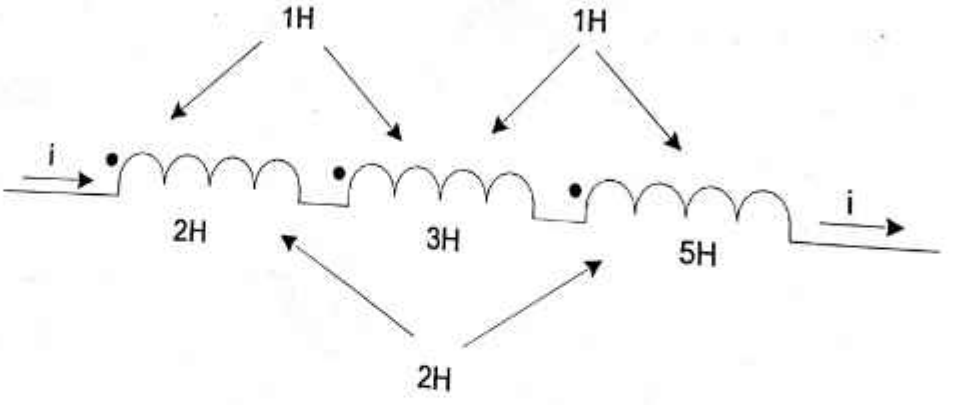



Figure:5

b) A cast steel ring is wound with 500 turns. The cross-section of core is $2 \times 10^{-3}$ $m^2$ and the mean length is 0.16m. (a) Find value of current required to develop a magnetic flux of $\varphi = 4 \times 10^{-4}$ wb. (b) Determine the value of $\mu$ and $\mu_r$ for the material under these conditions. Assume H for cast steel=170 At/m. [5]

(OR)

5 a) State and explain Faraday's laws of electromagnetic induction. [5]

b) Two coils of self-inductances $L_1$ and $L_2$ are mutually coupled. Derive the expression for the net inductance of the coils if they are connected in Series Aiding. [5]

**Unit-3**

6 a) For the periodic wave form shown in figure.6, determine average and rms values. [5]

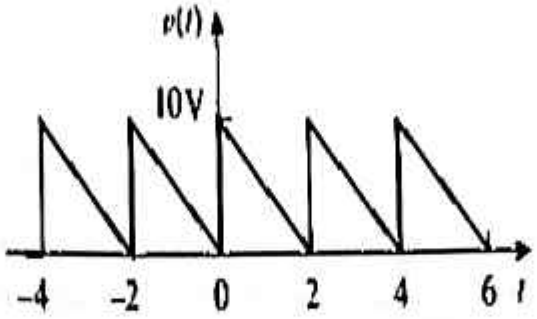



Figure:6

b) For the circuit shown in figure.7, find [5]

i) the total impedance ii) the total current iii) Power factor

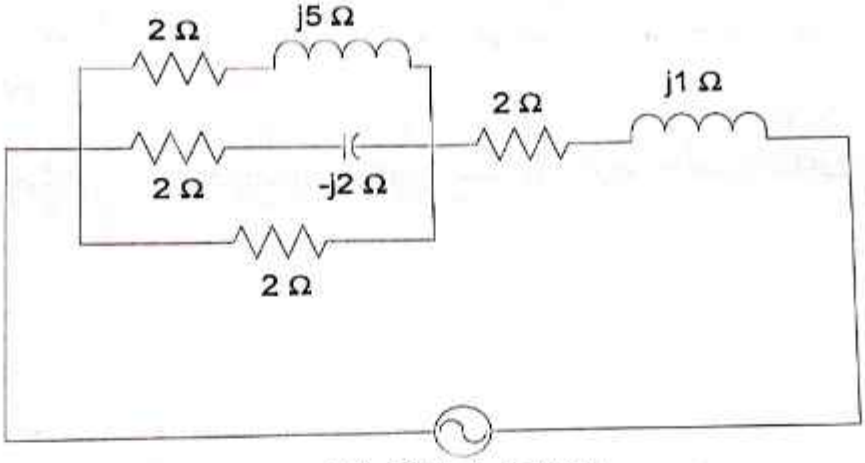



Figure:7

(OR)

7 a) For the circuit shown in figure.8, find the power delivered by the source. [5]

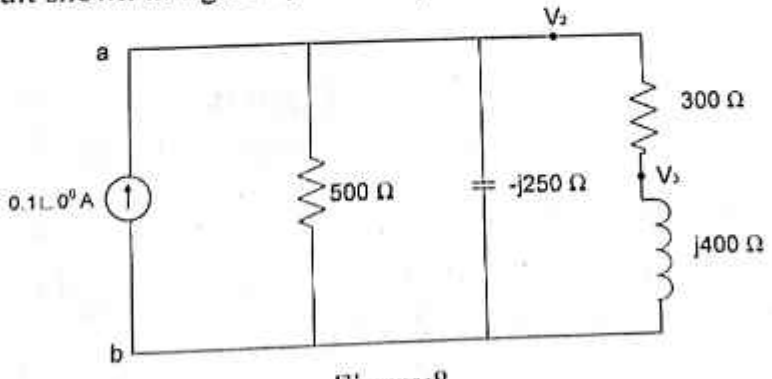



Figure:8

b) If voltage $v = 20\,sin(100t + 40^0)$ is applied to a 60 μF capacitor, calculate the current through the capacitor. [5]

## Unit-4

8 a) Explain the following terms related to resonance circuits: [5]

i) Band Width ii) Quality factor

b) For the series circuit shown figure.9, evaluate the value of reactance when the power factor is 0.866 lag using locus diagram. [5]

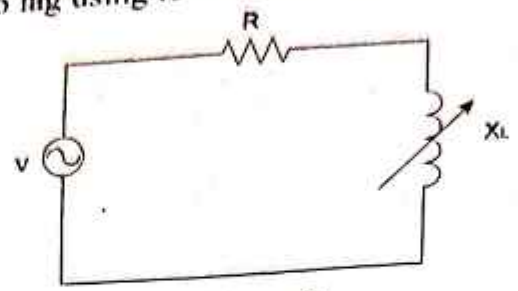



Figure:9

(OR)

9 a) An RLC series circuit consists of R=1KΩ, L=100mH, C=10μF. If a voltage of 100V is applied across the combination, determine resonant frequency, quality factor and bandwidth. [5]

b) At resonance, the current is maximum in a series circuit and minimum in a parallel circuit. Why? [5]

## Unit-5

10 a) State and explain maximum power transfer theorem with an example for DC excitation? [5]

b) For the circuit shown in figure.10, Compute the current flowing through the 23Ω resistor by applying Super position theorem. [5]

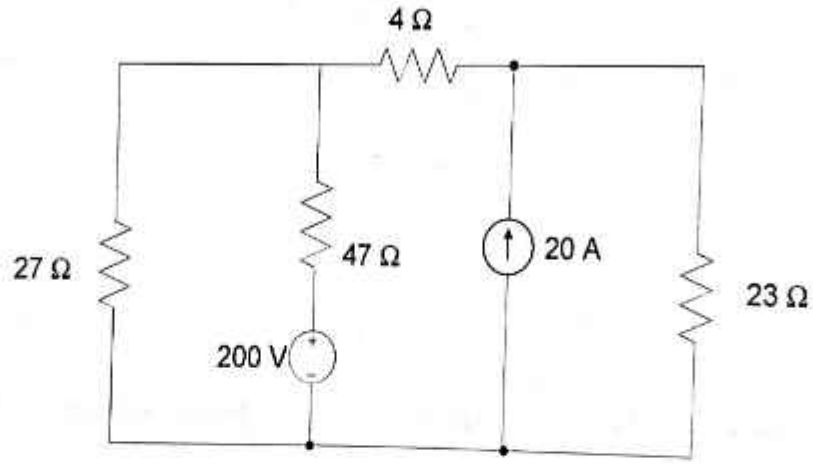



Figure:10

(OR)

11 a) In the network shown in figure.11, the 5Ω resistor is changed to 8Ω. Determine the resulting change in current thought the (3+j4) Ω impedance branch using compensation theorem. [5]

## Unit-4

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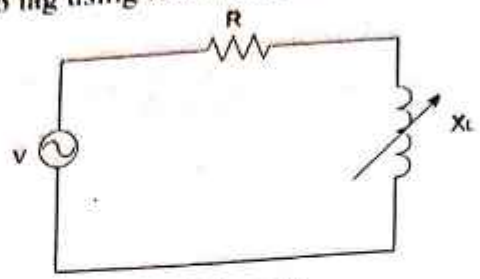


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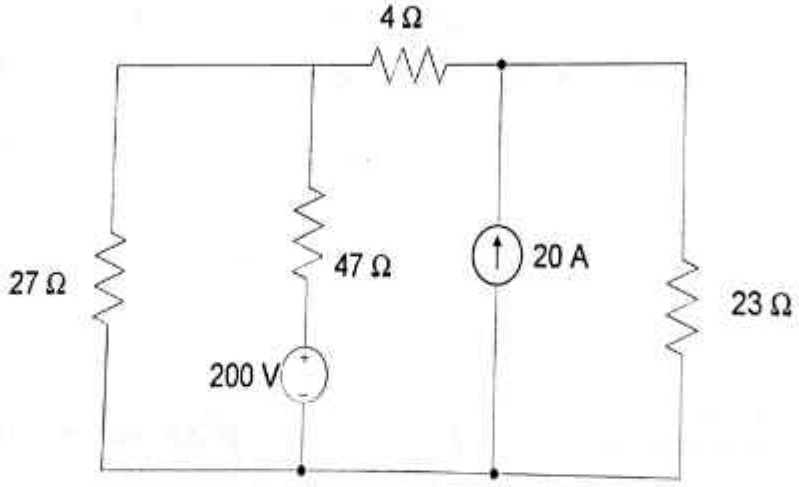


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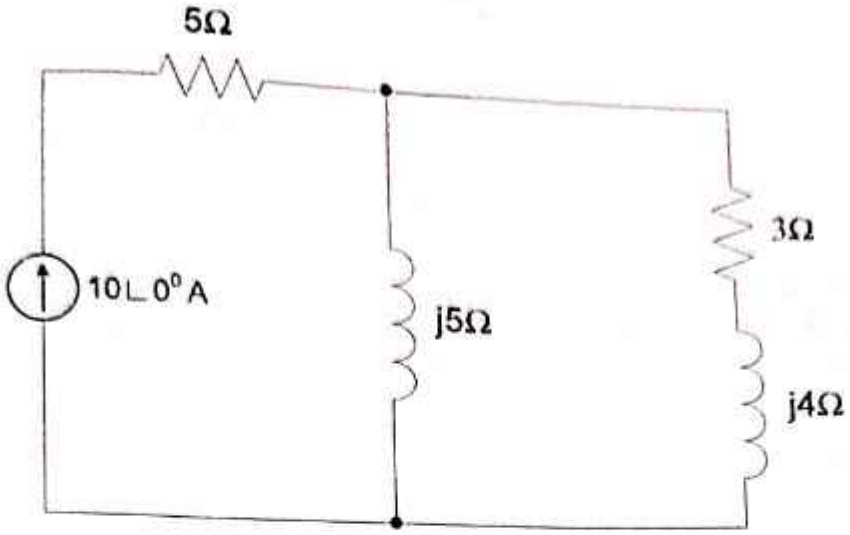


Figure:11

b) Find the Thevenin's equivalent for the circuit shown in figure.12. [5]

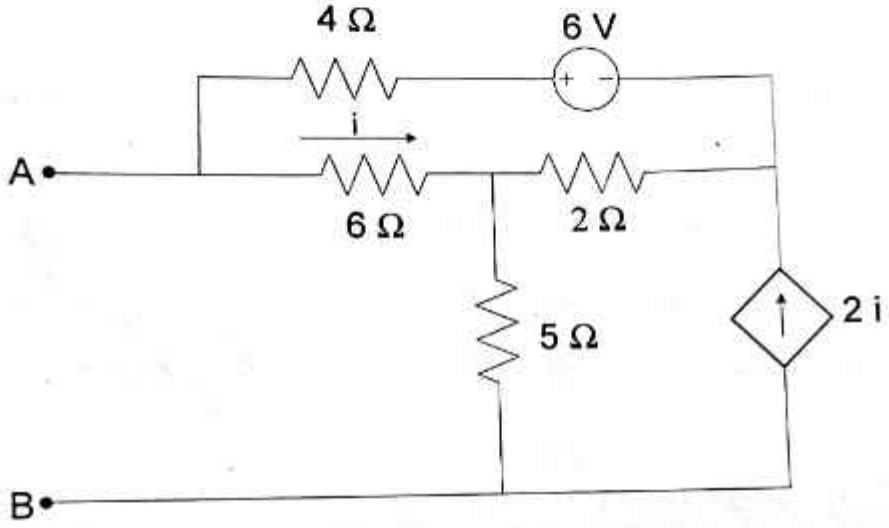


Figure:12

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Code No: R231210

R23

SET - 1

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY GURAJADA VIZIANAGARAM
I B. Tech II Semester Supplementary Examinations January-2025
ENGINEERING MECHANICS
(Common to CE, MECH and AME)

Time: 3 hours

Max. Marks: 70

*Question paper consists of Part A & Part B.*
*Part A is compulsory, Answer all questions.*
*In Part B, Answer any one question from each unit.*

*****

**PART-A** **(20 Marks)**

1 a) State the conditions of equilibrium for a system of coplanar concurrent forces. [2]

b) What is limiting friction, and when does impending motion occur? [2]

c) State Lami's theorem and mention one condition where it is applicable. [2]

d) State the Triangle Law of Forces and its converse condition for equilibrium. [2]

e) A uniform solid cone has a base radius R, height H, and density ρ. What is the vertical distance of its center of gravity from the base. [2]

f) Write the transfer formula for the product of inertia and explain its components. [2]

g) A car accelerates uniformly from rest and reaches a velocity of 20 m/s, in 10 seconds. Calculate the acceleration and the distance travelled by the car during this time. [2]

h) State D'Alembert's principle and explain its significance in dynamics. [2]

i) State the principle of work and energy for a particle in motion. [2]

j) Define the difference between displacement and velocity in the context of rectilinear motion. [2]

**PART-B** **(50 Marks)**

**Unit-1**

2 a) Define the principles of transmissibility and superposition of forces. Explain their significance in engineering mechanics with suitable examples. [5]

b) Derive the expression for the angle of repose and explain its relationship with the coefficient of friction. [5]

(OR)

3 a) A particle is acted upon by three forces: $F_1 = 10\,N$ at $0°$, $F_2 = 15\,N$ at $120°$, and $F_3 = 20\,N$ at $240°$. Determine the resultant force and its direction. [5]

b) Describe the significance of the parallelogram law of forces. Two forces of magnitudes 40 N and 60 N act at a point with an angle of $120°$ between them. Determine the resultant force and its direction. [5]

**Unit-2**

4 a) Draw the free body diagram for a uniform ladder of length L and weight W, leaning against a smooth vertical wall and resting on a rough horizontal surface. The angle between the ladder and the horizontal is $\theta$. Identify all forces acting on the ladder. [5]

b) Explain the graphical method to check the equilibrium of a coplanar system of forces using a force polygon. [5]

(OR)

5 a) A light rod AB of length 5 m is hinged at A and held in equilibrium by a string attached at B. A force of 100 N acts vertically downward at a point 2 m from A. The string makes an angle of $30°$ with the horizontal. Using Lami's theorem, find the tension in the string. [5]

b) A uniform beam of weight W=200 N is supported at two points A and B. A load of P=100 N is applied at a point between the supports. Show using the principle of virtual work that the reactions at A and B are consistent with equilibrium. [5]

**Unit-3**

6 a) A composite figure consists of a rectangle of dimensions 4 m × 2 m and a semicircle of radius 1 m placed on top. Determine the centroid of the composite figure from the base of the rectangle. [5]

b) State and derive the Transfer Theorem for moments of inertia. [5]

(OR)

7 a) Use Pappus's second theorem to find the surface area of a sphere of radius r. [5]

b) Define Polar Moment of Inertia and explain its significance in engineering mechanics. [5]

**Unit-4**

8 a) A car accelerates from rest at $2\,m/s^2$ for 5 seconds. It then maintains a constant velocity for 10 seconds before decelerating uniformly to rest in 5 seconds. Calculate the total distance travelled by the car. [5]

b) A particle moves under the influence of a force $F=-kx$, where $k=50\,N/m$. If the particle starts at $x=0.1$ m with zero initial velocity, calculate its maximum speed. [5]

(OR)

9 a) A 10 kg block is placed on an inclined plane making an angle of 30° with the horizontal. If the coefficient of friction is 0.2, determine the acceleration of the block down the incline. [5]

b) A 15 kg block slides down a rough incline of 30° over a distance of 5 m. If the coefficient of friction is 0.3, calculate the work done against friction and the velocity of the block at the bottom. Assume it starts from rest. [5]

**Unit-5**

10 a) A disk rotates about a fixed axis with an angular velocity of 10 rad/s. If it undergoes a constant angular acceleration of 5 rad/s² for 4 seconds, find the final angular velocity and the total angular displacement during this period. [5]

b) A 2 kg block slides down a frictionless incline from a height of 5 m. Calculate the velocity of the block at the bottom of the incline using the work-energy principle. [5]

(OR)

11 a) A car accelerates uniformly from rest to a speed of 20 m/s in 10 seconds. Calculate the acceleration of the car and the distance it travels in this time. [5]

b) A 5 kg ball initially moving at 10 m/s is struck by a force that acts for 2 seconds, changing its velocity to 20 m/s. Calculate the impulse imparted to the ball and the average force exerted. [5]

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Code No: R231211

R23

SET - 1

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY GURAJADA VIZIANAGARAM
I B. Tech II Semester Supplementary Examinations January-2025
NETWORK ANALYSIS
(Only ECE)

Time: 3 hours

Max. Marks: 70

*Question paper consists of Part A & Part B.*
*Part A is compulsory, Answer all questions.*
*In Part B, Answer any one question from each unit.*
*****

**PART-A** **(20 Marks)**

1 a) What is the difference between independent and dependent sources. [2]

b) State Thevenin's theorem with equivalent circuit. [2]

c) Write the expression for the time constant of an R-L circuit with DC excitation with graph. [2]

d) State the initial value theorem in Laplace transforms. [2]

e) Show the phasor representation of current and voltage in R,L,C circuit? [2]

f) Write the expression for impedance in a series R-C & R-L circuits? [2]

g) Differentiate between series resonance and parallel resonance? [2]

h) Discuss the coefficient of coupling affect the behavior of coupled circuits. [2]

i) List the types of attenuators commonly used in electrical circuits? [2]

j) State the relationship between Z and Y parameters. [2]

**PART-B** **(50 Marks)**

**Unit-1**

2 a) Solve the mesh and branch currents shown in figure.1 [5]

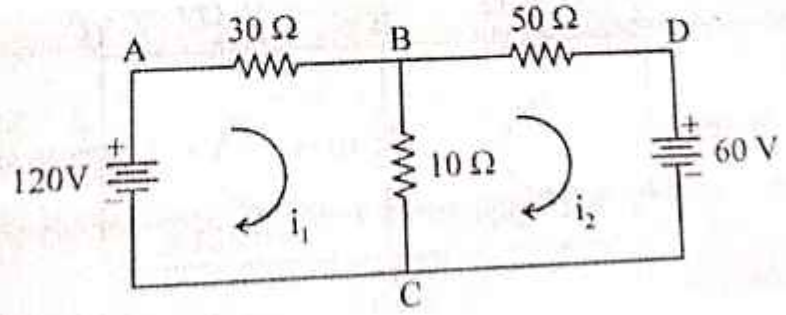


Figure: 1

b) Explain with an example of a pair of dual elements in electrical circuits. [5]

(OR)

3 a) Find the current through 3 Ω resistor using superposition theorem as shown in figure.2 [5]

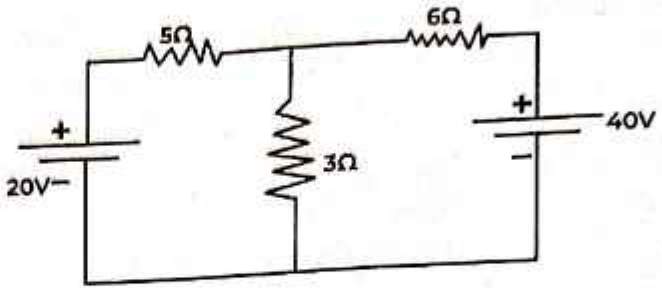


Figure:2

b) Explain Millman's theorem in brief using an example. [5]

**Unit-2**

4 a) Derive the expression for the transient response of an R-L circuit with DC excitation? [5]

b) Find the inverse Laplace transform for the Laplace transform [5]

$F(s)= (s+3) / (s^2+4s+3)$.

(OR)

5 a) Derive the expression for the transient response of an R-C circuit with DC excitation? [5]

b) Explain Heaviside's expansion theorem with an example. [5]

**Unit-3**

6 a) A resistance and a coil are connected in series and supplied from a single phase, 100 V, 50 Hz ac source as shown in the figure.3. Determine the rms values of voltages across the resistance ($V_R$) and coil ($V_C$) respectively, in volts. [5]

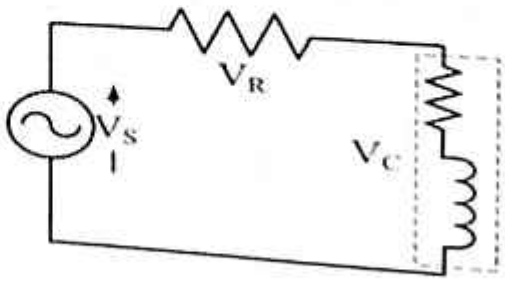


Figure: 3

b) Find the RMS value of the voltage $u(t)= 3 + 4 \cos (3t)$? [5]

(OR)

7 a) Calculate the current $I_c$ in the figure.4 for an RLC circuit with relevant data. [5]

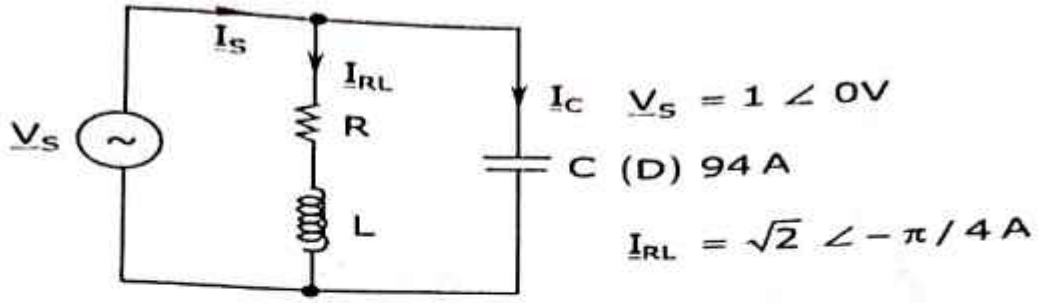


Figure:4

b) Determine the average power delivered to an impedance $(4-j3)\Omega$ by a current $5\cos(100\pi t+100)$A [5]

**Unit-4**

8 a) Calculate L1, L2, M and coupling coefficient for two coils when connected in series-aiding fashion have a total inductance of 250 mH. When connected in a series-opposing configuration, the coils have a total inductance of 150mH. If the inductance of one coil (L1) is three times the other. [5]

b) Derive the expression for impedance in a parallel resonant circuit and discuss its behavior at resonance. [5]

(OR)

9 a) Derive the expression for resonant frequency in a series R-L-C circuit and explain its significance. [5]

b) Determine the inductance of the three series-connected inductors of Figure.5 [5]

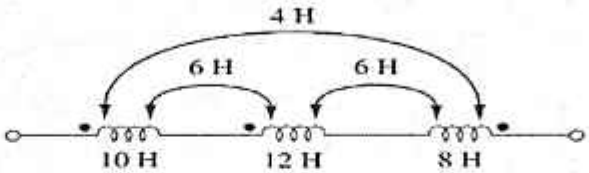


Figure:5

**Unit-5**

10 a) Derive the condition for reciprocity and symmetry in h-parameters. [5]

b) Explain the concept of image impedance with an example. [5]

(OR)

11 a) Explain the lattice network and derive its parameters. [5]

b) Explain the relationship between h-parameters and ABCD parameters. [5]

*****