

R23

II BTECH I SEM

END EXAMINATION QUESTION PAPERS

REG & SUPPLEMENTARY

NOVEMBER 2025

NARASARAOPETA ENGINEERING COLLEGE:: NARASARAOPET

(AUTONOMOUS)

II B.Tech II-I Semester Regular. Examinations, November – 2025

ENVIRONMENTAL STUDIES

Subject Code: R23CC21MC

Max. Marks: 70

Time: 3 hours

Note: Question Paper Consists of Two parts (part – A and Part -B)

PART-A

Answering all the questions from Part –A is compulsory (10x2M=20M)

Q.No		Questions	KL	CO	Marks
1	a	What is the scope of environmental studies?	1	1	2M
	b	Write about the benefits of dams	1	1	2M
	c	Define grass land ecosystem and give examples	1	2	2M
	d	Write about food chains.	1	2	2M
	e	Mention any two effects of soil pollution.	1	3	2M
	f	Define noise pollution	1	3	2M
	g	What is global warming?	1	4	2M
	h	What is sustainable development?	1	4	2M
	i	Define population explosion?	1	5	2M
	j	What is meant by migration?	1	5	2M

PART-B

All Questions Carry Equal Marks

Max Marks 5x10=50M

Q.No		Questions	KL	CO	M
2	Unit-I				
	a)	Define the Environment? What is the importance of environmental studies? Discuss about need for public awareness?	2	1	10M
	OR				
3	b)	Illustrate major environmental impacts of mineral extraction?	2	1	10M
	Unit-II				
	a)	Discuss the major uses of forests. How would you justify that ecological uses of forests surpass commercial uses?	2	2	10M
4	OR				
	b)	Comment upon Indian biodiversity with special reference as a mega diversity nation	2	2	10M
	Unit-III				
5	a)	What are the various sources, effects, & causes of water pollution?	2	3	10M
	OR				
	b)	Explain the causes and effects of soil pollution in environment	2	3	10M
6	Unit-IV				
	a)	Describe the rain water harvesting and water shed management	2	4	10M
	OR				
6	b)	Discuss the concept of consumerism and waste product.	2	4	10M
	Unit-V				
	a)	Briefly discuss HIV/AIDS, mode of its spread and its effects on environment.	2	5	10M
6	OR				
	ii)	Explain the causes and effects of rapid population growth.	2	5	10M

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

Sub Code: R23CC2101

DISCRETE MATHEMATICS & GRAPH THEORY

Time: 3 hours

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

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	Demonstrate how the quantifiers $\forall$ (for all) and $\exists$ (there exists) are used in predicate logic. Provide an example for each.	K3	1	2M
	b	Demonstrate the truth table for the logical connectives AND, OR, NOT, and IMPLIES with examples.	K3	1	2M
	c	Illustrate an equivalence relation on a set with an example. Show that the relation is reflexive, symmetric, and transitive.	K4	2	2M
	d	Illustrate the partial ordering of a set: Let $S = \{1,2,3,4\}$ with the relation $\leq$ (less than or equal to). Draw the Hasse diagram for the partial order $\leq$ on the set S.	K4	2	2M
	e	Write the Binomial Theorem.	K6	3	2M
	f	Write about Inhomogeneous Recurrence Relations.	K6	3	2M
	g	Demonstrate the Hamiltonian cycle in a graph.	K3	4	2M
	h	Demonstrate how to check if two graphs are isomorphic.	K3	4	2M
	i	Define a multigraph.	K1	5	2M
	j	What is Complete bipartite graph?	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				
	a	i) Show that the formulas $(p \rightarrow q) \Leftrightarrow (\neg p \vee q)$ and $(p \wedge \neg p) \rightarrow q \Leftrightarrow q$ are logically equivalent.	K3	1	5M
		ii) Show that the statement $(p \wedge q) \rightarrow r \Leftrightarrow (p \rightarrow r) \vee (q \rightarrow r)$ is a tautology using truth tables.	K3	1	5M
	OR				
	b	i) Show that the formula $\forall x (P(x) \rightarrow Q(x)) \Leftrightarrow \neg \exists x (P(x) \wedge \neg Q(x))$ is a valid equivalence.	K3	1	5M
		ii) Predict whether the statement $(P \wedge Q) \rightarrow R$ is logically equivalent to $P \rightarrow (Q \rightarrow R)$. Explain the reasoning behind your answer.	K3	1	5M
3	Unit-II				
	a	i) Identify the properties of a relation R on a set $A = \{1,2,3\}$, such as reflexive, symmetric, and transitive, and determine if the relation $R = \{(1,1), (2,2), (3,3), (1,2)\}$ is reflexive, symmetric, and transitive.	K4	2	5M

		ii) Identify and compute the composition of two functions $f(x)=x+1$ and $g(x)=2x$. What is $(f \circ g)(x)$?	K4	2	5M
		OR			
		i) Identify the compatibility of two relations on a set A, and determine if the relations $R=\{(1,2),(2,3)\}$ and $S=\{(2,3),(3,4)\}$ are compatible.	K4	2	5M
4	b	ii) Illustrate the concept of the greatest lower bound (GLB) and least upper bound (LUB) in a lattice with a diagram.	K4	2	5M
	Unit-III				
	a	i) Write the Binomial Theorem and use it to expand $(x+2)^4$.	K6	3	5M
		ii) Write the formula for permutations with repetitions and calculate the number of distinct arrangements of the letters in the word "MISSISSIPPI".	K6	3	5M
	OR				
	b	i) Solve the recurrence relation $T(n)=4T(n-1)-4T(n-2)$ with initial conditions $T(0)=1$ and $T(1)=4$, using the method of characteristic roots..	K6	3	5M
		ii) Solve the recurrence relation $T(n)=T(n-1)+T(n-2)$, with $T(0)=0$ and $T(1)=1$, using generating functions.	K6	3	5M
5	Unit-IV				
	a	i) How many vertices are needed to construct a graph with 7 edges in which each vertex has degree 2?	K3	4	5M
		ii) Consider the graph GGG with vertices $V=\{A,B,C,D\}$ and edges $E=\{AB,BC,CD,DA\}$. Compute if the graph has a Hamiltonian path or circuit. If so, determine the path or circuit.	K3	4	5M
	OR				
	b	i) Construct three examples of regular bipartite graphs. For each graph, specify: Vertex Set and Edge Set.	K3	4	5M
		ii) Is it possible to construct a simple graph with vertices having degrees: 1,1,3,3,3,3,5,6,8,9? Justify your answer using the degree-sum theorem and graph construction principles.	K3	4	5M
6	Unit-V				
	a	i) Explain the spanning tree and a minimum spanning tree with examples.	K2	5	5M
		ii) Explain the Euler's Theorem and Graph Coloring Problem	K2	5	5M
	OR				
	b	i) Describe BFS algorithm with one example.	K2	5	5M
		ii) Describe DFS algorithm with one example.	K2	5	5M

KL: Blooms Taxonomy Knowledge Level

CO: Course Outcome

M: Marks



NARASARAOPETA ENGINEERING COLLEGE (AUTONOMOUS)

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

R23

Sub Code: R23CC2103

DIGITAL LOGIC & COMPUTER ORGANIZATION

Time: 3 hours

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) Convert the hexadecimal number 2F to its decimal equivalent.	K2	1	2M
	b) How does the Karnaugh map (K-map) help in minimizing Boolean expressions?	K1	1	2M
	c) What is a Flip Flop?	K4	2	2M
	d) Mention various types of computers.	K4	2	2M
	e) Explain how does multiple-bus organization improve system performance?	K2	2	2M
	f) With an example, explain what is overflow in signed number addition?	K3	3	2M
	g) Compare Primary Vs Secondary memory.	K3	3	2M
	h) What are the advantages and disadvantages of associative mapping?	K2	3	2M
	i) What is the role of I/O devices in a computer system?	K2	4	2M
	j) How does a synchronous bus differ from an asynchronous bus?	K3	4	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	How does the K-map simplify Boolean expressions with 4 variables? Explain using the expression $A'B'C+ABC'+AB'C+A'BC'$	K2	1	5M
		Convert the following numbers in to binary equivalent $(47.423)_{10}=(\quad)_2$ $(8CD.A)_{16}=(\quad)_2$	K2	1	5M
	OR				
	b	i) Explain the concept of universal gates and discuss the properties of NAND and NOR gates that make them universal.	K2	1	5M
		ii) Represent the decimal number 46.5 as a floating point number with 16 bit mantissa and 8 bit exponent.	K3	1	5M
3	Unit-II				
	a	Write a short note on the following a) JK Flip-flop b) SR Flip-flop c) Ripple counters d) Program Counter e)Asynchronous Counter	K2	2	10M

	OR				
	b	Explain the Von Neumann Architecture and its significance in the development of modern computers.	K4	2	5M
		Compare and contrast multiprocessors and multicomputers in terms of architecture, performance, and applications	K2	2	5M
4	Unit-III				
	a	Explain the structure and working of a hardwired control unit. How does it differ from a micro programmed control unit?	K2	3	10M
	OR				
5	b	Explain the Booth's multiplications algorithm in detail with an example.	K2	3	10M
	Unit-IV				
	a	Explain the hierarchical memory organization in a computer system. Why is it important?	K2	4	10M
6	OR				
	b	Explain the concept of mapping functions in cache memory, describing the types of mapping functions: Direct Mapping, Associative Mapping, and Set-Associative Mapping.	K2	4	10M
	Unit-V				
6	a	Explain the role of interrupt hardware in a computer system. Discuss the components of interrupt hardware and their functions.	K3	4	10M
	OR				
	b	What are the components of a DMA system and how do they interact during a data transfer operation?	K2	4	10M

KL: Blooms Taxonomy Knowledge Level

CO: Course Outcome

M: Marks

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

R23

Sub Code: R23CC2104

ADVANCED DATA STRUCTURES & ALGORITHM ANALYSIS

Time: 3 hours

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

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	Define Time and Space Complexity.	1	1	2M
	b	What is Balance Factor in AVL tree.	1	1	2M
	c	What is connected component?	1	2	2M
	d	Write the control abstraction of Divide And Conquer	1	2	2M
	e	Write the principle of optimality	2	3	2M
	f	Express the term Dynamic Programming.	1	3	2M
	g	How backtracking is useful for solving problems.	1	4	2M
	h	List the applications of Branch and Bound	1	4	2M
	i	Categorize the NP Problems.	2	5	2M
	j	What is Clique Decision Problem	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) Calculate time and space complexity for the Matrix Multiplication.	2	1	5M
		ii) Explain AVL tree? Construct AVL tree for the Following elements: 10,12,5,4,20,8,7,15,13.	4	1	5M
	OR				
	b	i) Explain Asymptotic Notations	2	1	5M
		ii) Construct a Max-Heap from the following elements: [9, 3, 5, 7, 1, 8,12]	4	1	5M
3	Unit-II				
	a	i) Derive the Time Complexity of Quick Sort in Worst Case	2	2	5M
		ii) Explain the importance Strassen's Matrix Muplication? Multiply the matrices by using Strassen's Matrix Multiplication.	2	2	5M
		$A = \begin{bmatrix} 2 & 4 \\ 3 & 2 \end{bmatrix} \quad B = \begin{bmatrix} 1 & 2 \\ 3 & 2 \end{bmatrix}$			
	OR				
	b	i) Give an Algorithm for DFS traversal with the help of suitable example each	2	2	5M
ii) What is a Graph? Illustrate the different memory representations with an example each.		3	2	5M	

4	Unit-III				
	a	i) Design algorithm for solving the single source shortest path algorithm for connected graph.	4	3	5M
		ii) Construct job sequencing schedule for $n=7$, $(p_1, p_2, p_3, p_4, p_5, p_6, p_7) = (100, 10, 15, 27, 120, 55, 40)$ and deadlines $(d_1, d_2, d_3, d_4) = (2, 1, 2, 1, 4, 3, 1)$.	3	3	5M
	OR				
	b	i) Use an algorithm for greedy strategies for the knapsack to find an optimal solution to the knapsack instance $n=7, m=15$, $(p_1, p_2, \dots, p_7) = (10, 5, 15, 7, 6, 18, 3)$, and $(w_1, w_2, \dots, w_7) = (2, 3, 5, 7, 1, 4, 1)$.	2	3	5M
ii) Compare and contrast Greedy approach and Dynamic Programming approach.		3	3	5M	
5	Unit-IV				
	a	i) Explain 8-queens problem using backtracking.	2	4	5M
		ii) Solve the following instance for the subset problem $s=(1,3,4,5)$ and $d=11$ using backtracking technique.	2	4	5M
	OR				
	b	i) Construct the portion of state space tree generated by LCBF for the 0/1 Knapsack instance: $n = 5$, $(p_1, p_2, \dots, p_5) = (10, 15, 6, 8, 4)$, $(w_1, w_2, \dots, w_5) = (4, 6, 3, 4, 2)$ and $m=12$.	3	4	10M
6	Unit-V				
	a	i) Describe the relationship between * p and np * np-complete and np-hard	2	5	5M
		ii) Explain deterministic and non-deterministic algorithms with an example	2	5	5M
	OR				
	b	i) Compare and contrast about NP Hard and NP Complete Problems.	3	5	5M
ii) State and Prove TSP is np-complete.		2	5	5M	

KL: Blooms Taxonomy Knowledge Level

CO: Course Outcome

M: Marks

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

R23

Sub Code: R23CC2105

OBJECT ORIENTED PROGRAMMING THROUGH JAVA

Time: 3 hours

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

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 polymorphism and give one example?	K1	1	2M
	b	What is typecasting?	K1	1	2M
	c	What is the constructor?	K1	2	2M
	d	Distinguish between "static" and "final" keywords?	K4	2	2M
	e	Explain about an array?	K2	3	2M
	f	Distinguish between "array" and "vector"?	K4	3	2M
	g	What is the difference between "throw" and "throws"?	K1	4	2M
	h	What is an package?	K1	4	2M
	i	What is multithreading?	K1	5	2M
	j	Explain about scanner class?	K2	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) Explain the program structure of java	K2	1	5M
		ii) What are the core principles of Object-Oriented Programming (OOP), and how do they contribute to writing efficient and maintainable code?	K1	1	5M
	OR				
	b	What are Command Line Arguments ? Illustrate the use of Command Line Arguments using a simple java program.	K1	1	10M
3	Unit-II				
	a	Compare Method overloading and Method overriding with a Java Program	K2	2	10M
	OR				
	b	Write a Java program to read any five numbers from the keyboard and calculate their product and maximum value	K3	2	10M
4	Unit-III				
	a	Write a Java program to demonstrate inheritance by creating a base class Person with attributes like name and age, and a derived class Student that adds attributes like studentID and grade. Include methods in both classes to display their respective details and show how the derived class inherits properties and methods from the base class	K3	3	10M

5	OR				
	b	Write a Java program using 2D array to multiply two matrices	K2	3	10M
	Unit-IV				
5	a	Explain the purpose and functionality of the exception handling keywords try, catch, finally, throw, and throws in Java, provide examples of how they are used to handle errors during program execution	K2	4	10M
	OR				
	b	What are packages in Java? Explain their purpose, types, and how they are created and used in a Java program, with an example to illustrate their significance.	K1	4	10M
6	Unit-V				
	a	Explain String Handling methods with Suitable Examples? How to Identify whether a sub-string is present in a main-string or not?	K2	5	10M
	OR				
	b	What are the states in the lifecycle of a thread? Explain with a neat diagram? Create a thread that prints odd numbers up to N	K2	5	10M

KL: Blooms Taxonomy Knowledge Level

CO: Course Outcome

M: Marks

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

Sub Code: R23CC2106

ARTIFICIAL INTELLIGENCE

Time: 3-hours

(CSE(AI ML), AI, AI ML)

Max. Marks: 70

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

R23

PART-A

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

Q.No		Questions	KL	CO	M
1	a	State list of AI problems facing by Enterprises.	1	1	2M
	b	Draw a structure of simple reflex Agent.	1	1	2M
	c	Justify how searching helps for solutions.	1	2	2M
	d	What are the problems in game playing?	1	2	2M
	e	Give an example with description to the Atomic sentence.	1	3	2M
	f	What is the mass function of Dempster-Shafer theory?	1	3	2M
	g	Address the key components of First Order Logic.	1	4	2M
	h	What are the process steps for learning from Observations?	1	4	2M
	i	What are common pitfalls in planning an expert system?	1	5	2M
	j	Why are Heuristics useful for problem solving?	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) Illustrate the perspectives of AI	2	1	5M
		ii) Describe in detail about Goal Based agent and Learning Agent structures.	2	1	5M
	OR				
	b	i) Elaborate the problems of AI.	2	1	5M
		ii) Write a short note on Agent Terminology and Rationality.	2	1	5M
3	Unit-II				
	a	i) Illustrate the process of A* search algorithm with its advantages and disadvantages.	2	2	5M
		ii) How apply Alpha-beta pruning for two-player search tree? Describe its working in detail.	2	2	5M
	OR				
	b	i) Describe the process of depth First Search with its advantages and disadvantages.	2	2	5M
		ii) How does apply Min-Max algorithm in Tic-Tac Game? Illustrate in detail.	2	2	5M
4	Unit-III				
	a	i) Explain in detail about Quantifiers in Predicate logic.	2	3	5M
		ii) If cancer corresponds to one's age, how can determine the probability of cancer more accurately using Bayes' theorem? Illustrate.	2	3	5M

	OR																																																																																																																																																																																					
b	i) How semantic Nets are useful in AI to represent knowledge and understand relationships? Illustrate with a case study.											2	3	5M																																																																																																																																																																								
	ii) Discuss in detail about the leading causes of uncertainty to occur in the real world.											2	3	5M																																																																																																																																																																								
5	Unit-IV																																																																																																																																																																																					
	a	i) Construct a decision tree for deciding whether to wait for a table at a restaurant.											3	4	5M																																																																																																																																																																							
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ii) Illustrate how forward chaining is performed with example.											2	4	5M																																																																																																																																																																									
OR																																																																																																																																																																																						
b	i) How could evaluate the Effectiveness of Semantic Networks, Frames, and Inheritance in Knowledge Representation? Illustrate.											3	4	5M																																																																																																																																																																								
	ii) Illustrate the process of how could infer Socrates is mortal as new information from the following set of knowledge base and rules. Facts: Human(Socrates) Rules: $\forall x(\text{Human}(x) \rightarrow \text{Mortal}(X))$											3	4	5M																																																																																																																																																																								
6	Unit-V																																																																																																																																																																																					
	a	i)How MYCIN uses backward chaining to diagnose bacterial infections? Illustrate											2	5	5M																																																																																																																																																																							
		ii)Why are expert system important? Describe components and architecture of expert system.											2	5	5M																																																																																																																																																																							
	OR																																																																																																																																																																																					
	i)How XCON is used to select the appropriate hardware and software components based on the customer's requirements? Explain.											2	5	10 M																																																																																																																																																																								

KL: Blooms Taxonomy Knowledge Level

CO: Course Outcome

M: Marks

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

R23

Sub Code: R23CE2101 NUMERICAL TECHNIQUES & STATISTICAL METHODS

Time: 3 hours

(CE)

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 Explain the general Iteration method.	1	1	2M
	b Define Bisection method.	1	1	2M
	c Explain Trapezoidal rule.	1	2	2M
	d Explain Euler's method.	1	2	2M
	e Define Probability mass function.	1	3	2M
	f Define Continuous random variables.	1	3	2M
	g Define sampling distribution of mean.	1	4	2M
	h Define population.	1	4	2M
	i Explain t- test for single population mean.	1	5	2M
	j Explain type-I and type-II errors.	1	5	2M

PART-B

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

Q.No	Questions	KL	CO	M
2	Unit-I			
	a i)Find a root of $f(x)=xe^x - 1=0$ using Bisection method, correct to three decimal places.	3	1	5M
	ii)Explain the Newton backward interpolation formula.	2	1	5M
	OR			
	b i)find the root of equation $2x=\cos x+3$ correct to three decimal places in Iterative method.	3	1	5M
	ii)Explain the Lagrange's interpolation formula.	2	1	5M
3	Unit-II			
	a i)Find $y(0.1)$ for the differential equation $\frac{dy}{dx}=xy^2-1, y(0)=1$ using Taylor's series method.	3	2	5M
	ii)Determine the value of y when $x=0.1$ given that $y(0)=1$ and $y'=x^2+y$ using modified Eluer's method.	3	2	5M
	OR			
	b i) Find $y(0.1)$ for the differential equation $\frac{dy}{dx}=xy^2, y(0)=1$ using RK method of fourth order.	3	2	10M

4	Unit-III				
	a	i) A sample of 4 items is selected at random from a box containing 12 items of which 5 are defective. Find the Expected number of defective items.	3	3	5M
		ii) For the continuous probability function $f(x)=k x^2 e^{-x}$ when $x \geq 0$, find (i) k (ii) Mean	3	3	5M
	OR				
	b	i) 20% of items produced from a factory are defective. Find the probability that in a sample of 5 chosen at random (I) none is defective (II) one is defective	3	3	5M
		ii) If X is a Poisson variable such that a) $P(X=2)=9P(X=4)+90P(X=6)$. Find the mean and variance.	3	3	5M
5	Unit-IV				
	a	i) A population consists of four numbers 3, 7, 11, 15 by drawing samples of size two with replacement. Determine (I) The Population mean (II) The population standard deviation (III) The mean of sampling distribution of means	3	4	5M
		ii) Find 95% confidence limits for the mean of a normality distributed population from which the following sample was taken 15, 17, 10, 18, 16, 9, 7, 11, 13, 14.	3	4	5M
	OR				
	b	i) A normal population has a mean of 0.1 and standard deviation of 2.1. Find the probability that mean of a sample of size 900 will be negative.	3	4	5M
		ii) A random sample of size 100 is taken from an infinite population having the mean $\mu = 76$ and the variance $\sigma^2 = 256$. What is the probability that will be between 75 and 78.	3	4	5M
6	Unit-V				
	a	i) 20 people were attacked by a disease and only 18 survived will you reject the hypothesis is that the survival rate if attacked by this diseases is 85% in favour of the hypothesis that is more at 5% level.	3	5	5M
		ii) Among 900 people in a state 90 are found to be chapati eaters. Construct 99% confidence interval for the true proportion.	3	5	5M
	OR -				
	b	i) A random sample of six steel beams has a mean compressive strength of 58392 p.s.i. (pounds per square inch) with a standard deviation of 648 p.s.i. use this information and the level of significance $\alpha = 0.05$ to test whether the true average compressive strength of the steel from which this sample came is 58000 p.s.i. assume normality.	3	5	5M
		ii) A manufacturer claims that only 4% of his products are defective. A random samples of 500 were taken among which 100 were defective. Test the hypothesis at 0.05 level.	3	5	5M

KL: Blooms Taxonomy Knowledge Level

CO: Course Outcome

M: Marks

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

R23

Sub Code: R23CE2103

SURVEYING

Time: 3 hours

(CE)

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 are the objectives of surveying?	K1	1	2M
	b	Explain the term "ranging" in linear measurements.	K1	1	2M
	c	Define a contour and list its uses.	K1	2	2M
	d	List the different types of leveling?	K1	2	2M
	e	Define curvature correction and refraction correction.	K1	3	2M
	f	Explain the importance of taking back sights and fore sights in leveling.	K1	3	2M
	g	List the advantages of a total station?	K1	4	2M
	h	Define LiDAR. What is its application in modern surveying?	K1	4	2M
	i	Discuss the purpose of a stereoscope in photogrammetry?	K1	5	2M
	j	Explain mosaics in photogrammetry?	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																		
	a	i) Explain the principles of surveying with appropriate examples.	K2	1	5M														
		ii) Describe the process of applying tape corrections. Provide examples.	K3	1	5M														
	OR																		
	b	i) Below are the bearings observed in a traverse survey conducted with a prismatic compass at a place where local attraction was suspected?	K3	1	10 M														
		<table><tr><th>Line</th><th>Fore Bearing</th><th>Back Baring</th></tr><tr><td>PQ</td><td>124°30 1</td><td>304°301</td></tr><tr><td>QR</td><td>68°151</td><td>246°01</td></tr><tr><td>RS</td><td>310°301</td><td>138°151</td></tr><tr><td>SP</td><td>200°151</td><td>17°451</td></tr></table>				Line	Fore Bearing	Back Baring	PQ	124°30 1	304°301	QR	68°151	246°01	RS	310°301	138°151	SP	200°151
Line		Fore Bearing				Back Baring													
PQ		124°30 1				304°301													
QR		68°151				246°01													
RS		310°301				138°151													
SP	200°151	17°451																	
At what stations do you suspect local attraction? Find the corrected bearings of the lines.																			
Unit-II																			
3	a	i) Explain the methods of contouring. Use sketches to elaborate.	K2	2	5M														
		ii) Describe the step-by-step procedure for determining the capacity of a reservoir.	K3	2	5M														

	OR										
	b	i) The following offsets were taken from a chain line to an irregular boundary:						K3	2	5M	
		Distance (m)		0	20	40	60				80
		Offset (m)		3	4	6	5				4
Determine the area enclosed using the trapezoidal rule.											
	ii) Explain the method of determining earthwork volume using the cross-section method.						K2	2	5M		
4	Unit-III										
	a	i) Explain the permanent adjustments of a theodolite.						K2	3	5M	
		ii) Describe the process of measuring a horizontal angle using the repetition method.						K3	3	5M	
	OR										
	b	i) Discuss the steps involved in determining the elevation of a point using trigonometrical leveling when the base is inaccessible?						K2	3	5M	
		ii) A closed traverse is performed, and the following data is obtained:						K3	3	5M	
		Line		Length (m)		Bearing					
		AB		200		45°					
		BC		150		135°					
		CD		180		225°					
DA		220		315°							
Perform a traverse adjustment using Bowditch's rule.											
5	Unit-IV										
	a	i) Explain the necessity of compound curves and discuss their elements.						K2	4	5M	
		ii) Describe the method of setting out a simple curve using offsets from tangents.						K3	4	5M	
	OR										
	b	i) Briefly describe the principle and applications of drone surveys in civil engineering.						K2	4	5M	
		ii) Discuss the working principle and advantages of electronic distance measurement (EDM) instruments.						K3	4	5M	
6	Unit-V										
	a	i) Explain the concept of tilt displacement in aerial photography.						K2	5	5M	
		ii) A vertical photograph was taken from a height of 2000 m above mean sea level. The focal length of the camera is 20 cm. Determine the scale of the photograph.						K3	5	5M	
	OR										
	b	i) What is aerial triangulation? Explain its significance in photogrammetry.						K2	5	5M	
		ii) A vertical aerial photograph shows a tower of height 50 m. The displacement of the top of the tower is 10 mm on the photograph. The flying height is 1000 m above ground level. Calculate the radial distance of the tower from the principal point.						K3	5	5M	

KL: Blooms Taxonomy Knowledge Level

CO: Course Outcome

M: Marks

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

R23

Sub Code: R23CE2104

STRENGTH OF MATERIALS

Time: 3 hours

(CE)

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	Find the elongation of the bar due its self-weight.	K1	CO1	2M
	b	What is thermal stress?	K1	CO1	2M
	c	What is mean by positive or sagging BM?	K2	CO2	2M
	d	Define point of contra flexure.	K1	CO2	2M
	e	Define Shear centre.	K1	CO3	2M
	f	Write section modulus formula for rectangular section	K1	CO3	2M
	g	What are the different methods of finding slope and deflection of a cantilever?	K3	CO3	2M
	h	What are the important points in finding slope and deflection by Macaulay's Method?	K2	CO4	2M
	i	What do you mean by thick compound cylinder?	K2	CO4	2M
	j	Write about radial stresses.	K2	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
2	Unit-I				
	a	Draw stress - strain diagram for mild steel. Indicate salient points and define them.	K2	CO1	10M
	OR				
	b	Derive relation between three elastic moduli.	K2	CO1	10M
3	Unit-II				
	a	A simply supported beam 6 m long is carrying a uniformly distributed load of 5 kN/m over a length of 3 m from the right end. Draw shear force and bending moment diagrams for the beam and also calculate the maximum bending moment on the beam.	K1	CO2	10M
	OR				
	b	A cantilever beam of 2 m long carries a uniformly distributed load of 1.5 kN/m over a length of 1.6 m from the free end. Draw shear force and bending moment diagrams for the beam.	K3	CO2	10M
4	Unit-III				
	a	Obtain the shear stress distribution for a rectangular cross section 230X400mm subjected to a shear force of 40KN. Calculate the maximum and average shear stress.	K3	CO3	10M

	OR				
	b	Explain about different types of beams with different loading conditions	K2	CO3	10M
5	Unit-IV				
	a	Write the steps involved in Macaulay's method	K3	CO4	10M
	OR				
	b	A Simply supported beam of span 6 m loaded point load of 12 kN at its centre, in addition to the UDL of 6 kN/m for the whole span. Find slopes at the supports and maximum deflection.	K3	CO4	10M
6	Unit-V				
	a	A spherical shell of internal diameter 750 mm and of thickness 9 mm is subjected to an internal pressure of 1.8 N/mm ² . Determine the increase in diameter and increase in Volume. Take $E = 2 \times 10^5 \text{ N/mm}^2$, $\nu = 0.33$	K3	CO5	10M
	OR				
	b	Derive the Lames equations from the fundamentals in a thick cylindrical shell for the given radii (r_1 and r_2) and internal fluid pressure, p .	K3	CO5	10M

KL: Blooms Taxonomy Knowledge Level

CO: Course Outcome

M: Marks

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

Sub Code: R23CE2105

FLUID MECHANICS

Time: 3 hours

(CE)

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	Define specific weight and specific gravity.	K1	1	2M
	b	Explain the variation of viscosity with temperature.	K1	1	2M
	c	State Pascal's law and its practical applications.	K1	2	2M
	d	Differentiate between Piezometer and U-tube Manometer.	K1	2	2M
	e	Distinguish between streamline, pathline, and streakline.	K1	3	2M
	f	Define velocity potential function and its significance in fluid flow.	K1	3	2M
	g	Write the equation of motion for fluid flow (Euler's equation).	K1	4	2M
	h	State the significance of Reynolds Number in fluid flow.	K1	4	2M
	i	List the major and minor energy losses in a pipeline.	K1	5	2M
	j	Explain the concept of equivalent length in a pipeline system.	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				
	a	i) Derive the expression for Newton's law of viscosity.	K2	1	5M
		ii) Discuss the effects of surface tension and capillarity in practical applications.	K3	1	5M
	OR				
	b	i) Explain the concept of bulk modulus of elasticity and its importance.	K2	1	5M
		ii) A plate 1.5 m x 1.5 m moves at 0.5 m/s over a fixed plate with a fluid layer of thickness 0.01 m between them. If the dynamic viscosity of the fluid is 0.1 Pa-s, calculate the shear stress and the force required to move the plate.	K3	1	5M
3	Unit-II				
	a	i) Derive the expression for hydrostatic force on an inclined plane surface.	K2	2	5M
		ii) A differential U-tube manometer contains water (specific gravity = 1) and oil (specific gravity = 0.8). The difference in height of the two liquid columns is 0.2 m. Calculate the pressure difference between the two points.	K3	2	5M
	OR				
	b	i) Compare the working principles of a U-tube manometer and a differential manometer.	K2	2	5M
		ii) A rectangular block of wood 1.5 m x 1 m x 0.6 m weighs 8000 N. Determine the water immersion depth when the block floats. Take the density of water as 1000 kg/m ³ .	K3	2	5M

4	Unit-III				
	a	i) Derive the continuity equation for a three-dimensional incompressible flow.	K2	3	5M
		ii) Water flows through a pipe with a diameter of 0.3 m at a velocity of 2 m/s. The pipe then narrows to a diameter of 0.15 m. Calculate the velocity of water in the narrower section, assuming incompressible flow.	K3	3	5M
	OR				
	b	i) Define stream function and derive its relationship with velocity components.	K2	3	5M
		ii) Discuss the differences between rotational and irrotational flows with examples.	K3	3	5M
5	Unit-IV				
	a	i) Water flows through a horizontal pipe of varying cross-section. At section A, the velocity is 3 m/s and the pressure is 120 kPa. At section B, the velocity is 5 m/s. Calculate the pressure at section B. Assume the density of water is 1000 kg/m ³ .	K3	4	5M
		ii) Explain the working of a Venturimeter and its applications.	K2	4	5M
	OR				
	b	i) A venturimeter is installed in a pipeline carrying water. The diameters of the inlet and throat are 0.3 m and 0.15 m, respectively. If the pressure difference between the inlet and throat is 2.5 kPa, calculate the flow rate. Assume the density of water is 1000 kg/m ³ .	K3	4	5M
		ii) Discuss the practical significance of Froude Number and Mach Number in fluid dynamics.	K2	4	5M
6	Unit-V				
	a	i) A water pipeline of 200 m length and 0.2 m diameter has a flow velocity of 2 m/s. If the Darcy friction factor is 0.02, calculate the head loss due to friction.	K3	5	5M
		ii) Explain the concepts of hydraulic gradient line and total energy line with a diagram.	K2	5	5M
	OR				
	b	i) Discuss the arrangement of pipes in parallel and series with their advantages.	K2	5	5M
		ii) Two pipes, each 100 m long, are arranged in parallel. The diameters of the pipes are 0.2 m and 0.15 m, respectively. If the flow rate in the larger pipe is 0.1 m ³ /s, calculate the flow rate in the smaller pipe. Assume the friction factor is the same for both pipes.	K3	5	5M

KL: Blooms Taxonomy Knowledge Level

CO: Course Outcome

M: Marks

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 transcendental equation? Given an example.	K1	1	2M
	b	Write the merits & demerits of the Lagrange's interpolation formula.	K3	1	2M
	c	Demonstrate the formula for Trapezoidal rule.	K3	2	2M
	d	Compute the value of $y(0.1)$ using Euler's method from $\frac{dy}{dx} = x + y, y(0) = 1$.	K3	2	2M
	e	Verify whether the function $f(z) = z\bar{z}$ is analytic or not.	K3	3	2M
	f	Show that the real part of an analytic function satisfies Laplace equation.	K3	3	2M
	g	Demonstrate Taylor's series.	K3	4	2M
	h	Define an essential singularity and give an example.	K1	4	2M
	i	Compute the invariant points of the transformation $w = \frac{2z+6}{z+7}$	K3	5	2M
	j	Define conformal mapping	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														
	a	i) Compute an approximate value of the real root of $x^3 - x - 1 = 0$ by Bisection method.	K3	1	5M										
		ii) Using Newton-Raphson method, Compute a real root of $xe^x - \cos x = 0$	K3	1	5M										
	OR														
	b	i) Evaluate $y(1.6)$ using Newton's Forward Difference formula from the table <table><tr><td>x</td><td>1</td><td>1.4</td><td>1.8</td><td>2.2</td></tr><tr><td>y</td><td>3.49</td><td>4.82</td><td>5.96</td><td>6.5</td></tr></table>	x	1	1.4	1.8	2.2	y	3.49	4.82	5.96	6.5	K5	1	5M
		x	1	1.4	1.8	2.2									
y	3.49	4.82	5.96	6.5											
ii) Using Lagrange is interpolation formula compute the value of $y(10)$ from the following table: <table><tr><td>x</td><td>5</td><td>6</td><td>9</td><td>11</td></tr><tr><td>y</td><td>12</td><td>13</td><td>14</td><td>16</td></tr></table>	x	5	6	9	11	y	12	13	14	16	K3	1	5M		
x	5	6	9	11											
y	12	13	14	16											

Unit-II					
3	a	i) Evaluate $\int_0^2 e^{-x^2} dx$ using Simpson's $\frac{1}{3}^{rd}$ rule taking $h = 0.25$	K5	2	5M
		ii) Compute $y(0.1)$ using Taylor's series method given that $y' = y^2 + x$ and $y(0) = 1$.	K3	2	5M
	OR				
	b	Given that $y' = y - x, y(0) = 2$ compute $y(0.2)$ using 4 th order Runge Kutta method.	K3	2	10 M
Unit-III					
4	a	i) If $f(z)$ is a regular function of z , show that $\left(\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2}\right) f(z) ^2 = 4 f'(z) ^2$	K3	3	5M
		ii) Find Analytic function $f(z) = u + iv$ whose imaginary part is $v = \sinh x \cos y$		3	5M
	OR				
	b	i) Evaluate $\int_0^{1+i} (x^2 + iy) dz$ along parabola $y = x^2$	K5	3	5M
ii) Evaluate $\int_C \frac{\sin^2 z}{\left(z - \frac{\pi}{6}\right)^3} dz$		K5	3	5M	
Unit-IV					
5	a	i) Construct $\sin z$ as a Taylor series about $z = \frac{\pi}{4}$.	K3	4	5M
		ii) Construct the Laurent's series for $f(z) = \frac{7z-2}{(z+1)z(z-2)}$ about the point $z = -1$ in the region $1 < z+1 < 3$.	K3	4	5M
	OR				
	b	Evaluate $\oint_C \frac{\sin \pi z^2 + \cos \pi z^2}{(z-1)(z-2)} dz$, where 'C' is the circle $ z = 3$ by using Cau- chy's residue theorem.	K5	4	10 M
Unit-V					
6	a	i) Discuss the transformation $w = \sin z$	K2	5	5M
		ii) If $w = \frac{1+iz}{1-iz}$ then find the image of $ z < 1$	K3	5	5M
	OR				
	b	i) Evaluate the bilinear transformation which maps the points $(-1, 0, 1)$ into the points $(0, i, 3i)$	K5	5	5M
ii) Show that the function $w = \frac{4}{z}$ transforms the straight line $x = c$ in the z -plane into a circle in the w -plane.		K3	5	5M	

KL: Blooms Taxonomy Knowledge Level

CO: Course Outcome

M: Marks

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

Sub Code: R23EE2103

ELECTROMAGNETIC FIELD THEORY

Time: 3 hours

(EEE)

Max. Marks: 70

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

PART-A

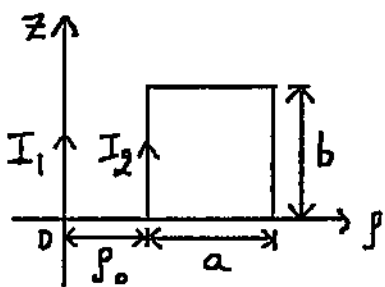
Answering all the questions from Part-A is compulsory (10 x 2M = 20M)

Q.No		Questions	KL	CO	M
1	a	Determine divergence of $A = yza_x + 4xya_y + ya_z$ at $P(1, -2, 3)$.	1	1	2M
	b	Define point form of Gauss's law.	1	1	2M
	c	Prove that the electrostatic fields are conservative.	1	2	2M
	d	Define Dielectric constant and dielectric strength	1	2	2M
	e	What are the different conditions in which magnetic forces are produced?	1	3	2M
	f	Define point form of Ampere's circuital law.	1	3	2M
	g	Calculate the magnetic energy density in a free space, if the strength of magnetic field is 1000 A/m.	1	4	2M
	h	What is Lorentz's force equation?	1	4	2M
	i	Explain the difference between static and time varying magnetic fields?	1	5	2M
	j	Define displacement current.	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) Find the electric field a distance z above the centre of a circular loop of radius r , which carries uniform line charge ρ_l .	3	1	10M
	OR				
	b	i) Show that $\nabla \times E = 0$. ii) State Coulomb's law. Three point charges $Q_1 = 1\text{mC}$, $Q_2 = 2\text{mC}$ and $Q_3 = -3\text{mC}$ are respectively located at $(0, 0, 4)$, $(-2, 6, 1)$ and $(3, -4, -8)$. Calculate the total force on Q_1 .	3	1	6M
3	Unit-II				
	a	i) Derive expression for electric potential due to an electric dipole.	3	2	5M
		ii) Deduce the expression for the capacitance of a co-axial conductor.	3	2	5M

	OR				
	Derive boundary conditions at the interface of the electric field separated by two different dielectrics.	3	2	10M	
4	Unit-III				
	a	i) State and explain Biot-Savart's law.	3	3	4M
	a	ii) Calculate the magnetic field at the centre of a square loop with length of each side is 3 cm and carries a current of 10 A.	3	3	6M
	OR				
	b	Find the magnetic force experienced by a rectangular current loop due to its neighboring current carrying filament wire placed as shown in below fig.	3	3	10M
					
5	Unit-IV				
	a	Derive self inductance of solenoid and coaxial cable.	3	4	10M
	OR				
	b	Prove that the mutual inductance between the closed wound coaxial solenoids of length l and area A which having turns N_1 and N_2 respectively is $M_{12} = \frac{\mu AN_1 N_2}{l}$.	3	4	10M
6	Unit-V				
	a	i) Derive point form and integral form of static and dynamic induced emfs.	3	5	6M
	a	ii) Find the induced voltage in a conducting loop of radius 20cm lies in $z = 0$ plane in a magnetic field of $B = 10 \cos 377t \mathbf{a}_z$ mWb/m ² .	3	5	4M
	OR				
	b	i) State and prove Poynting theorem	3	5	7M
	b	ii) Find the conduction and displacement current densities of a material having conductivity of 10^{-3} S/m and $\epsilon_r = 2.5$. If the electric field in the material is $E = 5.8 \times 10^{-6} \sin(9 \times 10^9 t)$ V/m.	3	5	3M

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

Sub Code: R23EE2104

ELECTRICAL CIRCUIT ANALYSIS-II

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	What is the difference is between balanced and un balanced 3 phase system?	1	1	2M
	b	What is the effect of power factor on two wattmeter method?	4	1	2M
	c	Find Laplace transform of $\sinh \Phi t$.	1	2	2M
	d	What is time constant? Illustrate through an example.	2	2	2M
	e	Draw an equivalent circuit of two ports in terms of (a) impedance parameters and (b) admittance parameters.	3	3	2M
	f	Define reciprocity and symmetry.	1	3	2M
	g	Derive an exponential form of Fourier series. Write the equation for evaluating the coefficients.	1	4	2M
	h	How can a complex wave be represented mathematically?	2	4	2M
	i	Define tie set and cut set with examples.	1	5	2M
	j	How are filters classified?	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) A delta connected 3 phase load has an impedance of $(7.07+j7.07)$ ohm in each phase. It is fed from a 173.2 volt 3 phase balanced supply. Find (a) line current (b) total power and (c) power factor.	2	1	5M
		ii) A 3 phase balanced star connected load is connected to a 240 V 3 phase supply. The total volt ampere is 6000 VA and total active power is 4800 W. Find (a) power factor (b) resistance and reactance of load in each phase.	3	1	5M
	OR				
	b	i) A 3 phase load has a resistance of 10 ohm in each phase and is connected in (i) star and (ii) delta against a 400 V 3 phase supply. Compare the power consumed in both cases.	2	1	5M
		ii) Explain about measurement of power and power factor of a balanced three phase load by using two wattmeters.	2	1	5M
3	Unit-II				
	a	i) A 10 ohm and 40 H are connected in series across a battery. At the instant of closing the switch, the current increases at the rate of 4 A/sec. Find (a) supply voltage, (b) rate of growth of current when 10 A flow in the circuit.	4	2	5M
		ii) Derive step response of R-C circuit to dc excitation.	3	2	5M
	OR				
	b	i) A voltage $V = e^{-t} \sin t$ is applied to a series circuit of 1 ohm resistance and 1 Henry inductance. Find $i(t)$.	3	2	5M

		ii)A circuit has a resistance of 1000 ohm and capacitance of 0.1 μ F. At t=0 it is connected to a 12 V battery. Find (a) current at t=0 (b) rate of change of current at t=0 (c) voltage across capacitor at t=0.1 milli sec.	3	2	5M
4	Unit-III				
	a	i) The Z parameters of a two port network are : $Z_{11}=2.1$ ohm, $Z_{12}=Z_{21}=0.6$ ohm and $Z_{22}=1.6$ ohm. A 2 ohms is connected across port 2. (a) What voltage must be applied at port 1 to produce a current of 0.5 A in 2 ohms. (b) Draw an equivalent circuit of this two port.	3	3	5M
		ii) What are transmission parameters? Why does negative sign appear in the equations of a two port network?	4	3	5M
	OR				
	b	i)Derive ABCD parameters in cascade connection.	4	3	5M
		ii) The H parameters of a circuit are $h_{11}=8/3$ ohms, $h_{22}=1/3$ mho, $h_{12}=1/3$ and $h_{21}=-1/3$. Find Y parameters.	4	3	5M
5	Unit-IV				
	a	i)A voltage wave has a value 100 between 0 and π and zero from π and 2π . Find the first four terms of Fourier series of the wave.	3	4	5M
		ii) The sum of two currents is $15 \sin (wt-10)+10 \sin(3wt+60)$ A. If one current is $10 \sin (wt+30) - 5 \sin (3wt-40)$, Find (a) other current (b) RMS current of each currents.	3	4	5M
	OR				
b	i)A current $i=5 \sin 100t +3 \sin 300t + 2 \sin 500t$ flows through a in a series connection consists of 10 ohms and 0.02 H. Find r.m.s value of applied voltage and average power.	3	4	10 M	
6	Unit-V				
	a	i) Define the following terms with an example (a) branch (b) tree (c) planar and non planar graph (e) Incidence matrix.	1	5	5M
		ii)A constant K band elimination filter has a characteristic resistance of 100 ohms and stops signal in the 1000 Hz to 3000 Hz range. Find the circuit parameters of the filter.	4	5	5M
	OR				
	b	i)Explain the procedure of obtaining fundamental Tie set matrix with an example.	2	5	5M
		ii)Draw T and π sections of constant K low pass filter. Derive equations for cut off frequency, attenuation and phase constant and characteristic impedance.	4	5	5M

KL: Blooms Taxonomy Knowledge Level

CO: Course Outcome

M: Marks

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

R23

Sub Code: R23EE2105

DC MACHINES & TRANSFORMERS

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	Differentiate the lap winding and wave windings in DC generators	K2	1	2M
	b	Explain the working principle of DC Motor and how to find the direction of rotation of motor?	K2	1	2M
	c	Draw the speed-torque characteristics of DC shunt and series motors.	K2	2	2M
	d	What is the necessity of starter in DC motor?	K2	2	2M
	e	Differentiate between Shell type and Core type transformers.	K2	3	2M
	f	What is all-day efficiency? Explain its significance	K2	3	2M
	g	What are the essential conditions to be fulfilled for operating two single transformers in parallel?	K1	4	2M
	h	State the merits and demerits of an Auto transformer over two winding transformer.	K1	4	2M
	i	List the applications of three phase transformers.	K1	5	2M
	j	What is an open delta system? What are the applications of this system?	K2	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) Classify the DC generators according to their field excitation and draw the single-line diagram of each one.	K2	1	5M
		ii) Determine the internal characteristics from external characteristics of a DC shunt generator.	K2	1	5M
	OR				
	b	i) Discuss clearly the load characteristics of DC shunt, series and compound generators.	K2	1	5M
		ii) Briefly explain different methods to improving commutation in DC generators.	K2	1	5M
3	Unit-II				
	a	i) An 8-pole DC motor has a wave connected armature with 90 slots, each slot containing 8 conductors. The flux per pole is 25 mWb and the armature has a resistance of 0.15 Ω . When the motor is connected to 240 V supply and the armature draws a current of 85 A driving a load of 18 kW. Calculate the Speed, Armature torque, and Shaft torque.	K3	2	5M
		ii) Enumerate the various losses in a DC motor and derive the expression for the efficiency of DC Motor.	K2	2	5M

	OR				
	b	i) Explain Swinburn's test on DC Machine when the machine act as motor with suitable diagram.	K2	2	5M
		ii) The Hopkinson's test on two machines gave the following results for full load: Line voltage 250 V, line current (excluding field current)= 60 A. Motor armature current = 48 A. Field currents are 6 A and 4.8 A. Calculate the efficiency of each machine. Armature resistance of each machine = 0.03 Ω .	K3	2	5M
4	Unit-III				
	a	i) Develop and explain the phasor diagram of a single-phase transformer under loaded conditions. Assume leading power factor load.	K2	3	5M
		ii) Draw the equivalent circuit of the transformer and explain how you have achieved it.	K2	3	5M
	OR				
	b	i) Derive the expression for voltage regulation of a transformer and also obtain the conditions for zero regulation and maximum regulation.	K2	3	5M
		ii) A single-phase transformer is rated at 150 KVA, 5000/250V. The full – load copper losses are 2500W and iron losses are 1300 W. Find efficiency at full-load at unity power factor and full-load at 0.85 Power factor lagging.	K2	3	5M
5	Unit-IV				
	a	i) Open and short-circuit tests performed on a 500 kVA, 6600/2300 V, 50 Hz transformer yielded the following data: No-load loss = 3.5 kW; Full-load short circuit loss = 4.5 kW. Calculate the load (kVA) at which the transformer efficiency would be maximum for a given power factor. Calculate this efficiency for a power factor of 0.8.	K3	4	5M
		ii) Derive an expression for load sharing between two transformers of equal voltage ratios when they are connected in parallel.	K2	4	5M
	OR				
	b	i) A 5 kVA, 220/440V transformer when tested gave the following results: OC Test, measurements on the LV side: 150W, 3A, 220V SC Test, measurements on the HV side: 300W, 12.6A, 45V Calculate % voltage regulation and efficiency at full load and 0.85 pf lagging.	K3	4	5M
		ii) Explain the principle of operation of an Auto – transformer and how come this is different from normal single-phase transformer	K2	4	5M
6	Unit-V				
	a	i) Explain in detail about open delta connection of 3-phase transformer.	K2	5	5M
		ii) Give the equivalent circuit and applications of 3- winding transformer.	K2	5	5M
	OR				
	b	i) Explain with necessary diagrams how two 3- phase transformers can be used to convert a 3- phase supply to a 2- phase one. If the load is balanced on one side, show that it will be balanced on other side.	K2	5	5M
		ii) Explain with the help of connection diagrams the operation of off-load and on-load tap changers.	K2	5	5M

KL: Blooms Taxonomy Knowledge Level

CO: Course Outcome

M: Marks

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

R23

Sub Code: R23ME2101

NUMERICAL METHODS & TRANSFORM TECHNIQUES

Time: 3 hours

(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	Demonstrate Bisection method	K3	1	2M
	b	Illustrate the value of $\Delta \tan^{-1} x$	K5	1	2M
	c	Demonstrate the formula for Trapezoidal rule.	K3	2	2M
	d	Demonstrate Euler's method.	K3	2	2M
	e	Compute $L[e^{-2t}(2\cos 5t - 3\sin 5t)]$	K3	3	2M
	f	Compute $L^{-1}\left[\frac{e^{-s}}{(s+1)^3}\right]$	K3	3	2M
	g	Compute the Fourier constants b_n for $x \sin x$ in $(-\pi, \pi)$.	K3	4	2M
	h	Expand $f(x) = x$ in $(0,1)$ as a Fourier sine series.	K3	4	2M
	i	Compute the Fourier cosine transform of e^{-3x}	K3	5	2M
	j	Demonstrate Change of scale property of Fourier transforms.	K3	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) Compute a real root of $xe^x = 2$ using method of false position.							K3	1	5M															
		ii) Using Newton-Raphson's method, compute a positive root of $xe^x - \cos x = 0$							K3	1	5M															
	OR																									
	b	i) Using Newton's forward interpolation formula, compute the value of $f(2.5)$, given that							K3	1	5M															
		<table><tr><td>x</td><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td></tr><tr><td>y</td><td>0</td><td>1</td><td>16</td><td>81</td><td>256</td><td>625</td><td>1296</td></tr></table>										x	0	1	2	3	4	5	6	y	0	1	16	81	256	625
x		0	1	2	3	4	5	6																		
y	0	1	16	81	256	625	1296																			
ii) Compute the unique polynomial $P(x)$ of degree 2 such that $P(0) = 2$, $P(1) = 3, P(2) = 12$ using Lagrange interpolation formula.																										
3	Unit-II																									

	a	i) Evaluate $\int_0^6 \frac{1}{1+x} dx$, by using (i) Simpson's $\frac{1}{3}$ rule (ii) Simpson's $\frac{3}{8}$ rule (iii) Trapezoidal rule.	K5	2	10M
	OR				
	b	i) Using Runge – Kutta method, compute $y(0.2)$ for the equation $\frac{dy}{dx} = \frac{y-x}{y+x}$, $y(0)=1$ take $h=0.2$.	K3	2	5M
		ii) Compute $y(0.1)$ if $\frac{dy}{dx} = x - y^2$, $y(0)=1$ by using Euler's method.	K3	2	5M
Unit-III					
4	a	i) Find the Laplace transform of $\frac{e^{-at} - e^{-bt}}{t}$	K3	3	5M
		ii) Apply Convolution theorem, evaluate $L^{-1} \left[\frac{s^2}{(s^2 + a^2)(s^2 + b^2)} \right]$.	K5	3	5M
	OR				
	b	Solve by the method of Laplace transform $y'' - 3y' + 2y = 4$, where $y(0) = 2, y'(0) = 3$.	K3	3	10 M
Unit-IV					
5	a	i) Construct the Fourier series for the function $f(x) = x^2, 0 < x < 2\pi$.	K3	4	5M
		ii) Expand the Fourier series expansion for the function $f(x) = x - x^2, -1 < x < 1$.	K3	4	5M
	OR				
	b	i) Obtain the Fourier Cosine series for $f(x) = x \sin x, 0 < x < \pi$.	K3	4	5M
		ii) Obtain the half range sine series for the function $f(x) = \begin{cases} \frac{1}{4} - x, 0 \leq x \leq \frac{1}{2} \\ x - \frac{3}{4}, \frac{1}{2} \leq x \leq 1 \end{cases}$	K3	4	5M
Unit-V					
6	a	i) Find the Fourier transform of $f(x) = \begin{cases} 1 - x^2, x \leq 1 \\ 0, x > 1 \end{cases}$. Hence evaluate $\int_0^\infty \frac{x \cos x - \sin x}{x^3} \cos \frac{x}{2} dx$.	K5	5	10 M
	OR				
	b	i) Deduce the integrals $\int_0^\infty \frac{\cos px}{a^2 + p^2} dp$.	K3	5	5M
		ii) Construct the Fourier cosine transform of $e^{-ax} \cos ax$	K3	5	5M

KL: Blooms Taxonomy Knowledge Level

CO: Course Outcome

M: Marks



NARASARAOPETA ENGINEERING COLLEGE (AUTONOMOUS)

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

Sub Code: R23ME2103

THERMODYNAMICS

Time: 3 hours

(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	Define Zeroth law of thermodynamics	K2	1	2M
	b	Differentiate heat and work	K3	1	2M
	c	Define internal energy and write the units of internal energy	K2	2	2M
	d	Write the first law expression for a system undergoing a cycle	K3	2	2M
	e	What do you understand by entropy? and write the units of entropy	K2	3	2M
	f	State Clausius statement of II law of thermodynamics.	K3	3	2M
	g	Draw the Carnot Cycle on T-S diagram and write expression for efficiency	K4	4	2M
	h	What is the significance of Clausius-Clapeyron equation	K3	4	2M
	i	Clearly differentiate between summer and winter air conditioning systems	K4	5	2M
	j	Explain the process of heating load calculations for an auditorium	K3	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) What is thermal equilibrium? And explain the construction of temperature scales	K2	1	5M
		ii) A quantity of air having a volume of 0.03m^3 at a temperature of 200°C and pressure of 150 N/m^2 is expanded at constant pressure to 0.06 m^3 ; it then expanded adiabatically to 0.12m^3 . Find (i) Temperature and pressure at the end of the adiabatic process. (ii) Work done during each stage assume $\gamma = 1.41$.	K3	1	5M
	OR				
	b	i) Derive an expression for the First Law of thermodynamics applied to a closed system undergoing cyclic process.	K3	1	5M
		ii) 325 kJ of heat is supplied to a system at constant volume. System rejects 365 kJ of heat at constant pressure and 100 J of work is done on it. The system is brought to an initial state by an adiabatic work. Calculate the values of internal energy at all state points. Take initial value as 400 J .	K3	1	5M
	Unit-II				
	a	i) Derive the steady flow energy equation and also brief on assumptions made. Discuss the flow work and shaft work. Write the expressions for the same.	K2	2	10M

3	OR				
	b	i) Define the First law of Thermodynamics for system undergoing change of state and discuss the procedure to estimate the work and heat interactions	K3	2	5M
		ii) A chilled water of 15 kg/s enters the system for air conditioning a tall building with a velocity of 60 m/s at a height of 40m from the ground. The water leaves the system with a velocity of 20 m/s at a height of 70 m. The enthalpies of water entering in and leaving out are 30 KJ/kg and 50 KJ/kg respectively. The rate of work done by a pump in the line is 40 KW. Find out the rate at which heat is removed from the building.	K3	2	5M
4	Unit-III				
	a	i) Water is heated at a constant pressure of 0.7 MPa. The boiling point is 164.97°C. The initial temperature of water is 0°C. The latent heat of evaporation is 2066.3 kJ/kg. Find the increase of entropy of water if the final temperature is steam.	K4	3	5M
		ii) Define COP of a refrigeration system. A manufacturer claims that its refrigerator has a COP of 1.4 when cooling food at 7°C using ambient air at 23°C as a heat sink. Is this claim valid?	K4	3	5M
	OR				
	b	i) Illustrate the processes of Carnot Cycle. A Carnot engine efficiency 40% and temperature of sink 300 K to increase up to 60% calculate the change in temperature of the source.	K3	3	10M
5	Unit-IV				
	a	i) Explain the types of steam calorimeters with neat sketches. And write the applications of calorimeters.	K3	4	5M
		ii) Explain the process of formation of steam taking the example of ice at -10°C to the steam at 250°C. Draw the plots on P-V and T-S diagrams.	K3	4	5M
	OR				
	b	Discuss why the enthalpy of air-vapor mixture remains constant does during an adiabatic saturation process.	K4	4	10M
6	Unit-V				
	a	Draw the vapor compression refrigeration cycle on T-s diagram when the refrigerant is dry and saturated at the end of compression and find an expression for the C.O.P in terms of (i) Temperature and entropies; (ii) Enthalpy.	K3	5	10M
	OR				
	b	Explain the concept of comfort air-conditioning? Draw a rough comfort chart indicating the processes.	K4	5	5M
		Explain the following: i) Heating and dehumidification ii) Cooling and dehumidification processes in psychrometric chart	K4	5	5M

KL: Blooms Taxonomy Knowledge Level

CO: Course Outcome

M: Marks

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

R23

Sub Code: R23ME2104

MECHANICS OF SOLIDS

Time: 3 hours

(ME)

Max. Marks: 70

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

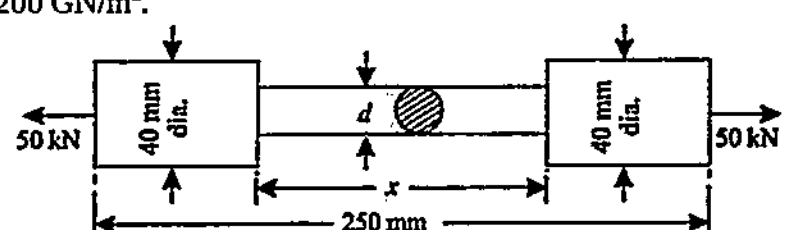
PART-A

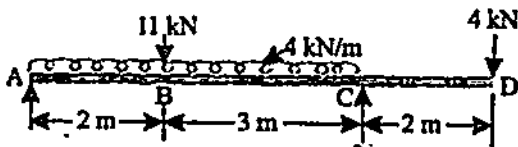
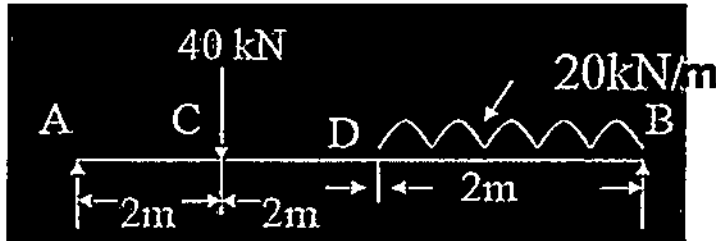
Answering all the questions from Part-A is compulsory (10 x 2M = 20M)

Q.No		Questions	KL	CO	M
1	a	Define modulus of elasticity and modulus of rigidity	1	1	2M
	b	Differentiate proportionality limit and elastic limit	1	1	2M
	c	Types of beams	1	2	2M
	d	Point of contraflexure	1	2	2M
	e	Define pure bending	1	3	2M
	f	Sketch the shear stress distribution for circular cross-section and locate the maximum.	1	3	2M
	g	What are the advantages of Macaulay method over the double integration method	1	4	2M
	h	Define section modulus	1	4	2M
	i	Distinguish between thick and thin cylinders	1	5	2M
	j	What are the different modes of failures of a column?	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) The bar shown in Fig. is subjected to a tensile load of 50 kN. Find the diameter of the middle portion if the stress is limited to 130 MN/m². Find also the length of the middle portion if the total elongation of the bar is 0.15 mm. Take $E = 200 \text{ GN/m}^2$. 	3	1	5M
		ii) Derive the relationship between the moduli of a material.	3	1	5M
	OR				
	b	An Aluminium solid cylinder of 7.5 cm diameter fits loosely inside a steel tube having 10 cm external diameter and 8 cm internal diameter. The steel tube is 0.02 cm long than aluminium cylinder and is 250 cm long before the load is applied. Calculate the safe load which can be placed on a rigid flat plate on the top of the steel tube. Safe stress for steel is 95 MPa and for Aluminium is 65 MPa. $E_{\text{steel}} = 210 \text{ GPa}$, $E_{\text{Al}} = 70 \text{ GPa}$.	3	1	

Unit-II					
3	a	Draw the SFD and BMD for the overhanging beam shown in fig. 	3	2	10M
	OR				
b	Draw the SFD and BMD for the overhanging beam shown in fig. 		3	2	10M
	Unit-III				
4	a	Derive the flexure bending formula by mentioning the assumptions made in it.	3	3	10M
	OR				
b	i) The shear stress is not maximum at the neutral axis in case of a triangular section. Prove this statement.		3	3	5M
	ii) Draw and explain shear stress distribution across I section.		3	3	5M
Unit-IV					
5	a	Find the maximum deflection and the maximum slope for the beam loaded as shown in fig. using Macaulay's method. Take flexural rigidity $EI = 15 \times 10^9 \text{ kN-mm}^2$. 	3	4	10M
	OR				
b	i) Derive the torsion equation for power transmitted by the shaft.		3	4	3M
	ii) Calculate the power that can be transmitted at a 300 r.p.m. by a hollow steel shaft of 75 mm external diameter and 50 mm internal diameter when the permissible shear stress for the steel is 70 N/mm ² and the maximum torque is 1.3 times the mean. Compare the strength of this hollow shaft with that of a solid shaft. The same material, weight and length of both the shafts are the same.		3	4	7M
Unit-V					
6	a	i) Determine the lames equations for cylinder	3	5	10M
	OR				
b	Determine the section of a hollow C.I. cylindrical column 5 m long with ends firmly built in. The column has to carry an axial compressive load of 588.6 KN. The internal diameter of the column is 0.75 times the external diameter. Use Rankine's constant $a = 1 / 1600$, $\sigma_c = 57.58 \text{ KN/cm}^2$ and F.O.S = 6.		3	5	5M
				5	5M

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

Sub Code: R23ME2105

MATERIAL SCIENCE & METALLURGY

Time: 3 hours

(ME)

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	What is solid solution?	1	1	2M
	b	State lever rule.	1	1	2M
	c	What are the effects of carbon on the properties of cast iron?	1	2	2M
	d	Important characteristics of copper alloy	1	2	2M
	e	List any two differences between annealing and normalizing	1	3	2M
	f	What is meant by hardenability of steels?	1	3	2M
	g	Basic steps in Powder Metallurgy	1	4	2M
	h	Brief about the major metal powder characteristics	1	4	2M
	i	Differentiate Thermoplastic and Thermoset polymer	1	5	2M
	j	Define ceramics	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) What is Hume Rothery's rules? Discuss in detail	2	1	5M
		ii) Explain crystal imperfections	2	1	5M
	OR				
	b	Draw the Eutectoid system diagram and label all points, lines and areas. Explain its important features.	2	1	10M
3	Unit-II				
	a	i) Explain the structure and properties of Ductile cast iron	2	2	5M
		ii) Explain the effect of alloying elements on Iron – Iron carbon system?	2	2	5M
	OR				
	b	Write a short note on light weight non-ferrous alloys and discuss the aluminium and its alloys with respect to alloying and heat treatment.	2	2	10M
4	Unit-III				
	a	What are TTT diagrams? How they prepared? What is their significance?	2	3	10M

	OR				
	b	i) What are heat treatment processes? Explain briefly.	2	3	5M
		ii) What is hardenability? Explain the procedure to measure the hardenability.	2	3	5M
5	Unit-IV				
	a	i) Discuss about the powder conditioning methods adopted in Powder metallurgy.	2	4	5M
		ii) Differentiate between the various Mechanical and thermal methods of powder compaction	2	4	5M
	OR				
	b	i) Illustrate with figure the mechanism of atomization.	2	4	5M
		ii) Explain solid state sintering briefly.	2	4	5M
6	Unit-V				
	a	i) Describe the properties and applications of following structural ceramics Silicon carbide and Silicon nitride	2	5	5M
		ii) What are glasses? How they manufactured?	2	5	5M
	OR				
	b	i) What is composite material? How is it classified? Give a short note.	2	5	5M
		ii) Briefly explain top down approaches for producing nanomaterials	2	5	5M

KL: Blooms Taxonomy Knowledge Level

CO: Course Outcome

M: Marks

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

R23

Sub Code: R23EC2101

PROBABILITY THEORY & STOCHASTIC PROCESS

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	When three coins are tossed, the random variable is taken to be the number of heads that result. Find the variance of this random variable.	2	1	2M
	b	A pair of dice are tossed 10 times. Find the probability that a 6 will occur exactly 4 times.	1	1	2M
	c	Give an example of a random variable where its mean value might not equal any of its possible values.	2	2	2M
	d	Define conditional distribution and density functions for random variable X for a given random event of Z.	1	2	2M
	e	What is joint central moment? For what it is uses?	1	3	2M
	f	Write any joint characteristics function uses cases in real time.	1	3	2M
	g	Differentiate deterministic and non-deterministic processes.	2	4	2M
	h	Compare Gaussian and Poisson random process.	2	4	2M
	i	How the effective noise temperature can be estimated and reduced using correlation function	1	5	2M
	j	Which are all spectral characteristics considered for a system and why?	2	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) A random variable Y has a probability density function of the form $f(y) = Ky$ for $0 < y \leq 6$ and $f(y) = 0$ elsewhere. Find the value of K for which this is a valid probability density function.	3	1	5M
		ii) Derive and prove Bayes' theorem.	2	1	5M
	OR				
	b	i) A random variable θ is uniformly distributed over a range of 0 to 2π . Another random variable X is related to θ by $X = \cos\theta$ Find the probability density function of X. and Find the mean value of X	2	1	6M
		ii) A manufacturer of electronic equipment buys 1000 ICs for which the probability of one IC being bad is 0.01. Using the DeMoivre-Laplace theorem determine a) What is the probability that exactly 10 of the ICs are bad? b) What is the probability that none of the ICs is bad?	3	1	4M

3	Unit-II				
	a	i) Find $f_y(y)$ for the square law transformation. $Y = T(X) = cX^2$	2	2	4M
		ii) A random variable X is uniformly distributed on the interval (-5, 10). Another random variable $Y = e^{-X/5}$ is formed. Find $E[Y]$.	4	2	6M
	OR				
	b	i) Define moment and show the types of functions which can give moments.	2	2	4M
		ii) A random variable X has a probability density $f_X(x) = \begin{cases} \frac{\pi}{16} \cos\left(\frac{\pi x}{8}\right) & -4 \leq x \leq 4 \\ 0 & \text{elsewhere} \end{cases}$ Find its mean value $\bar{X}$, its second moment $\bar{X}^2$ and its variance.	4	2	6M
Unit-III					
4	a	i) Derive the central limit theorem for unequal distributions.	3	3	5M
		ii) The joint distribution function for two random variables X and Y is $F_{X,Y}(x,y) = u(x)u(y)[1 - e^{-ax} - e^{-ay} + e^{-a(x+y)}]$ Where $u(\cdot)$ is the unit step function and $a > 0$. Sketch $F_{X,Y}(x,y)$,	2	3	5M
		OR			
	b	i) Find the marginal density functions of X and Y for given two random variables X and Y have a joint probability density function $F_{X,Y}(X,Y) = \begin{cases} (5/16)x^2y & 0 < x < 2 \text{ and } 0 < y < 2 \\ 0 & \text{elsewhere} \end{cases}$	4	3	5M
		ii) Explain the properties of joint characteristic functions.	2	3	5M
5	Unit-IV				
	a	i) Show that X and Y are both zero-mean random variables and that they are uncorrelated for given joint characteristics function. $\Phi_{X,Y}(w_1, w_2) = e^{(-2w_1^2 - 8w_2^2)}$	2	4	5M
		ii) Discuss ergodicity in the context of time averages.	2	4	5M
	OR				
	b	i) Derive the autocorrelation function and its properties	3	4	5M
		ii) List and explain the properties of N jointly Gaussian random variables.	1,2	4	5M
6	Unit-V				
	a	i) Derive the relationship between the power spectrum and the autocorrelation function.	1, 3	5	10M
	OR				
b	i) Derive and Explain the properties of the cross-power density spectrum.	2	5	10M	

KL: Blooms Taxonomy Knowledge Level

CO: Course Outcome

M: Marks

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

R23

Sub Code: R23EC2103

SIGNALS & SYSTEMS

Time: 3 hours

(ECE)

Max. Marks: 70

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

PART-A

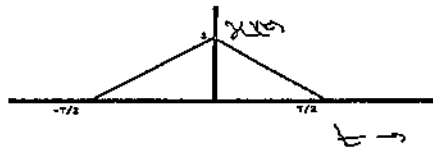
Answering all the questions from Part-A is compulsory (10 x 2M = 20M)

Q.No	Questions	KL	CO	M
1	a Define signal and system?	1	1	2M
	b Define sampling theorem.	1	1	2M
	c Explain condition for orthogonality of two signals	2	2	2M
	d List Dirichlet conditions	1	2	2M
	e List the properties of convolution?	2	3	2M
	f Write expression for inverse F.T	1	3	2M
	g Define ROC of a Laplace Transform	1	4	2M
	h Find Z Transform of unit step function	1	4	2M
	i List different types of systems	3	5	2M
	j Define system bandwidth	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) Explain about Time scaling, Time shifting and Time inversion properties of signals with an example.	2	1	5M
	ii) Find the power and rms value of $x(t)=20 \cos (2\pi t)$	2	1	5M
	OR			
	b i) Examine whether the given signal is periodic or aperiodic $x(t)=3 \sin 100 \pi t+5 \cos 200 \pi t$. if periodic, find fundamental period	4	1	5M
	ii) Determine whether the following signal is Energy or Power signal. $x(t)=\begin{cases} t-2 & \text{for } -2 \leq t \leq 0 \\ 2-t & \text{for } 0 \leq t \leq 2 \\ 0 & \text{otherwise} \end{cases}$	5	1	5M
3	Unit-II			
	a i) What is the Significance of Hilbert Transform? Explain in detail?	3	2	5M
	ii) Find the complex exponential Fourier Series coefficients of the signal $x(t)=\sin (3 \pi t)+2 \cos (4 \pi t)$	3	2	5M
	OR			
	b i) Develop the Complex Fourier series and derive the relation between trigonometric F.S and E.F.S	3	2	5M
	ii) List and prove any three properties of Fourier series	4	2	5M

4	Unit-III				
	a	i) Build the Fourier transform of the signal $x(t)$ applying differentiation in time property of Fourier transform 	3	3	5M
		ii) List and prove any three properties of Fourier Transform	4	3	5M
	OR				
	b	i) List and prove the time and frequency differentiation property of Fourier Transform	3	3	5M
	ii) Evaluate the Fourier transform of the signal $x(t) = e^{-at}$	4	3	5M	
5	Unit-IV				
	a	i) A system is described by $\frac{d^2 y(t)}{dt^2} + 7 \frac{dy(t)}{dt} + 12 y(t) = x(t)$. Solve the response for $u(t)$ using Laplace Transform	4	4	5M
		ii) List and prove the following properties of Z Transform (i) Time shifting (ii) Final value theorem	4	4	5M
	OR				
	b	i) A signal has $X(s) = \frac{s+2}{s^2+4s+5}$ Evaluate $L[tx(t)]$	3	4	5M
	ii) List and prove the following properties of Z transform. (i) Differentiation (ii) convolution (iii) Integration	2	4	5M	
6	Unit-V				
	a	i) List different types of systems with examples	2	5	10M
	OR				
	b	i) Identify the linearity, memory and time invariance of the system $y(t) = t^2 x(t)$	3	5	10M

KL: Blooms Taxonomy Knowledge Level

CO: Course Outcome

M: Marks

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

Sub Code: R23EC2104

ELECTRONIC DEVICES & CIRCUITS

Time: 3 hours

(ECE)

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	Differentiate between Intrinsic and Extrinsic semiconductors.		1	2M
	b	Define dynamic resistance of the diode.		1	2M
	c	What is photo diode and mention the applications.		2	2M
	d	What is Zener breakdown.		2	2M
	e	Draw the symbols of n-p-n and p-n-p transistors.		3	2M
	f	List the different current components in a transistor.		3	2M
	g	Name different biasing techniques.		4	2M
	h	What is meant by stability factor (S)		4	2M
	i	What is UJT and list its applications.		5	2M
	j	What is Amplification factor.		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) Explain the classification of materials into insulators, semiconductors, and metals using the concept of energy band gap.	2	1	5M
		ii) Draw and explain the V-I characteristics of a P-N junction diode in both forward and reverse bias.	2	1	5M
	OR				
	b	i) Explain transition and diffusion capacitances and how do they affect diode performance?	2	1	5M
		ii) Derive the diode current equation for a P-N junction diode.	2	1	5M
	Unit-II				
	a	i) Explain the V-I characteristics of Zener diode and also explain how it is used as voltage regulator.	2	2	5M
		ii) Describe the operation and characteristics of a tunnel diode. Why does it	2	2	5M

3		exhibit negative resistance?			
		OR			
	b	i) Analyse the functioning of half-wave rectifier with the help of neat circuit diagram and derive the efficiency.	2	2	5M
		ii) Explain the working principle, and characteristics of LED.	2	2	5M
4		Unit-III			
	a	i) Derive the transistor current equation.	2	3	5M
		ii) Analyze how the transistor is used as amplifier.	2	3	5M
		OR			
	b	i) Compare the input and output characteristics of CB, CE, and CC transistor configurations	2	3	5M
		ii) Explain the operation of an NPN transistor in active, cutoff, and saturation regions	2	3	5M
5		Unit-IV			
	a	i) What causes thermal runaway in BJTs? How can it be prevented?	2	4	5M
		ii) Derive the expression for stability factor S for a fixed bias circuit.	2	4	5M
		OR			
	b	i) Explain the concept of the operating point and describe how the DC load line is used to determine it.	2	4	5M
		ii) Explain how a thermistor or sensistor is used for bias compensation in a transistor.	2	4	5M
6		Unit-V			
	a	i) Discuss the comparison between JFET and MOSFET.	2	5	5M
		ii) Analyze drain and transfer characteristics of n-channel depletion MOSFET.	2	5	5M
		OR			
	b	i) Analyse the construction, operation, and characteristics of a JFET.	2	5	5M
		ii) Explain the symbol and working of an SCR.	2	5	5M

KL: Blooms Taxonomy Knowledge Level

CO: Course Outcome

M: Marks

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

Sub Code: R23EC2105

SWITCHING THEORY & LOGIC DESIGN

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	Convert $(97.75)_{10}$ to base 2.	6	1	2M
	b	Convert $(2468)_{10}$ to $()_{16}$	2	1	2M
	c	Prove that NAND gates are universal gates	4	2	2M
	d	State De Morgans's theorems	5	2	2M
	e	List the applications of Multiplexers	1	3	2M
	f	Design 2x4 decoder using NAND gates.	3	3	2M
	g	Write the differences between combinational and sequential circuits	4	4	2M
	h	What are applications of Flip-Flop?	5	4	2M
	i	Write the demerits of PROM	2	5	2M
	j	Give the comparison between PROM, PLA and PAL.	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) Perform the subtraction using 1's complement and 2's complement methods. (i) $01011 - 10111$ (ii) $10100 - 10110$ (iii) $110010 - 110000$	3	1	6M
		ii) Perform the following addition using excess-3 code i) $386 + 756$ ii) $1010 + 444$	2	1	4M
	OR				
	b	i) Given the 8bit data word 01001001, generate the 12 bit composite word for the hamming code that corrects and detects single error	4	1	5M
		ii) How are negative numbers represented? Represent signed numbers from +7 to -8	1	1	5M
3	Unit-II				
	a	i) Reduce the following function using k-map technique $F(A,B,C,D) = \sum M(1,2,3,5,6,7,8,9,12,13)$	6	2	5M
		ii) Design a combinational circuit that converts four bit binary number into gray code	2	2	5M
	OR				
	b	i) Reduce the following function using k-map technique $F(A,B,C,D) = \pi(0,2,3,8,9,12,13,15)$	4	2	5M
		ii) Prove that OR-AND network is equivalent to NOR-NOR network	1	2	5M

4	Unit-III				
	a	i) Design a 1:8 demultiplexer using two 1:4 demultiplexer	2	3	5M
		ii) Design a BCD adder using 4-bit parallel binary adder and logic gates.	1	3	5M
	OR				
	b	i) Design BCD to gray code converter and realize using logic gates.	3	3	5M
		ii) Perform the realization of full subtractor and full adder using decoders and logic gates	2	3	5M
5	Unit-IV				
	a	i) Draw the logic diagram of a SR latch using NAND gates. Explain its Operation using excitation table.	5	4	5M
		ii) What do you mean by triggering? Explain the various triggering modes with examples.	5	4	5M
	OR				
	b	i) Draw and explain Moore circuit?	4	4	5M
		ii) What are the different types of registers? Explain the Parallel Input Serial Output shift register	1	4	5M
6	Unit-V				
	a	i) Design and implement Full adder with PLA	3	5	5M
		ii) Design a BCD to Excess-3 code converter using a PROM	2	5	5M
	OR				
	b	i) Implement the following Boolean functions using PLA. $A(x,y,z) = \sum m(0,1,2,4,6)$ $B(x,y,z) = \sum m(0,2,6,7)$ $C(x,y,z) = \sum m(3,6)$	1	5	6M
		ii) What is the principal advantage of a PLD?	4	5	4M

KL: Blooms Taxonomy Knowledge Level

CO: Course Outcome

M: Marks

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

R23

Sub Code: R23DS2107

INTRODUCTION TO DATA SCIENCE

Time: 3 hours

(DS)

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	Define the term "data science".	K1	1	2M
	b	Demonstrate how you would use exploratory data analysis to identify patterns in a given dataset.	K2	1	2M
	c	Summarize some applications of machine learning in data science?	K3	2	2M
	d	Distinguish between the stages of feature engineering, model selection, and model validation.	K3	2	2M
	e	List python packages used for data science projects.	K2	3	2M
	f	Illustrate Case study on risk management?	K6	3	2M
	g	List few NOSQL databases.	K1	4	2M
	h	What is neo4j and explain?	K5	4	2M
	i	What is data visualization?	K2	5	2M
	j	List different types of tools for dash board development?	K6	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) Explain briefly about data science with examples and their uses?	K2	1	5M
		ii) Briefly discuss about Data Science process with six steps of the data science process.	K2	1	5M
	OR				
	b	i) Explain the steps involved in a data science project with a neat sketch.	K3	1	5M
		ii) Who is data scientist? Explain his skills.	K2	1	5M
3	Unit-II				
	a	i) Define Machine Learning. Discuss different types of machine learning with an example.	K3	2	5M
		ii) Describe integrating and transforming data in data science.		2	5M
	OR				
	b	i) Briefly explain the role of machine learning in data science and what are steps involved in data science?	K5	2	10M
4	Unit-III				
	a	i) Briefly summarize about ACID principles of relational databases.	K2	3	5M
		ii) Explain in brief Base principles of NoSQL in data bases?	K6	3	5M

	OR				
	b	i) Examine how the CAP theorem works in Data Science.	K5	3	5M
		ii) What are the main components of the Hadoop framework, and how do they contribute to distributed data processing?	K3	3	5M
5	Unit-IV				
	a	i) Write a case study on classifying reddit posts.	K6	4	5M
		ii) How does Neo4j store and manage data differently compared to traditional relational databases?.	K2	4	5M
	OR				
	b	i) Briefly explain about NLTK package in python?	K1	4	5M
		ii) Explain briefly for the following terms?	K2	4	5M
		1. Data Scraping 2. Cleaning 3. Pre-processing			
6	Unit-V				
	a	i) What are the different types of data visualization tools and techniques available for representing data?	K3	5	10M
	OR				
	b	i) Describe the various data visualization options available for building interactive dashboards. Include tools such as Tableau, Plotly, and dc.js.	K3	5	5M
		ii) Explain how to Create an interactive dash board with dc.js?	K1	5	5M

KL: Blooms Taxonomy Knowledge Level

CO: Course Outcome

M: Marks
