

R23

I BTECH II SEM

END EXAMINATION QUESTION PAPERS

SUPPLEMENTARY

NOVEMBER 2025

I B.Tech II Semester Supple. Examinations, November-2025

Sub Code: R23CC1201 DIFFERENTIAL EQUATIONS & VECTOR CALCULUS

Time: 3 hours

(Common to All Branches)

Max. Marks: 70

R23

Note: Question Paper consists of Two parts (Part-A and Part-B)

PART-A

Answering all the questions from Part-A is compulsory (10 x 2M = 20M)

Q.No	Questions	KL	CO	M
1	a Solve the equation $3x(xy-2)dx + (x^3+2y)dy = 0$	3	1	2M
	b Calculate the integrating factor to find solution of $(x+y+1)\frac{dy}{dx} = 1$	3	1	2M
	c Find the Wronskian of $y_1 = \cos ax$, $y_2 = \sin ax$, $a \neq 0$.	3	2	2M
	d Determine the general solution of a non-homogeneous linear differential equations of nth order with constant coefficients.	3	2	2M
	e Obtain partial differential equation from $z = ax^2 + by^2$ by eliminating arbitrary constants a and b.	3	3	2M
	f Find the partial differential equation from $z = x^n f\left(\frac{y}{x}\right)$	3	3	2M
	g Given $\vec{A} = t^2\vec{i} - t\vec{j} + (2t+1)\vec{k}$, $\vec{B} = (2t-3)\vec{i} + \vec{j} - t\vec{k}$ find $\frac{d}{dt}(\vec{A} \cdot \vec{B})$	3	4	2M
	h Define a Solenoidal function.	3	4	2M
	i State Gauss divergence theorem.	3	5	2M
	j State Green's theorem.	3	5	2M

PART-B

Answer either 'a' or 'b' from each question of PART-B (5 x 10M = 50M)

Q.No	Questions	KL	CO	M
2	Unit-I			
	a i) Solve the differential equation $\frac{dy}{dx} + \frac{y}{x} = y^2x$	3	1	5M
	ii) Solve $(x^2 + y^3 + 6x)dx + y^2x dy = 0$	3	1	5M
	OR			
	b i) Solve the differential equation $\tan y \frac{dy}{dx} + \tan x = \cos y \cos^3 x$	3	1	5M
	ii) Solve $(x^2y^2 + xy + 1)y dx + (x^2y^2 - xy + 1)x dy = 0$	3	1	5M
3	Unit-II			
	a i) Solve the equation $(x+2y)(dx-dy) = dx+dy$	3	2	5M
	ii) By method of variation of parameters solve the equation $(D^2 + 1)y = \operatorname{cosec} x \cdot \cot x$.	3	2	5M
	OR			

	b	$y^2 + (x^2 - xy)\frac{dy}{dx} = 0$ i) Solve the equation	3	2	5M
		ii) Solve the simultaneous equations $\frac{dx}{dt} = 3x + 8y; \frac{dy}{dt} = -x - 3y$ with $x(0) = 6, y(0) = -2$	3	2	5M
4	Unit-III				
	a	i) Solve the equation $p - q = \ln(x + y)$.	3	3	5M
		ii) Find the complimentary function of the partial differential equation $(25D_x^2 - 40D_{xy} + 16D_y^2)z = 0$	3	3	5M
	OR				
	b	i) Find the general solution of $(y^2 + z^2)p - xyq + zx = 0$.	3	3	5M
		ii) Solve the equation $(D_x^3 - D_x^2 D_y - 8D_x D_y^2 + 12D_y^3)z = 0$	3	3	5M
5	Unit-IV				
	a	i) Find curl curl of $\vec{A} = x^2 y \vec{i} - 2xz \vec{j} + 2yz \vec{k}$ of at the point (1, 0, 2).	3	4	5M
		ii) Find the directional derivative of $\nabla \vec{U}$ at the point (4, 4, 2) in the direction of the corresponding outer normal of the sphere $x^2 + y^2 + z^2 = 36$, where $\vec{U} = x^4 \vec{i} + y^4 \vec{j} + z^4 \vec{k}$.	3	4	5M
	OR				
	b	i) Calculate $\nabla^2 f$ when $f = 3x^2 z - y^2 z^3 + 4x^3 y + 2x - 3y - 5$ at the point (1, 1, 0).	3	4	5M
		ii) Find the constants a and b so that the surface $ax^2 - byz = (a + 2)x$ will be orthogonal to the surface $4x^2 y + z^3 = 4$ at the point (1, -1, 2).	3	4	5M
6	Unit-V				
	a	i) If S is the curved surface of the cylinder $x^2 + y^2 = a^2$ between the planes $z = 0$ and $z = 2a$, show that $\int_S r \cdot n \, dS = 4\pi a^3$.	3	5	5M
		ii) If $f = (5xy - 6x^2)\vec{i} + (2y - 4x)\vec{j}$, evaluate $\int_C f \cdot dr$ where C is the curve $y = x^3$ from the point (1, 1) to the point (2, 8).	3	5	5M
	OR				
	b	Verify Stoke's theorem for the vector field $f = (x^2 - y^2)\vec{i} + 2xy \vec{j}$ over the rectangular box bounded by the planes $x = 0, x = a; y = 0, y = b; z = 0, z = c$ with the face $z = 0$ removed.	3	5	10M

KL: Blooms Taxonomy Knowledge Level

CO: Course Outcome

M: Marks

I B.Tech II Semester Supple. Examinations, November-2025

R23

Sub Code: R23CC1202

DATA STRUCTURES

Time: 3 hours

(CSE,IT,AI,CS,DS,AIML,CSE(AIML))

Max. Marks: 70

Note: Question Paper consists of Two parts (Part-A and Part-B)

PART-A

Answering all the questions from Part-A is compulsory (10 x 2M = 20M)

Q.No		Questions	KL	CO	M
1	a	Write the time complexity of Binary Search in the best, average, and worst case.	K4	1	2M
	b	Explain the basic idea behind Fibonacci Search.	K4	1	2M
	c	What is the main advantage of using a linked list over an array?	K6	2	2M
	d	Write a key difference between doubly linked list and singly linked list.	K6	2	2M
	e	Mention two applications of stacks.	K3	3	2M
	f	Convert the infix expression $A + B * C$ to postfix.	K3	3	2M
	g	Define a Binary Search Tree (BST).	K3	5	2M
	h	Write any one application of trees.	K3	5	2M
	i	Define a graph and list two types of graph representations.	K3	5	2M
	j	What is open addressing in hashing?	K3	6	2M

PART-B

Answer either 'a' or 'b' from each question of PART-B (5 x 10M = 50M)

Q.No		Questions	KL	CO	M
2	Unit-I				
	a	i) Explain the concept of Abstract Data Types (ADTs) with examples. How is an ADT different from a data structure?	K4	1	5M
		ii) Analyze the time and space complexity of the Merge Sort algorithm with an example array [8, 4, 2, 6, 5].	K4	1	5M
	OR				
	b	i) Compare and contrast Quick Sort and Bubble Sort in terms of time complexity, number of swaps, and use cases.	K4	1	5M
		ii) Perform Insertion Sort on the array [7, 2, 9, 1, 5] and show all steps.	K4	1	5M
3	Unit-II				
	a	i) Explain how linked lists can be used to implement dynamic memory allocation. Illustrate with an example.	K6	2	5M
		ii) Draw a circular linked list with nodes 5, 10, and 15. Show how deletion of node 10 is handled.	K6	2	5M
	OR				
	b	i) What are the advantages of circular linked lists over singly linked lists? Provide one practical use case.	K6	2	5M
		ii) Show step-by-step how to reverse a singly linked list with elements [1 → 2 → 3 → 4].	K6	2	5M

4	Unit-III				
	a	i) Convert the infix expression $(A + B) * (C - D)$ into postfix and evaluate it for $A=5, B=2, C=10, D=4$.	K3	3	5M
		ii) Implement stack operations (PUSH, POP) using arrays. Simulate the operations: PUSH(5), PUSH(10), POP(), PUSH(15).	K3	3	5M
	OR				
	b	i) Implement a queue using linked list and perform ENQUEUE(10), ENQUEUE(20), DEQUEUE(), and ENQUEUE(30).	K3	4	5M
		ii) Explain circular queues and demonstrate their advantage over linear queues with a wrap-around insertion example.	K3	4	5M
5	Unit-IV				
	a	i) Define a binary tree. Show Preorder, Inorder, and Postorder traversals for the tree: <pre> A /\ B C /\ D E</pre>	K3	5	5M
		ii) Insert the elements [50, 30, 70, 20, 40, 60, 80] into a Binary Search Tree and show the structure step-by-step.	K3	5	5M
	OR				
	b	i) Explain the difference between binary trees and binary search trees with examples.	K3	5	5M
		ii) Write pseudocode to search for a node in a Binary Search Tree and show an example using [25, 15, 35, 10, 20].	K3	5	5M
6	Unit-V				
	a	i) Represent the graph below using both an adjacency list and an adjacency matrix: Vertices: A, B, C, D Edges: A-B, A-C, B-D, C-D	K3	5	5M
		ii) Write the differences between BFS and DFS in terms of traversal order and applications.	K3	5	5M
	OR				
	b	i) Explain open addressing in hashing. Demonstrate insertion of [23, 43, 13, 27, 37] into a hash table of size 10 using open addressing.	K3	6	5M
		ii) Describe an application of graph traversal in real-world systems such as social networks or Google Maps.	K3	6	5M

KL: Blooms Taxonomy Knowledge Level

CO: Course Outcome

M: Marks

I B.Tech II Semester Supple. Examinations, November-2025

Sub Code: R23CC1203

BASIC ELECTRICAL & ELECTRONICS ENGINEERING

Time: 3 hours

(CSE,IT,AI)

Max. Marks: 70

R23

PART-A
(CE)

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Q.No		Questions	KL	CO	M
1	a	Give the volt – ampere relations for R and C parameters.	K1	1	1M
	b	What is the function of commutator in dc generator?	K1	2	1M
	c	Differentiate the Conventional and non-conventional energy resources.	K1	3	1M
	d	Draw the phasor diagram of series RL circuit excited with an AC source.	K1	1	1M
	e	What is meant by two-part electricity tariff?	K1	4	1M
2	Unit-I				
	a	i) Explain the Superposition theorem with example	K2	1	5M
		ii) Draw the phasor diagram, impedance triangle and power triangle of series RLC circuit excited with AC supply for $XL < XC$ and $XC > XL$ conditions.	K2	1	5M
	OR				
	b	i) Explain KCL and KVL with an example	K2	1	5M
		ii) Determine the form factor and peak factor for a sinusoidal wave form	K2	1	5M
3	Unit-II				
	a	i) Explain the principle of DC generator	K2	2	5M
		ii) Explain the Construction and working Principal of Moving Iron (MI) Instruments.	K2	2	5M
	OR				
	b	i) Explain the general working principle of a three-phase induction motor and also list its advantages and disadvantages.	K2	2	5M
		ii) Explain the working of a synchronous generator and describe its constructional details.	K2	2	5M
4	Unit-III				
	a	i) Draw the Layout and explain the operation of Nuclear power plant.	K2	3	5M
		ii) Explain the calculation of electricity bill for domestic consumers with an example.	K2	4	5M
	OR				
	b	i) Draw the Layout and explain the operation of Hydal power plant.	K2	3	5M
		ii) What is meant by Earthing and list the types of earthing.	K2	4	5M

PART-B

(ME)

Q.No		Questions	KL	CO	M
5	a	Explain the Zener Effect.	K1	5	1M
	b	What is meant by electronic instrumentation system?	K1	6	1M
	c	Realize the AND gate and OR gate using NOR gate.	K1	7	1M
	d	What are the majority and minority carriers in the regions of npn transistor?	K1	5	1M
	e	What are the applications of Flip flops?	K1	7	1M
6	Unit-IV				
	a	i) With a neat circuit, draw the input – output characteristics of a N – P – N transistor in Common base configuration.	K2	5	10M

	OR				
	b	i) Discuss the role of emitter, base and collector regions in the operation of BJT.	K2	5	5M
		ii) Draw and explain the equivalent circuit of a CE amplifier.	K2	5	5M
	Unit-V				
7	a	i) Explain the working and analysis of a Full wave rectifier with a neat diagram and corresponding wave forms.	K2	6	5M
		ii) Explain in detail about the frequency response of CE amplifier.	K2	6	5M
	OR				
	b	i) Explain the Public Address system with the help of Block diagram.	K2	6	5M
		ii) Explain the working of common emitter (RC coupled) amplifier along with its frequency response.	K2	6	5M
	Unit-VI				
8	a	i) Draw the truth tables of AND, NOR, NAND, XOR and XNOR gates.	K2	7	5M
		ii) Design and implement the half adder with truth table.	K2	7	5M
	OR				
	b	i) Explain D flip flop with its truth table.	K2	7	5M
		ii) Explain serial input and output shift registers.	K2	7	5M

KL: Blooms Taxonomy Knowledge Level CO: Course Outcome M: Marks

I B.Tech II Semester Supple. Examinations, November-2025

Sub Code: R23CC1204

ENGINEERING GRAPHICS

Time: 3 hours

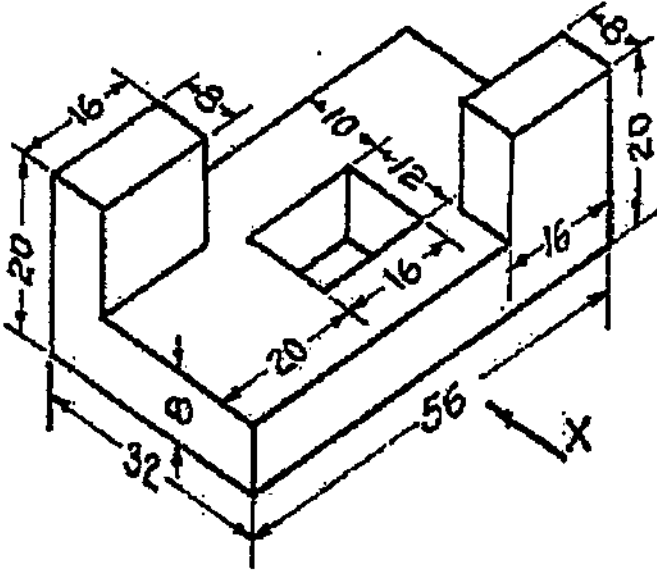
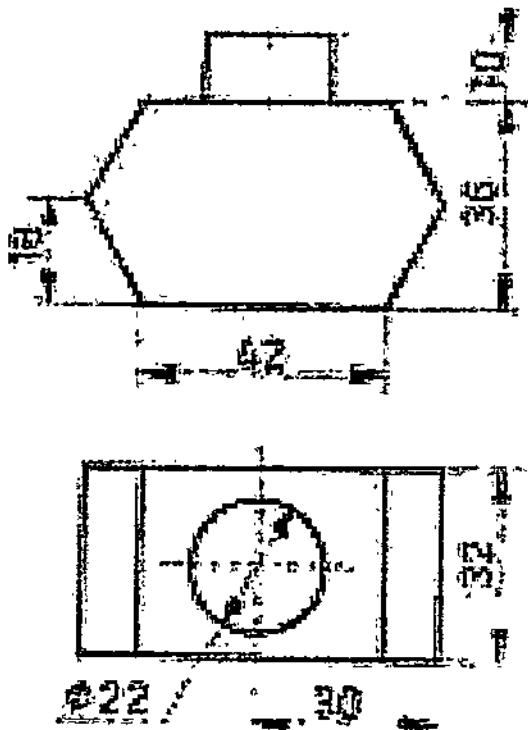
(CSE,IT,AI)

Max. Marks: 70

Note: Answer All FIVE Questions.

All Questions Carry Equal Marks (5 X 14 = 70M)

Q.No	Questions	KL	CO	M
1	Unit-I			
	a Draw an cycloid of rolling circle of diameter 40 mm which rolls on straight line for one revolution. Draw a tangent and normal at any point on the curve.	K3	CO1	14M
	OR			
b	Construct a diagonal scale 1/50, showing metres, decimetres and centimeters , to measure upto 5 metres. Mark a length 4.75 m on it.	K3	CO1	14M
2	Unit-II			
	a A line AB, 65mm long has its end A 20mm above H.P. and 25mm in front of VP. The end B is 40mm above H.P. and 65mm in front of V.P. Draw the projections of AB and shows its inclination with H.P.	K3	CO2	14M
	OR			
b	A Hexagonal plate with a 30mm side and negligible thickness has its surface perpendicular to the HP and inclined at 45° to the VP. Draw it's Projections? When one of it's sides of the Plane is Parallel to and 15 mm in front of the VP.	K3	CO2	14M
3	Unit-III			
	a A pentagonal Prism having a base with a 30 mm side and 60mm long axis, is resting on one of its rectangular faces on the HP. with axis parallel to the VP. Draw its projections.	K4	CO3	14M
	OR			
b	A cone 40 mm diameter and 50 mm axis is resting on one of its generator on HP which makes 30° inclinations with VP. Draw it's projections?	K4	CO3	14M
4	Unit-IV			
	a A square prism having a base with a 40mm side and a 60 mm long axis rests on its base on HP. such that one of the vertical faces makes an angle of 30 ° with VP. A section plane perpendicular to the VP. Inclined at 45° to the HP. and passing through the axis at a point 20 mm from its top end cuts the prism. Draw its front view, sectional top view.	K4	CO4	14M

		OR			
	b	Draw the development of the lateral surfaces of a right square prism of edge of base 30 mm and axis 50 mm long.	K4	CO4	14M
Unit-V					
	a	Draw the Front view, Top view and Side view for the figure shown below. All dimensions are in mm. 	K4	CO5	14M
OR					
5	b	Draw the isometric view of the given orthographic projection of the object? 		CO5	14M

KL: Blooms Taxonomy Knowledge Level CO: Course Outcome M: Marks

I B.Tech II Semester Supple Examinations, November-2025

Sub Code: R23CC1205

ENGINEERING PHYSICS

Time: 3 hours

(CSE,IT,AI)

Max. Marks: 70

Note: Question Paper consists of Two parts (Part-A and Part-B)

PART-A

Answering all the questions from Part-A is compulsory (10 x 2M = 20M)

Q.No		Questions	KL	CO	M
1	a	Describe the applications of lasers in engineering technology	2	1	2M
	b	Discuss the principle of light propagation in optical fibers.	6	1	2M
	c	Define the unit cell and what are its parameters?	1	2	2M
	d	Discuss the importance of Miller indices.	6	2	2M
	e	Explain the origin of magnetic moment due to orbital angular momentum of electrons.	2	3	2M
	f	Mention the applications of superconductors in medical field.	4	3	2M
	g	Derive the expression for de-Broglie wavelength.	5	4	2M
	h	Explain the merits of classical free electron theory of metals.	2	4	2M
	i	Obtain the Einstein relation between mobility and diffusion coefficient.	6	5	2M
	j	Mention the properties of chromic materials.	4	5	2M

PART-B

Answer either 'a' or 'b' from each question of PART-B (5 x 10M = 50M)

Q. No		Questions	KL	CO	M
2	Unit-I				
	a	i) Differentiate spontaneous and stimulated emission of radiation using energy level diagram.	4	1	5M
		ii) Discuss the construction and working of semiconductor laser.	6	1	5M
	OR				
	b	i) Discuss the construction and working of He-Ne laser and mention its engineering applications.	6	1	5M
		ii) Derive the expression for numerical aperture of an optical fiber and mention its significance.	5	1	5M
3	Unit-II				
	a	i) Discuss the crystal structure determination using powder diffraction method.	6	2	5M
		ii) Derive the atomic packing fraction for face centered cubic and body centered cubic system.	5	2	5M
	OR				
	b	i) Derive Bragg's law and how it helps in the determination of crystal structure.	5	2	5M
		ii) Classify the Bravais lattices based on unit cell parameters.	2	2	5M

4	Unit-III				
	a	i) Categorize the magnetic materials based on intensity of magnetization, susceptibility and temperature.	2	3	5M
		ii) Discuss Meissner effect in superconductors and how this effect classifies the superconductors.	6	3	5M
	OR				
	b	i) Explain AC and DC Josephson effect in superconductors.	2	3	5M
ii) Differentiate soft and hard magnetic materials based on hysteresis.		4	3	5M	
5	Unit-IV				
	a	i) Derive Schrodinger time independent wave equation for a free particle.	5	4	5M
		ii) Derive the electrical conductivity of metal based on quantum free electron theory of metals.	5	4	5M
	OR				
	b	i) Discuss the Fermi-Dirac function and explain the importance of Fermi energy level.	6	4	5M
ii) Prove the quantization of energy levels for the case of a particle in one dimensional potential well.		5	4	5M	
6	Unit-V				
	a	i) State and explain Hall effect and obtain a relation between Hall voltage and Hall coefficient.	5	5	5M
		ii) Discuss the properties of shape memory alloys with examples and mention its engineering applications.	6	5	5M
	OR				
	b	i) Discuss the different types of solids based on band theory and differentiate intrinsic and extrinsic semiconductors.	6	5	5M
ii) Discuss the properties of magneto-rheological fluids and electro-rheological fluids.		6	5	5M	

KL: Blooms Taxonomy Knowledge Level

CO: Course Outcome

M: Marks

I B.Tech II Semester Supple. Examinations, Nov-2025

Sub Code: R23CC1206

COMMUNICATIVE ENGLISH

Time: 3 hours

(CE,EEE,ME,ECE,CSE(AIML),DS,CS,AIML)

Max. Marks: 70

Note: Question Paper consists of Two parts (Part-A and Part-B)

PART-A

Answering all the questions from Part-A is compulsory (10.x 2M = 20M)

Q. No	Questions	KL	CO	Marks
1	a. What was the significance of the gifts that Jim and Della exchanged?	K3	CO1	2M
	b. What is note-making? Mention its importance in academic settings.	K3	CO2	2M
	c. What emotions are created by the imagery used in the poem 'The Brook'?	K3	CO1	2M
	d. The children played the garden hours their parents returned work. (Fill in the blanks with suitable prepositions)	K3	CO3	2M
	d. How has SpaceX changed the cost and frequency of space travel?	K3	CO1	2M
	f. Fill in the blanks with suitable verb forms. 1. The students (wait) for the results since morning. 2. By the time the ambulance arrived, the patient (die).	K3	CO3	2M
	g. Why did Harvey's sister bring the toys for the children?	K3	CO1	2M
	H. Fill in the blanks with the correct word. 1. The minister gave a speech at the conference. (principal, principle) 2. The criminal made a confession to the police. (full, complete)	K3	CO4	2M
	i. How does intrapersonal communication affect decision-making processes?	K3	CO1	2M
	j. Correct the following sentences: 1. Neither the teachers nor the principal were present. 2. She requested me that I should help her.	K3	CO3	2M

PART-B

Answer either 'a' or 'b' from each question of PART-B (5 x 10M = 50M)

Q.No		Questions	KL	CO	Marks
2		Unit-I			
	a	i) Compare and contrast the characters of Jim and Della; highlighting their values and priorities.	K3	CO1	7M
		ii) Rewrite the jumbled sentences in the correct order:	K3	CO3	3M

		a. In the early learned to morning-swim I. b. Before me the reached bus station I. c. Often library books from I borrow the.			
		OR			
	b	1. i) B. Identify the parts of speech for the following sentences. a. Suddenly, a loud <u>noise</u> startled everyone in the quiet room. b. The brave firefighter quickly <u>rescued</u> the child from the burning building. c. Although it was raining <u>heavily</u> , they continued playing outside happily. d. Between the mountains and the sea lies a beautiful <u>small</u> village. e. Wow! That was an incredibly exciting performance by the <u>dancers</u> .	K3	CO3	5M
		ii) Write the synonyms for the following words. a. Diligent b. Enormous c. Benevolent d. Terminate e. Perplexed	K3	CO4	5M

		Unit-II			
	a	i) Analyze how the poem 'The Brook' reflects the cycle of human life through natural imagery.	K3	CO1	7M
		ii) Write a short paragraph of 120-150 words on the following topic. 'Every cloud has a silver lining.'	K6	CO2	3M
3		i) Fill the blanks with suitable articles. a. She wants to be engineer when she grows up. b. Have you ever climbed Mount Everest? c. sun rises in the east. d. I found old coin in my grandfather's collection. e. Rohan plays guitar very well	K3	CO3	5M
	b	i. Arrange the following sentences in the correct order to form a coherent paragraph: a. The ancient city of Hampi was the capital of the Vijayanagara Empire. b. Today, Hampi is recognized as a UNESCO World Heritage Site. c. It was founded in the 14th century and flourished for over two centuries. d. The ruins of Hampi showcase magnificent temples, palaces, and other structures. e. However, the city was devastated and abandoned following a military defeat in 1565	K3	CO3	5M

		Unit-III			
	a	i) Examine how Elon Musk's vision for sustainable energy has influenced the automotive industry globally.	K3	CO1	7M
4		ii) Summarize the following paragraph Education is not merely the acquisition of academic knowledge but a lifelong journey of personal growth and development. It encompasses formal schooling, practical experiences, and self-directed learning, all contributing to the	K3	CO2	3M

I B.Tech II Semester Supple. Examinations, November-2025

Sub Code: R23CC1207

CHEMISTRY

Time: 3 hours

(EEE,ECE,CSE(AIIML),DS,CS,AIIML)

Max. Marks: 70

Note: Question Paper consists of Two parts (Part-A and Part-B)

PART-A

Answering all the questions from Part-A is compulsory (10 x 2M = 20M)

Q.No		Questions	KL	CO	M
1	a	What is LCAO principle?	1	1	2M
	b	Explain bond order?	2	1	2M
	c	Define superconductors.	1	2	2M
	d	What are nanomaterials?	1	2	2M
	e	Write the difference between primary and secondary battery.	2	3	2M
	f	Explain reactions occurring at anode and cathode in a polymer electrolyte membrane fuel cell.	2	3	2M
	g	Explain how PVC is prepared.	2	4	2M
	h	Explain step growth polymerization with example.	2	4	2M
	i	Discuss π - π^* transitions in UV spectroscopy.	2	5	2M
	j	Define Lambert's Beer Law.	1	5	2M

PART-B

Answer either 'a' or 'b' from each question of PART-B (5 x 10M = 50M)

Q.No		Questions	KL	CO	M
2	Unit-I				
	a	i) Discuss the characteristics of bonding and anti-bonding molecular orbital.	2	1	5M
		ii) Draw and explain π -molecular orbital energy level diagram of butadiene.	3	1	5M
	OR				
	b	i) Calculate the bond order and draw MO diagram of O ₂ molecule.	3	1	5M
		ii) Discuss the conditions for hydrogen bonding.	2	1	5M
3	Unit-II				
	a	i) Discuss the types of superconductors.	2	2	5M
		ii) Explain the basic concept of super capacitors.	2	2	5M
	OR				
	b	i) Discuss the properties of fullerenes.	2	2	5M
		ii) Explain any one method for preparation of pure semiconducting material.	2	2	5M
4	Unit-III				
	a	i) Discuss conductometric titration of strong acid vs weak base and weak acid vs strong base.	2	3	5M
		ii) Explain working of sodium ion battery and its applications.	2	3	5M

	OR				
	b	i) Explain the working of potentiometric sensor and applications.	2	3	5M
		ii) Draw and explain a galvanic cell.	2	3	5M
5	Unit-IV				
	a	i) Explain properties and applications of conducting polymer polyaniline.	2	4	5M
		ii) Explain preparation, properties and applications of Buna-N.	2	4	5M
	OR				
	b	i) Differentiate between thermoplastics and thermosetting plastics.	2	4	5M
		ii) Explain properties and applications of poly lactic acid.	2	4	5M
6	Unit-V				
	a	i) Discuss applications of IR spectroscopy.	2	5	5M
		ii) Explain instrumentation of UV-visible spectrophotometer.	2	5	5M
	OR				
	b	i) Explain the instrumentation of NMR.	3	5	5M
		ii) Explain the principle of UV-visible spectroscopy.	2	5	5M

KL: Blooms Taxonomy Knowledge Level

CO: Course Outcome

M: Marks



NARASARAOPETA ENGINEERING COLLEGE (AUTONOMOUS)

I B.Tech II Semester Supple. Examinations, November-2025

R23

Sub Code: R23CC1208

ENGINEERING CHEMISTRY

Time: 3 hours

(CE,ME)

Max. Marks: 70

Note: Question Paper consists of Two parts (Part-A and Part-B)

PART-A

Answering all the questions from Part-A is compulsory (10 x 2M = 20M)

Q.No		Questions	KL	CO	M
1	a	What is permanent hardness? Give example.	K1	1	2M
	b	Define electro dialysis	K1	1	2M
	c	What is primary cell? Give example.	K1	2	2M
	d	What is pilling-bedworth rule?	K1	2	2M
	e	Define thermosetting plastics? Give example.	K1	3	2M
	f	Define alternative fuels With examples.	K1	3	2M
	g	Write chemical composition of portland cement.	K1	4	2M
	h	Define Viscosity.	K1	4	2M
	i	Classify any two applications of nano-materials.	K2	4	2M
	j	Write principle of SEM	K1	4	2M

PART-B

Answer either 'a' or 'b' from each question of PART-B (5 x 10M = 50M)

Q.No		Questions	KL	CO	M
2	Unit-I				
	a	i) Apply EDTA method to calculate hardness of water.	K3	1	5M
		ii) Discuss sludge and scale formation problems in boiler troubles.	K5	1	5M
	OR				
	b	i) Explain the electro dialysis process with a neat diagram.	K2	1	5M
		ii) Define reverse osmosis and explain process of purification of brackish water.	K2	1	5M
3	Unit-II				
	a	i) Define reference electrode and describe with one example	K3	2	5M
		ii) Explain factors affecting the rate of corrosion.	K2	2	5M
	OR				
	b	i) Explain Lithium-ion batteries working principle including cell reactions.	K2	2	5M
		ii) Summarise cathodic protection with example.	K2	2	5M

4	Unit-III				
	a	i) Discuss the mechanism of Free radical chain polymerization process.	K6	3	5M
		ii) Discuss preparation, properties and applications of Buna-S Rubber.	K4	3	5M
	OR				
	b	i) Explain Refining of petroleum process with a neat diagram.	K2	3	5M
		ii) Explain significance of Proximate analysis of coal.	K5	3	5M
5	Unit-IV				
	a	i) Propose Fibre reinforced composites for manufacturing composite materials.	K5	4	5M
		ii) What factors contribute to the failure of refractory materials.	K4	4	5M
	OR				
	b	i) Explain the chemical reactions involved in the setting and hardening of cement.	K2	4	5M
		ii) Discuss Flash point & Fire point of a Lubricant.	K4	4	5M
6	Unit-V				
	a	i) How does the sol-gel process contribute to the development of nano-materials.	K3	4	5M
		ii) Discuss characterization of nanomaterials by TEM.	K5	4	5M
	OR				
	b	i) Illustrate the functioning of Laser ablation process in the preparation of CNT's	K4	4	5M
		ii) Classify Fullerenes types, properties and applications.	K4	4	5M

KL: Blooms Taxonomy Knowledge Level

CO: Course Outcome

M: Marks

I B.Tech II Semester Supple. Examinations, November-2025

R23

Sub Code: R23CC1209

ENGINEERING MECHANICS

Time: 3 hours

(CE,ME)

Max. Marks: 70

Note: Question Paper consists of Two parts (Part-A and Part-B)

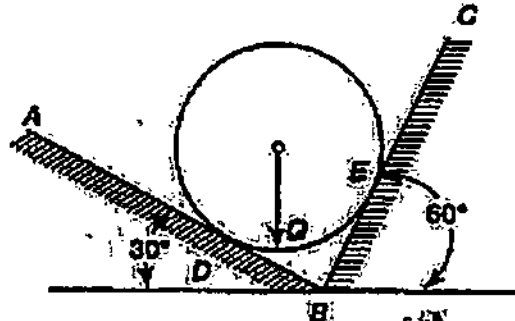
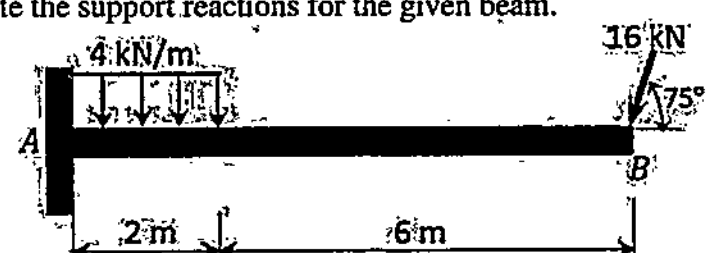
PART-A

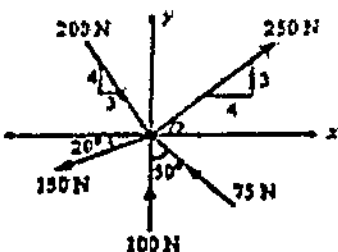
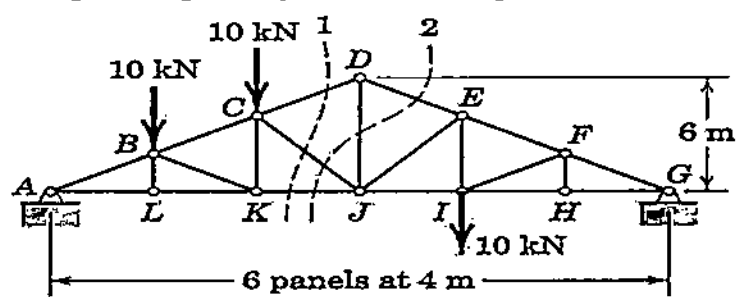
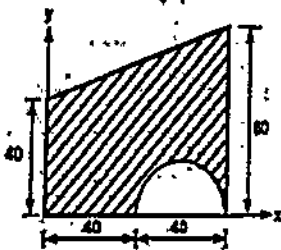
Answering all the questions from Part-A is compulsory (10 x 2M = 20M)

Q.No		Questions	KL	CO	M
1	a	Interpret the free body diagram for co-planar concurrent force system	K2	CO1	2M
	b	State Parallelogram law of forces.	K1	CO1	2M
	c	Define a truss. When is a truss said to be externally redundant.	K2	CO2	2M
	d	State the laws of static friction.	K1	CO2	2M
	e	What is the difference between center of mass and center of gravity.	K1	CO3	2M
	f	Derive the centroidal coordinates for a triangle about the base.	K2	CO3	2M
	g	Define radius of gyration.	K1	CO4	2M
	h	Define polar moment of inertia.	K1	CO4	2M
	i	Write the equations for a particle in curvilinear motion.	K2	CO5	2M
	j	State D'Alembert's Principle?	K1	CO5	2M

PART-B

Answer either 'a' or 'b' from each question of PART-B (5 x 10M = 50M)

Q.No		Questions	KL	CO	M
Unit-I					
2	a	A ball of weight $Q=53.4$ N rests in a right-angled trough, as shown in figure. Determine the forces exerted on the sides of the trough at D and E if all surfaces are perfectly smooth. 	K3	CO1	5M
		ii) Compute the support reactions for the given beam. 	K3	CO1	5M

OR					
b	i)	Find the resultant, its magnitude and direction, of the given concurrent force system.	K3	CO1	5M
					
ii) State and Prove Lami's theorem.			K2	CO1	5M
Unit-II					
3	a	Calculate the force in the member DJ of the Howe roof truss as shown in the figure. Neglect any horizontal components of force at the supports.	K3	CO2	10M
					
OR					
b	Analyze the coefficients of static and kinetic friction between the block and the inclined plane.		K3	CO2	10M
Unit-III					
4	a	Locate the center of gravity of a hemisphere of radius r.	K3	CO3	10M
	OR				
b	Determine the mass moment of inertia of a circular plate of radius r and thickness about its centroidal axis.		K3	CO3	10M
Unit-IV					
5	a	State and derive the perpendicular axis theorem.	K2	CO4	10M
	OR				
b	Find moment of inertia of the plane shaded area about the given x and y axes.		K3	CO4	10M
					
Unit-V					
6	a	Derive work-energy equation for translation.	K3	CO5	10M
	OR				
b	State and prove Impulse momentum principle.		K2	CO5	10M

KL: Blooms Taxonomy Knowledge Level

CO: Course Outcome

M: Marks

I B.Tech II Semester Supple. Examinations, November-2025

R23

Sub Code: R23CC1210

ELECTRICAL CIRCUITS ANALYSIS-I

Time: 3 hours

(EEE)

Max. Marks: 70

Note: Question Paper consists of Two parts (Part-A and Part-B)

PART-A

Answering all the questions from Part-A is compulsory (10 x 2M = 20M)

Q.No		Questions	KL	CO	M
1	a	Write the properties of dependent sources?	1	1	2M
	b	Write the V-I relations of capacitors?	1	1	2M
	c	Define MMF?	1	2	2M
	d	Write the faraday's laws of electromagnetic induction?	1	2	2M
	e	Define average value of alternating quantities?	1	3	2M
	f	What is meant by the phase difference?	1	3	2M
	g	Write the effects of series resonance?	1	4	2M
	h	Write the effects of parallel resonance?	1	4	2M
	i	State compensation theorem?	1	5	2M
	j	Write the statement of maximum power transfer theorem?	1	5	2M

PART-B

Answer either 'a' or 'b' from each question of PART-B (5 x 10M = 50M)

Q.No		Questions	KL	CO	M
2	Unit-I				
	a	Derive and analyze the source transformation technique by using an example and circuit diagrams?	4	1	10M
	OR				
	b	i) A 22 micro farad capacitor is connected in parallel with a 42.7 micro farad capacitor and the combination is connected across a time varying voltage source. At a particular time, the current supplied by the source is 5.8A. Find the magnitudes of instantaneous currents through the individual capacitors?	3	1	5M
3		ii) A 50.9 micro farad capacitor is initially charged to accumulate 104 micro coulombs. One un charged capacitor of 204.8 micro farads is connected across it in parallel. Find the charge transferred?	3	1	5M
	Unit-II				
	a	Derive and analyze the series and parallel magnetic circuits with circuit diagrams and necessary equations?	4	2	10M
	OR				

	b	i) Two coupled coils have $K=0.7$. $N_1=520$ turns and $N_2=1010$ turns. The mutual flux being 0.8wb . calculate the primary coil flux? If the primary current be 11.4A . determine the primary coil inductance? Also find the secondary inductance?	3	2	5M
		ii) Two coupled coils have the self-inductances of $L_1=11.2 \times 10^{-3}\text{H}$ and $L_2=22.8 \times 10^{-3}\text{H}$. The coefficient of coupling K is 0.88 in the air. Calculate the voltage in the second coil and the flux of the first coil provided the second coil has 580 turns and the circuit current is given as $i_1=2.4\sin 320t\text{ A}$?	3	2	5M
4	Unit-III				
	a	Derive and analyze the form factor of a pure sine wave?	4	3	10M
	OR				
	b	In a series RLC circuit the maximum inductor voltage is twice the capacitor voltage maximum. However, the circuit current lags the applied voltage by 45 degrees and the instantaneous drop across the inductance is given as $V_L=103\sin 312t\text{ V}$. Assuming the resistance being 27.6 ohms , calculate the value of inductance and capacitances?	3	3	10M
5	Unit-IV				
	a	A series RLC circuit has $R=2.6\text{ ohms}$, $L=2.4\text{mH}$, $C=9.8\text{ micro farads}$. Find the Q factor, band width, resonant frequency and the half power frequencies f_1 and f_2 of the circuit?	3	4	10M
	OR				
	b	A coil of inductance 8.8H and resistance of 57.8 ohms in series with a capacitor and is supplied from a constant voltage variable frequency source. The circuit is at resonance at 85Hz and the circuit current is 1.4A ? Determine the frequency when the current is 0.7A ?	3	4	10M
6	Unit-V				
	a	State and prove Super position theorem for a ' π ' network excited with two unequal AC sources?	4	5	10M
	OR				
	b	Derive the necessary equations and prove the Thevenin's theorem with an example?	4	5	10M

KL: Blooms Taxonomy Knowledge Level

CO: Course Outcome

M: Marks

I B.Tech II Semester Supple. Examinations, November-2025

R23

Sub Code: R23EC1211

NETWORK ANALYSIS

Time: 3 hours

(ECE)

Max. Marks: 70

Note: Question Paper consists of Two parts (Part-A and Part-B)

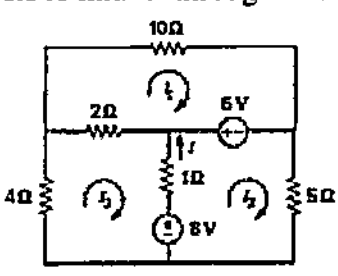
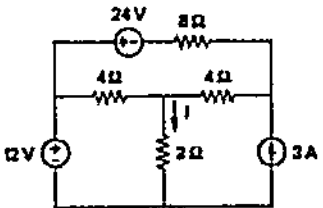
PART-A

Answering all the questions from Part-A is compulsory (10 x 2M = 20M)

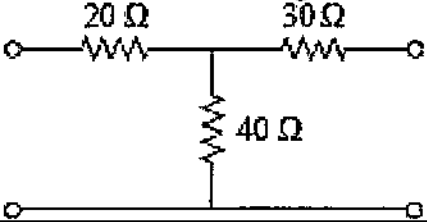
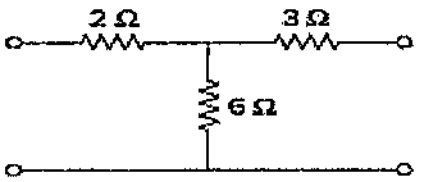
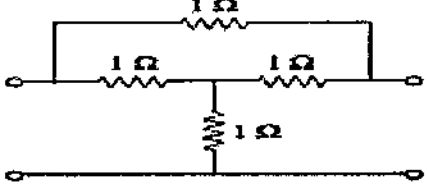
Q.No.	Questions	KL	CO	M
1	a List different passive circuit components.	K1	1	2M
	b State Thevenin's Theorem.	K1	1	2M
	c Define time constants of R-L and R-C Circuits.	K1	2	2M
	d Write V-I relation of inductor and capacitor.	K1	2	2M
	e Distinguish between steady state and transient response.	K1	3	2M
	f What is the value of equivalent delta resistance if 4Ω resistance connected in star?	K1	3	2M
	g Define the term Quality factor of a circuit in resonance.	K1	4	2M
	h Define self inductance and mutual inductance.	K1	4	2M
	i In terms of ABCD parameters, write symmetry and reciprocity conditions for a two-port network.	K1	5	2M
	j Define Lattice network.	K1	5	2M

PART-B

Answer either 'a' or 'b' from each question of PART-B (5 x 10M = 50M)

Q.No.	Questions	KL	CO	M
2	Unit-I			
	i) Apply mesh analysis to find ' i ' through 1Ω resistor. 	K3	1	5M
	ii) State the maximum power transfer theorem and derive the expression for maximum power transferred to the load.	K2	1	5M
	OR			
	i) Determine the value of ' i ' through 3Ω resistor using superposition theorem. 	K3	1	5M
	ii) Calculate the equivalent resistance R_{ab} .	K3	1	5M

3	Unit-II				
	a	i) Derive the expression for voltage across capacitance of a series R-C circuit excited with a DC source at $t=0$.	K2	2	5M
		ii) Find $v(t)$ for $t > 0$ in the circuit shown below. Assume the switch has been open for a long time and is closed at $t=0$.			
			K3	2	5M
b	OR				
	b	i) Derive the expression for current through the inductor of a series R-L circuit excited with a DC source at $t=0$.	K2	2	5M
		ii) Find i_o in the following circuit for $t > 0$.			
			K3	2	5M
4	Unit-III				
	a	i) A series RLC circuit consists of a resistance of 25Ω , inductance $0.4H$, capacitance of $250\mu F$ is connected a supply of $230V$, $50Hz$. Calculate (i) total impedance (ii) current, power (iii) power factor (iv) voltage across coil (v) voltage across capacitance.	K3	3	5M
		ii) Obtain the star connected equivalent circuit of the delta connected circuit with an example.	K2	3	5M
	OR				
	b	i) Derive the expression for total impedance single phase series RL circuit and draw the phasor diagram.	K2	3	5M
		ii) A coil of the resistance 100Ω and inductance $100\mu H$ is connected in series with a $100\mu F$ capacitor. The circuit is connected to a $10V$ variable frequency supply. (i) Calculate frequency at which voltage across inductor is maximum and (ii) find frequency at which voltage across capacitor is maximum.	K3	3	5M
5	Unit-IV				
	a	i) What is Resonance? Derive the expression for resonance frequency in a series RLC circuit.	K2	4	5M
		ii) An RLC series circuit has $R=100\Omega$, $L=500mH$ and $C=40F$. Calculate (i) Resonant frequency (ii) lower half-power frequency (iii) Upper half-power frequency (iv) bandwidth (v) Q factor.	K3	4	5M

2	OR				
	b	i) A series RLC circuit with $R=100\Omega$, $L=0.5H$, $C=40\mu F$ has an applied voltage of $100V$ with variable frequency. Find the resonance frequency, current at resonance and voltage across R , L , and C .		4	5M
		ii) What is meant by coupling coefficient? Derive the expression coupling coefficient.	K2	4	5M
6	Unit-V				
	a	i) Determine the Z-parameters of the following circuit. 		5	5M
		ii) A two port network has the following parameters: $Z_{11}=6\Omega$, $Z_{12}=Z_{21}=3\Omega$ and $Z_{22}=4\Omega$. Calculate hybrid parameters.	K3	5	5M
	OR				
	b	i) Find the hybrid parameters for the two-port network shown below. 	K3	5	5M
		ii) For the two port circuit shown in Figure, find the Z parameters. 	K3	5	5M

KL: Blooms Taxonomy Knowledge Level

CO: Course Outcome

M: Marks
