Narasaraopeta Engineering College (Autonomous)
Kotappakonda Road, Yellamanda (P.O), Narasaraopet- 522601, Guntur District, AP.

R25

I M.Tech I Semester Regular Examinations, March-2026

D251BA01 **Data Structures and Algorithm Analysis**

Time:3 hours (Branch:CSE) Max.Marks:60

Note:Answer all FIVE Questions

All questions carry equal marks(5x12M=60M)

Q. No		Questions	KL	CO	Marks
1		Unit-I			
	a	i) Explain with suitable example and algorithm how insertion and deletion are performed in a singly linked list. Also write the algorithm for traversal.	3	1	6M
		ii) Develop an algorithm to delete a node containing a given key from a Doubly Linked List. Explain how the deletion differs when: 1. Node is at the beginning 2. Node is in the middle 3. Node is at the end. Illustrate pointer adjustments with diagrams.	3	1	6M
		OR			
	b	i) Write algorithm to implement a Stack using Linked List (Push and Pop operations).	3	1	6M
		Write algorithm to implement a Queue using Linked List (Enqueue and Dequeue operations).	3	1	6M
2		Unit-II			
	a	i) Explain Linear search and Binary Search with algorithm and time complexity. State the condition required to apply binary search.	3	2	6M
		ii)Given the following sorted array of integers: 5,9,17,23,25,45,59,63,71,89. Use the Binary Search algorithm to find the position of the target value 71. Show the step-by-step process, indicating the mid-point and the updated search interval at each iteration.	3	2	6M
		OR			
	b	a) Explain Insertion Sort with suitable example. (b) Trace the algorithm for: 9, 5, 1, 4, 3 (c) Discuss time complexity in best and worst cases. (d) State applications of Insertion Sort.	K3	2	12M
3		Unit-III			
	a	i) Define Stack ADT and Queue ADT. Explain their fundamental operations.	K2	3	6M
		ii) Define Abstract Data Type (ADT).Explain the List ADT with its operations and applications.	K3	3	6M
		OR			
	b	Explain Hash Table representation. Describe the role of hash functions in dictionary implementation. What is collision in hashing?	K3	3	12M

		b) Explain collision resolution techniques: i) Separate Chaining ii) Open Addressing – Linear Probing iii) Double Hashing			
4		Unit-IV			
	a	Specify the ADT (Abstract Data Type) for a Priority Queue. Clearly define the operations and their functionality. Differentiate between Max Priority Queue and Min Priority Queue with suitable examples	K3	4	12M
		OR			
	b	Define a *Max Heap* and a *Min Heap*. Explain the algorithm for insertion in a Max Heap with an example. Explain the deletion operation (Delete-Max or Delete-Min) in a heap.	K3	4	12M
5		Unit-V			
	a	Derive the height of an AVL tree and show why it is O(logn) Explain AVL Tree insertion with suitable example and required rotations (LL, RR, LR, RL). Explain deletion in AVL Tree and discuss how rebalancing is performed.	K3	5	12M
		OR			
	b	Define a B-Tree of order m. State its properties. Derive the height of a B-Tree and prove it is O(logn)	K3	5	6M
	b	Explain searching operation in: i) AVL Tree ii) Red-Black Tree iii) B-Tree iv) Splay Tree	K3	5	6M

KL:BloomsTaxonomyKnowledgeLevel CO:CourseOutcome M:Marks

NARASARAOPETA ENGINEERING COLLEGE
(AUTONOMOUS)

I M.Tech I Semester Regular Examinations, March-2026

R25

Sub Code: D2511501 **MECHANICAL VIBRATIONS & ACOUSTICS**

Time: 3 hours (ME) Max. Marks: 60

Note: Answer All **FIVE** Questions.
All Questions Carry Equal Marks (5 X 12M = 60M)

Q. No		Questions	KL	CO	M
1		Unit-I			
	a	i) Define and explain the following terms: a) Natural Frequency b) Degree of Freedom c)Resonance.	**K3**	1	6M
		ii) Distinguish between free vibrations and forced vibrations.	**K3**	1	6M
		OR			
	b	i) Develop the mathematical model of a single degree of freedom spring–mass system.	**K4**	1	6M
		ii) Derive the expression for the natural frequency of an undamped free vibration system.	**K4**	1	6M
2		Unit-II			
	a	i) Determine the natural frequencies of a simple spring-mass system using the energy method.	**K4**	2	6M
		ii) What is meant by Eigenvalue and Eigenvector? Explain with respect to vibration, with an example.	**K4**	2	6M
		OR			
	b	Analyze longitudinal, torsional, and lateral vibrations with neat sketches and practical examples.	**K4**	2	12M
3		Unit-III			
	a	Determine the natural frequency of a simple pendulum i) neglecting the mass of rod. ii)considering the mass of rod.	**K3**	3	12M
		OR			
	b	A uniform bar of length l is fixed at one end, and the free end, is stretched uniformly l_0 and released at t =0. Find the resulting longitudinal vibration.	**K4**	3	12M
4		Unit-IV			
	a	Interpret the relationship among speed of sound, wavelength, frequency, and wave number with suitable expressions.	**K4**	4	12M
		OR			
	b	Explain in brief the following terms: i) Acoustic Intensity and Acoustic Energy Density. ii) Directivity Factor and Directivity Index.	**K3**	4	12M
5		Unit-V			
	a	Describe the construction and working principle of an Intensity Level Meters.	**K4**	5	12M
		OR			
	b	Explain the procedure for the measurement of sound power of a noise source using standard methods.	**K3**	5	12M

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

NARASARAOPETA ENGINEERING COLLEGE
(AUTONOMOUS)

I M.TECH I Semester Regular Examinations, March-2026

R25

Sub Code: D2514201 ELECTRICAL MACHINE MODELING & ANALYSIS

Time: 3 hours (PID) Max. Marks: 60

Note: Answer All **FIVE** Questions.
All Questions Carry Equal Marks (5 X 12M = 60M)

Q.No		Questions	KL	CO	M
1		Unit-I			
	a	i) Derive the first order transfer functions of separately excited DC motor by suitable assumptions	K3	1	5M
		ii) Deduce the mathematical model of separately excited DC motor in the matrix form	K3	1	7M
		OR			
	b	Explain the transient analysis of separately excited DC motor for a practical transient situation.	K3	1	12M
2		Unit-II			
	a	i) Explain the importance of phase and active transformations in case of AC motors.	K3	2	6M
		ii) In order to ensure power invariance in transforming one set of variables to another, show that the transformation matrix should be equal to its inverse.	K3	2	6M
		OR			
	b	Obtain identical transformations for currents and voltages from a rotating balanced 3-phase (a, b, c) winding to a rotating balanced 2-phase (α, β) winding. Show that the power invariance is maintained under this transformation.	K3	2	12M
3		Unit-III			
	a	Obtain the dynamic model of a 3-φ induction motor in synchronizing rotating reference frame in state variable form and represent them in matrix form.	K3	3	12M
		OR			
	b	Derive the power equation and electromagnetic torque equation of a 3-φ induction motor.	K3	3	12M
4		Unit-IV			
	a	Derive the mathematical representation of a synchronous machine.	K3	4	12M
		OR			
	b	Obtain the voltage equations of 3-φ synchronous motor in state variable form with reference to stator reference frame. And also write the torque equation of this motor.	K3	4	12M
5		Unit-V			
	a	Explain the modelling aspects of switched reluctance motor and discuss its applications.	K3	5	12M
		OR			
	b	Discuss the modelling aspects of a BLDC motor and explain its analysis part.	K3	5	12M

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

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NARASARAOPETA ENGINEERING COLLEGE
(AUTONOMOUS)

I M.Tech I Semester Regular Examinations, March-2026

R25

Sub Code: D2516801 **ADVANCED DIGITAL SYSTEMS DESIGN**

Time: 3 hours (VLSI&ES) Max. Marks: 60

Note: Answer All **FIVE** Questions.
All Questions Carry Equal Marks (5 X 12M = 60M)

Q.No		Questions	KL	CO	M
1		Unit-I			
	a	i)Draw the CPLD-Architecture and explain its operation	2	1	6M
		ii) write short notes on GAL devices in detail	2	1	6M
		OR			
	b	i) List out different FPGA Programming Technologies and explain each one in detail	1	1	6M
		ii) List out few comparisons of Actel ACTI and ACT2 in detail	1	1	6M
2		Unit-II			
	a	i)Explain the concept of sequential parity checker along with block diagram	4	2	6M
		ii) write shirt notes sequence detector in detail	4	2	6M
		OR			
	b	i) Explain the concept of strategies for multi-clock sequential circuits in detail	2	2	6M
		ii) write short notes on serial data conversion	2	2	6M
3		Unit-III			
	a	i) Explain the procedure of Design of Iterative circuits in detail	3	3	6M
		ii) explain the different FSM Issues and explain	3	3	6M
		OR			
	b	i)Explain the concept of Simulation and testing of Sequential circuits in detail	3	3	6M
		ii) write short notes on Design of a comparator	3	3	6M
4		Unit-IV			
	a	i)Explain the following terms with examples (i)multiple Stuck at Fault models (ii) Bridging Fault model.	5	4	12M
		OR			
	b	i)Explain the operation of KOHAVI algorithm along with examples	5	4	6M
		ii) write short notes on Fault detection in detail	4	4	6M
5		Unit-V			
	a	i)Explain the operation of Circuit Test Approach along with examples	6	5	6M
		ii) write short notes on Design of fault detection experiment.	6	5	6M
		OR			
	b	i) Explain the operation of fault detection experiment in detail	1	5	6M
		ii) write short notes on Transition check Approach in detail	1	5	6M

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

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NARASARAOPETA ENGINEERING COLLEGE
(AUTONOMOUS)

I M.Tech I Semester Regular Examinations, March-2026

R25

Sub Code: D2518701 **THEORY OF ELASTICITY**

Time: 3 hours (STRU) Max. Marks: 60

Note: Answer All FIVE Questions.

All Questions Carry Equal Marks (5 X 12M = 60M)

Q.No		Questions	KL	CO	M
1		Unit-I			
	a	i) Explain plane stress and plane strain with examples	2	1	6M
		ii) State Hooke's law and explain about pure shear	2	1	6M
		OR			
	b	i) Explain the generalized Hooke's law for an isotropic material	2	1	6M
		ii) Explain about components of strain at a point	2	1	6M
2		Unit-II			
	a	i) Write the application of Fourier series for two dimensional problems for gravity loading	2	2	6M
		ii) Explain boundary conditions used in two-dimensional elasticity problems.	2	2	6M
		OR			
	b	i) Explain about Saint Venant's principle	2	2	6M
		ii) Derive the polynomial solution for two-dimensional elasticity problems in rectangular coordinates.	3	2	6M
3		Unit-III			
	a	Derive the stress components of a plate with circular hole subjected to uniaxial load	3	3	12M
		OR			
	b	i) Discuss about stress concentration factor.	2	3	6M
		ii) Derive the general equations in polar co-ordinates	3	3	6M
4		Unit-IV			
	a	i)Write about a) Uniqueness of solution b)Reciprocal theorem	2	4	6M
		ii) What is meant by Homogenous deformation? Explain with examples	2	4	6M
		OR			
	b	i) Derive the expression for principal stresses in three dimensions	3	4	6M
		ii) Discuss about a)Conditions of compatibility b)Principle of superposition	2	4	6M
5		Unit-V			
	a	A hollow circular torsion member has an outside diameter of 22mm and inside diameter of 18mm, with mean diameter ,D=20mm and t/D=0.10.calculate the torque and angle of twist per unit length if shearing stress at mean diameter is 70MPa. Calculate these values if a out is made through the wall thickness along the entire length G=77.5 GPa	3	5	12M
		OR			
	b	i) Explain torsion of prismatic bars and derive the basic torsion equation.	2	5	6M
		ii) Explain membrane analogy for torsion problems.	2	5	6M

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

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NARASARAOPETA ENGINEERING COLLEGE
(AUTONOMOUS)

I M.Tech I Semester Regular Examinations, March-2026

R25

Sub Code: D251BA02 **ADVANCED DATA WAREHOUSING & DATA MINING**

Time: 3 hours (CSE) Max. Marks: 60

Note: Answer All **FIVE** Questions. All Questions Carry Equal Marks (5 X 12M = 60M)

Q.No		Questions	KL	CO	M
1		Unit-I			
	a	i) Define a Data Warehouse. Explain its characteristics.	K2	1	6M
		ii) Differentiate between Operational Database Systems and Data Warehouses.	K4	1	6M
		OR			
	b	i) Explain the Multitiered Architecture of a Data Warehouse with a neat diagram.	K2	1	6M
		ii) Compare ROLAP, MOLAP, and HOLAP architecture	K4	1	6M
2		Unit-II			
	a	i) Define Data Objects and Attributes. Explain different types of attributes: Nominal, Binary, Ordinal, and Numeric	K2	2	6M
		ii) Differentiate between Discrete and Continuous attributes with suitable examples	K4	2	6M
		OR			
	b	i) Explain measures of Central Tendency: Mean, Median, and Mode.	K2	2	6M
		ii) Describe Minkowski Distance, Cosine Similarity, and dissimilarity measures for Ordinal and Mixed-type attributes.	K2	2	6M
3		Unit-III			
	a	i) Describe how a Decision Tree works and explain the steps involved in building a Decision Tre	K2	3	6M
		ii) Explain different methods for expressing Attribute Test Conditions in Decision Trees	K2	3	6M
		OR			
	b	i) State and explain Bayes Theorem. Describe the Naïve Bayes Classification method.	K2	3	6M
		ii) Explain Cross-Validation and Bootstrap methods in model evaluation.	K2	3	6M
4		Unit-IV			
	a	i) Explain the FP-Growth Algorithm and its advantages over Apriori.	K2	4	6M
		ii) Describe the construction of FP-Tree with a neat diagram	K2	4	6M
		OR			
	b	i) Explain Compact Representation of Frequent Itemsets. Describe Maximal Frequent Itemsets	K2	4	6M
		ii) Explain Closed Frequent Itemsets with suitable examples.	K2	4	6M

5	Unit-V				
	a	i) Consider the following 2-dimensional data points: A(2,10), B(2,5), C(8,4), D(5,8), E(7,5), F(6,4) Assume K = 2 and initial centroids are: C_1 = A(2,10) and C_2 = C(8,4) 1. Compute the distance of each point from the centroids using Euclidean distance. 2. Assign the points to the nearest cluster. 3. Compute the new centroids. 4. Perform one more iteration and show the final clusters.	K3	5	6M
		ii) Explain the challenges and techniques in Mining Text Data.	K2	5	6M
	OR				
	b	i) Consider the following 2D dataset: P1(1,1), P2(2,2), P3(2,1), P4(8,8), P5(8,9), P6(25,25) Assume Eps (ε) = 2, MinPts = 2 1. Identify the core points. 2. Identify border points and noise points. 3. Form clusters using DBSCAN algorithm. 4. Clearly show the final clustering result.	K3	5	6M
		ii) Compare clustering methods based on partitioning, hierarchical, and density-based approaches.	K4	5	6M

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

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Narasaraopeta Engineering College (Autonomous)

Kotappakonda Road, Yellamanda (P.O), Narasaraopet- 522601, Guntur District, AP.

Subject Code: D2511502

I M.Tech - I Semester Regular Examinations, March-2026

ADVANCED MECHANICS OF SOLIDS

(MD)

Time: 3 hours **Max Marks: 60**

All questions carry EQUAL marks **5 X 12 = 60M**

S. No		Question	KL	CO	M
1	a	(a) Define stress at a point and explain the complete stress notation in three dimensions. b) Derive the expressions for principal stresses and discuss their physical significance. c) Briefly explain the concept of strain at a point and principal strains under small displacement theory.	K2	CO1	12
		OR			
	b	(a) Derive the differential equations of motion for a deformable body including body forces. b) Explain stress–strain–temperature relations for an isotropic elastic solid. c) Discuss Hooke's Law for isotropic and anisotropic materials and explain the commonly used yield criteria for initiation of yielding.	K2	CO1	12
2	a	A simply supported beam of length L=5m carries a central point load P=30kN. The beam has a rectangular cross-section of width b=120mm and depth d=210 mm, Young's modulus E=200 GPa. a) Using Castigliano's theorem, derive the expression for mid-span deflection. b) Calculate the maximum deflection. c) Determine the maximum bending stress in the beam and comment on whether the section is safe if the allowable stress is 160 MPa.	K3	CO2	12
		OR			
	b	A solid circular steel column of length L=2.5 m is hinged at both ends. The column has a diameter of d=40 mm Young's modulus E=200 GPa a) Determine the Euler critical buckling load for the column. b) Calculate the critical stress. c) Comment whether Euler's theory is applicable if the yield stress of the material is 250 MPa.	K3	CO2	12
3	a	A simply supported rectangular beam of length L=4 m, width b=80 mm, and depth d=160 mm is subjected to a concentrated load P=15 kN at mid-span. The load is inclined at an angle of 45^0 to the vertical axis and does not act in a principal plane of the section. Assume: Young's modulus E=210 GPa i) Resolve the load into appropriate components and determine the bending stresses at the extreme corners of the beam section due to unsymmetrical bending. ii) Determine the resultant maximum bending stress in the section. iii) Calculate the deflection at mid-span considering the effect of bending about both principal axes.	K3	CO3	12

		OR			
	b	A curved bar of rectangular cross-section (width b=60mm, depth d=40 mm) forms part of a circular ring. Inner radius ri=150 mm Outer radius ro=190 mm The ring is subjected to a concentrated load of 20 kN at its crown. a) Using Winkler–Bach theory, determine the maximum circumferential stress at the inner and outer fibers. b) Determine the radial stress at the neutral axis. c) Comment on the difference between curved beam theory and straight beam theory for this problem.	**K4**	**CO3**	**12**
4	**a**	A solid rectangular shaft of lengthL=1.5 m, width b=100 mm, and thickness t=25 mm is subjected to a torque of T=4 kN•m Assume the section behaves as a narrow rectangular section under torsion. Given: Shear modulus G=75 GPa i) Determine the maximum shear stress using the linear elastic torsion solution for a narrow rectangular section. ii) Calculate the angle of twist of the shaft. iii) Compare the maximum shear stress with that of a circular shaft having the same cross-sectional area.	**K5**	**CO4**	**12**
		OR			
	b	A thin-walled circular tube of mean radius R=75 mm and thickness t=4 mm is subjected to a torque of T=2.5 kN•m Length of the shaft L=1.2 m Young's modulus E=200 GPaE = 200 Poisson's ratio ν=0.3 i) Determine the maximum shear stress in the tube. ii) Calculate the angle of twist. iii) Determine the shear flow in the section.	**K4**	**CO4**	**12**
5	**a**	Discuss in detail the stresses developed in two bodies under line contact when subjected to: (a) Load normal to the contact area (b) Combined normal and tangential (frictional) loads	**K2**	**CO5**	**12**
		OR			
	b	A steel roller of radius R=100 mm rests on a rigid horizontal surface and carries a load of P=18 kN per metre length. Material properties of the roller: E=210 GPa, ν=0.28 Assuming Hertz contact theory and that the surface is perfectly rigid, Determine: i) The half-width of the contact area. ii) The maximum contact pressure. iii) The vertical approach (deflection) of the cylinder due to contact.	**K2**	**CO5**	**12**

NARASARAOPETA ENGINEERING COLLEGE
(AUTONOMOUS)

I M.TECH I Semester Regular Examinations, March-2026

R25

Sub Code: D2514202 **POWER ELECTRONIC CONVERTERS**

Time: 3 hours (PID) Max. Marks: 60

Note: Answer All **FIVE** Questions.
All Questions Carry Equal Marks (5 X 12M = 60M)

Q.No		Questions	KL	CO	M
1		Unit-I			
	a	i) Draw the operational characteristics and explain the power MOSFET?	2	1	6M
		ii) Describe the desired features of gate drive circuits for switching devices?	2	1	6M
		OR			
	b	i)Draw the operational characteristics and explain the power IGBT?	2	1	6M
		ii)Compare the objectives and outcomes of static and dynamic characteristics of switching devices?	4	1	6M
2		Unit-II			
	a	i)Relate the power factor improvement with the AC to DC converters with relevant relations?	4	2	6M
		ii)Compare the extinction angle control and symmetrical angle control of rectifiers with necessary equations?	4	2	6M
		OR			
	b	i)Explain in detail about the three phase dual converters with circuit diagram?	2	2	6M
		ii)Explain the single stage single boost power factor corrected rectifier with necessary equations?	2	2	6M
3		Unit-III			
	a	i) Explain in detail about the bipolar PWM technique with relevant output waveforms?	2	3	6M
		ii) Justify the voltage control of single phase inverters with phase displacement control?	5	3	6M
		OR			
	b	i) Explain in detail about the unipolar PWM technique with relevant output waveforms?		3	6M
		ii) Explain and summarize the properties of three phase voltage source inverters with diagram?	2	3	6M
4		Unit-IV			
	a	i) Explain in detail about the space vector modulation with outcome waveforms?	2	4	6M
		ii) Describe the three phase inverters employing sinusoidal PWM with waveforms?	2	4	6M
		OR			
	b	i) Describe the operation of three phase current source inverters with waveforms?	2	4	6M
		ii) What is meant by the third harmonic PWM? Explain the outcomes?	2	4	6M
5		Unit-V			
	a	i) Describe the capacitor voltage balancing with waveforms?	2	5	6M

		ii)	Discuss in detail about the features of PWM multilevel inverters with circuit diagram?	2	5	6M
	OR					
	b	i)	Discuss in detail about the features of diode clamped multilevel inverters with circuit diagram?	2	5	6M
		ii)	Explain and justify the objectives and outcomes of space vector PWM?	5	5	6M

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

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NARASARAOPETA ENGINEERING COLLEGE
(AUTONOMOUS)

I M.TECH I Semester Regular Examinations, March-2026

R25

Sub Code: D2516802 EMBEDDED HARDWARE PLATFORMS & PROGRAMMING

Time: 3 hours (ECE-VLSI&ES) Max. Marks: 60

Note: Answer All **FIVE** Questions.
All Questions Carry Equal Marks (5 X 12M = 60M)

Q.No		Questions	KL	CO	M
1		Unit-I			
	a	i)Classify embedded systems based on functionality and performance. Explain with suitable examples	2	1	6M
		ii) Discuss the trade-offs in ES design with respect to cost, power and performance.	3	1	6M
		OR			
	b	i) Explain the processor technology used in embedded systems.	2	1	6M
		ii) Describe IC technologies such as ASICs, FPGAs, and SoCs used in ES applications.	3	1	6M
2		Unit-II			
	a	i) Explain requirement analysis and feasibility study in embedded system development	3	2	6M
		ii) Describe system integration and validation testing procedures.	4	2	6M
		OR			
	b	i) Explain system-level architecture design with a neat block diagram.	3	2	6M
		ii) Discuss hardware–software partitioning in embedded systems with an example.	4	2	6M
3		Unit-III			
	a	i) Explain bus-based computer systems with a neat diagram	2	3	6M
		ii) Describe different types of memory devices used in embedded systems.	4	3	6M
		OR			
	b	i) Explain component interfacing techniques in embedded hardware platforms.	2	3	6M
		ii) Discuss CPU power consumption and power optimization techniques.	4	3	6M
4		Unit-IV			
	a	i) Explain basic compilation techniques in embedded software development.	3	4	6M
		ii) Discuss program-level energy and power analysis methods.	5	4	6M
		OR			
	b	i) Explain the process of assembly, linking, and loading.	3	4	6M
		ii) Describe program validation and testing techniques in embedded systems.	5	4	6M
5		Unit-V			
	a	i) Explain different scheduling algorithms used in RTOS.	2	5	6M
		ii) Discuss the priority inversion problem and its solutions.	4	5	6M
		OR			
	b	i) Explain inter-process communication mechanisms in RTOS (Mailboxes, Message Queues, Pipes).	2	5	6M
		ii) Explain the features and applications of MicroC/OS-II and RT Linux.	4	5	6M

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

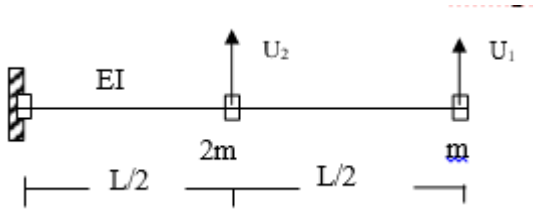
NARASARAOPETA ENGINEERING COLLEGE
(AUTONOMOUS)

I M.TECH I Semester Regular Examinations, March-2026

Sub Code: D2518702 STRUCTURAL DYNAMICS **R25**

Time: 3 hours (STRU) Max. Marks: 60

Note: Answer All **FIVE** Questions.
All Questions Carry Equal Marks (5 X 12M = 60M)

Q.No		Questions	KL	CO	M
1		Unit-I			
	a	i) What is critical damping, and why is it important in vibration analysis?	K2	1	6M
		ii) Explain the concept of logarithmic decrement and its use in determining damping ratio.	K2	1	6M
		OR			
	b	i) The natural period of a SDOF system is 0.75 sec. The system is subjected to some initial displacement 25mm and allowed to vibrate its own. The displacement observed after 2.5 sec was 10 mm. If the mass of the system is 500kg, determine (i) circular natural frequency, (ii) stiffness, (iii) damping ratio, (iv) damped circular natural frequency and (v) critical damping coefficient of the system (vi) period and frequency of vibration.	K2	1	12M
2		Unit-II			
	a	i) Describe the different types of prescribed loading that a structure may experience.	K2	2	6M
		ii) Dicuss about a) Logarithmic decrement b) Dynamic magnification factor c) Band width.	K2	2	6M
		OR			
	b	i) Describe the different types of damping mechanisms in SDOF systems.	K2	2	6M
		ii) The successive amplitudes from a free vibration test for a structure are 1.2, 0.8, 0.5, and 0.3 units respectively. Determine the damping ratio (assuming it to be very small) of the system considering (i) each cycle separately and (ii) considering them all together.	K2	2	6M
3		Unit-III			
	a	i) Formulate the equations of motion for an undamped MDOF system.	K2	3	6M
		ii) A 2-DOF system has masses $m_1 = 1$ kg, $m_2 = 2$ kg, and stiffnesses $k_1 = 100$ N/m, $k_2 = 200$ N/m. Formulate the equations of motion and determine the natural frequencies and mode shapes.	K2	3	6M
		OR			
	b	Determine the natural frequencies and mode shapes of vibration for the beam shown in figure 2 adopting the stiffness matrix. Normalized modes have unit vertical deflection at the free end. Show that the modes show orthogonality relation. 	K2	3	12M

4		Unit-IV			
	a	i) Explain the Stodola method for determining the fundamental mode of vibration of a multi-degree of freedom system.	K2	4	6M
		ii) Considering distributed mass and elasticity, derive expressions for the first three natural frequencies and draw mode shapes for a Fixed Ends beam.	K2	4	6M
		OR			
	b	Explain the significance of the Velocity Response factor Rv. Discuss the variation of Rv with damping as the excitation frequency is varying from gradually varying to rapidly varying stage while the structure is undergoing vibration.	K2	4	12M
5		Unit-V			
	a	Derive the equation of motion for a SDOF system subjected to translational earthquake excitation using the generalized coordinate approach.	K2	5	12M
		OR			
	b	i) Explain the difference between deterministic and probabilistic earthquake analysis.	K2	5	6M
		ii) Describe the linear static method for response analysis of a multi-storied RC building	K2	5	6M

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

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NARASARAOPETA ENGINEERING COLLEGE
(AUTONOMOUS)

I M.TECH I Semester Supple. Examinations, March-2026

R24

Sub Code: R24MCS102 MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE

Time: 3 hours (CSE) Max. Marks: 60

Note: Answer All **FIVE** Questions.
All Questions Carry Equal Marks (5 X 12M = 60M)

Q.No		Questions	KL	CO	M
1		Unit-I			
	a	i) Show that [(P→Q)→R]→[(P→Q)→ (P→R)] is a tautology.	K3	1	6M
		ii) Predict $(\exists x)$ P(x) Λ $(\exists x)$ Q(x) and $(\exists x)$ (P(x) Λ Q(x)) are not logically equivalent.	K4	1	6M
		OR			
	b	i) State and explain the principle of duality in propositional logic. Using the principle of duality, derive the dual of (P∨Q) ∧ (¬P∨R).	K2	1	6M
		ii) Compare and contrast free and bound variables in predicate logic. Provide examples and explain their significance in logical statements.	K4	1	6M
2		Unit-II			
	a	i) Explain the different operations on sets with examples. Illustrate with Venn diagrams how the union and intersection of two sets work.	K2	2	6M
		ii) Explain how recursive functions are defined. Write a recursive function to compute the factorial of a number n and derive its output for n=5.	K3	2	6M
		OR			
	b	i) What are equivalence relations? Explain with an example how equivalence relations partition a set into equivalence classes.	K2	2	6M
		ii) Define a lattice and its properties. Prove that every finite lattice is bounded.	K2	2	6M
3		Unit-III			
	a	i) Evaluate the validity of the binomial theorem in deriving the number of subsets of a set with n elements.	K4	3	6M
		ii) Solve the recurrence relation $\mathbf{a}_n=3\mathbf{a}_{n-1}-2\mathbf{a}_{n-2}$ with initial conditions $a_0=2$ and $a_1=5$.	K3	3	6M
		OR			
	b	i) If $P(n,4)=42\times P(n,2)$, write n?.	K3	3	6M
		ii) Write the coefficient of $x^{11}y^4$ in the expansion $(2x^3+3xy^2+z^2)^6$ by using Multinomial theorem.	K3	3	6M
4		Unit-IV			
	a	i) Describe Eulerian and Hamiltonian graphs. What are the necessary and sufficient conditions for a graph to be Eulerian?	K2	4	6M
		ii) What are adjacency and incidence matrices in graph theory? Illustrate with an example of a graph with 4 vertices.	K2	4	6M
		OR			
	b	i) Construct six regular bipartite graphs along with description of vertex and edge sets respectively.	K3	4	6M
		ii) Compute that any 2 simple connected graphs with n vertices all of degree 2 are isomorphic.	K3	4	6M

5		Unit-V			
	a	i) Compare and contrast Prim's and Kruskal's algorithms for finding a minimum spanning tree with example.	K4	5	6M
		ii) Define a multigraph and a bipartite graph. Provide one example of each.	K2	5	6M
		OR			
	b	i) Explain BFS and DFS spanning trees with example.	K4	5	6M
		ii) State Euler's formula for planar graphs. Explain its significance with an example.	K2	5	6M

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

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NARASARAOPETA ENGINEERING COLLEGE
(AUTONOMOUS)

R25

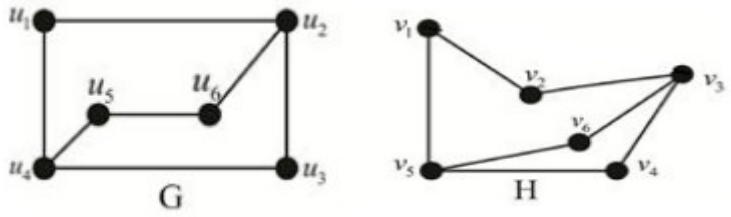
I M.TECH I Semester Regular Examinations, March-2026

Sub Code: D251BA03 **MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE**

Time: 3 hours (CSE) Max. Marks: 60

Note: Answer All **FIVE** Questions. All Questions Carry Equal Marks (5 X 12M = 60M)

Q.No		Questions	KL	CO	M
1		Unit-I			
	a	i) Explain conditional probability and independent events. Prove that if A and B are independent, then $P(A \cap B)=P(A)P(B)$.	K3	1	6M
		ii) Distinguish between discrete and continuous random variables. If $f(x)=2x$, $0<x<1$, find (i) $P(0 < X < 0.5)$ (ii) Mean of X	K3	1	6M
		OR			
	b	i) The probability density function of a variate X is X: 0, 1, 2, 3, 4, 5, 6 P(x): K, 3k, 5k, 7k, 9K, 11k, 13k (i) Find $P(X < 4)$, $P(X \geq 5)$, $P(3 < X \leq 6)$ (ii) What will be the minimum value of k ,so that $P (X \leq 2) > 3$.	K3	1	6M
		ii) Define a random experiment, sample space, and events. State and explain the axioms of probability with an example.	K2	1	6M
2		Unit-II			
	a	i) Define population, sample, parameter, and statistic. Explain sampling with and without replacement with suitable examples.	K2	2	6M
		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.	K3	2	6M
		OR			
	b	i) Explain sampling distribution and derive the sampling distribution of the sample mean for a large sample.	K4	2	6M
		ii) Define unbiased and efficient estimators. Show that the sample mean is an unbiased estimator of the population mean.	K3	2	6M
3		Unit-III			
	a	i) Explain the procedure of hypothesis testing. What is level of significance? Distinguish between one-tailed and two-tailed tests.	K2	3	6M
		ii) A sample of 64 items has a mean of 53. The population mean is 50 and $\sigma = 8$. Test whether the sample mean differs significantly at 5% level.	K3	3	6M

		OR			
	b	i) Explain Chi-square test for goodness of fit. A die is thrown 120 times and the observed frequencies are given. Test whether the die is fair.	K4	3	6M
		ii) Two samples of sizes 100 and 120 have means 50 and 52 and standard deviations 5 and 6 respectively. Test whether the means differ significantly at 5% level.	K3	3	6M
4		Unit-IV			
	a	i) Define group and subgroup. Prove that every subgroup of a group is itself a group. Give example of Abelian and non-Abelian groups.	K4	4	6M
		ii) Using prime factorisation find the gcd,lcm(35,46)	K3	4	6M
		OR			
	b	i) Define semigroup and monoid. Give suitable examples and verify their properties.	K3	4	6M
		ii) Find the remainder when 3^{200} is divided by 17 using Fermat's theorem.	K3	4	6M
5		Unit-V			
	a	i) Define graph, subgraph, multigraph, and planar graph. Explain Euler's formula for planar graphs with example.	K2	5	6M
		ii) Examine whether the following pair of graphs are isomorphic or not. Justify your answer. 	K4	5	6M
		OR			
	b	i) Explain about the adjacency matrix representation of graphs. Illustrate with an example?	K3	5	6M
		ii) Give an example of a graph which is both Hamiltonian and Eulerian.	K3	5	6M

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

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Narasaraopeta Engineering College (Autonomous)

Kotappakonda Road, Yellamanda (P.O), Narasaraopet- 522601, Guntur District, AP.

Subject Code: D2511503

I M.Tech - I Semester Regular Examinations, March-2026

AI&ML for Mechanical Engineering

(MD)

Time: 3 hours **Max Marks: 60**

All questions carry EQUAL marks

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5 X 12 = 60M

S. No		Question	KL	CO	M
1	a	Describe different types of environments in AI. Explain how the nature of the environment affects agent design.	K3	CO1	12
		OR			
	b	Discuss Distance-based learning methods. Explain Nearest Neighbour algorithm with advantages and limitations.	K3	CO1	12
2	a	Explain Instance-based Learning. Describe K-Nearest Neighbour algorithm and compare it with Naïve Bayes.	K2	CO2	12
		OR			
	b	What is Dimensionality Reduction? Explain Principal Component Analysis (PCA) with mathematical formulation.	K2	CO2	12
3	a	Describe Multilayer Neural Networks and Backpropagation algorithm with mathematical derivation.	K3	CO3	12
		OR			
	b	Describe the working of Genetic Algorithms. Explain selection, crossover, and mutation operators.	K3	CO3	12
4	a	Describe LSTM architecture. Explain how it solves the vanishing gradient problem.	K3	CO4	12
		OR			
	b	Explain Ensemble Learning methods. Compare Bagging, Boosting, and Random Forests.	K2	CO4	12
5	a	Explain the application of Machine Learning in crack detection and fatigue life estimation.	K2	CO5	12
		OR			
	b	Explain tool wear prediction and surface roughness prediction in CNC machining using ML models.	K2	CO5	12

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NARASARAOPETA ENGINEERING COLLEGE
(AUTONOMOUS)

I M.TECH I Semester Regular Examinations, March-2026

Sub Code: D2514203 **ELECTRIC VEHICLES**

Time: 3 hours (P&ID) Max. Marks: 60M

Answer FIVE Questions ONE Question from Each Unit

All Questions Carry Equal Marks (5 X 12 = 60M)

Q.No.		Questions	Cognitive level	CO	Marks
1		**Unit-I**			
	a	I) Define drive cycle and explain its significance in evaluating vehicle performance.	**K3**	**1**	**6M**
		II) Explain the effect of drive terrain (road gradient and road condition) on vehicle performance.	**K3**	**1**	**6M**
		OR			
	b	Compare conventional vehicles, electric vehicles, and hybrid vehicles in terms of efficiency, emissions, and maintenance.	**K3**	**1**	**12M**
2		**Unit-II**			
	a	I) Define hybridisation in automobiles and explain why hybrid technology is introduced in modern vehicles.	**K2**	**1**	**6M**
		II) List and explain the main subsystems required for vehicle hybridisation.	**K2**	**1**	**6M**
		OR			
	b	Compare Hybrid Electric Vehicle (HEV) and Plug-in Hybrid Electric Vehicle (PHEV) in terms of charging method, battery capacity, and operating modes.	**K2**	**1**	**12M**
3		**Unit-III**			
	a	I) List and explain the essential characteristics required for motors used in EV applications.	**K2**	**2**	**6M**
		II) Explain why high starting torque is important in electric vehicle motors.	**K2**	**2**	**6M**
		OR			
	b	Explain the factors influencing motor selection for two-wheeler and four-wheeler electric vehicles.	**K3**	**2**	**12M**
4		**Unit-IV**			
	a	Explain the need for power electronics converters in Hybrid Electric Vehicles (HEVs). Describe the function of a rectifier in HEVs.	**K3**	**3**	**12M**
		OR			
	b	I) Describe the operation of an isolated bidirectional DC-DC converter and its advantages.	**K2**	**3**	**6M**

		II)	Compare Voltage Source Inverter (VSI) and Current Source Inverter (CSI) for EV applications.	**K3**	**3**	**6M**
5	**Unit-V**					
	a	I)	Explain key energy storage parameters such as energy density, power density, cycle life, and efficiency.	**K3**	**4**	**6M**
		II)	Explain the basic working principle of an Ultra-capacitor (Supercapacitor).	**K3**	**4**	**6M**
	OR					
	b	Explain the role of Ultra-capacitors in hybrid energy storage systems. And explain the operation of a Compressed Air Energy Storage (CAES) system.		**K2**	**4**	**12M**

NARASARAOPETA ENGINEERING COLLEGE
(AUTONOMOUS)

I M.TECH I Semester Regular Examinations, March-2026

R25

Sub Code: D2516803 **FPGA DESIGN**

Time: 3 hours (ECE-VLSI&ES) Max. Marks: 60

Note: Answer All **FIVE** Questions.
All Questions Carry Equal Marks (5 X 12M = 60M)

Q.No		Questions	KL	CO	M
1		Unit-I			
	a	i) Explain the evolution of programmable logic devices leading to modern FPGA'S.	2	1	6M
		ii) List out the applications of FPGA.	2	1	6M
		OR			
	b	i) Explain the architecture and operation of floating point multiplier.	2	1	6M
		ii)Explain FPGA-based system design methodology	2	1	6M
2		Unit-II			
	a	i) Draw the structure of Actel FPGA and explain it.	2	2	6M
		ii) Compare the speed performance of ACT-1, ACT-2, and ACT-3.	4	2	6M
		OR			
	b	i) Explain the SRAM based programming technology.	2	2	6M
		ii) Explain ACT-3 architecture in detail.	2	2	6M
3		Unit-III			
	a	i) Explain Routing Structures in FPGA.	2	3	6M
		ii) How effects the logic block functionality on FPGA's performance?	2	3	6M
		OR			
	b	i) Explain the Configurable Logic Block (CLB)	2	3	6M
		ii) Write about programmable I/O blocks in FPGA.	2	3	6M
4		Unit-IV			
	a	i) Explain about global routing and detailed routing.	2	4	6M
		ii) What are the routing algorithms used in FPGA?	2	4	6M
		OR			
	b	i) Explain Segmented Channel Routing.	2	4	6M
		ii) What are the advantages of row based FPGA?	1	4	6M
5		Unit-V			
	a	i) Explain about architectural assumptions of FPGA.	2	5	6M
		ii) Explain the specifications virtex-7 FPGA.	2	5	6M
		OR			
	b	i) Explain the Switch Block (SB)	2	5	6M
		ii) Explain the applications Artix-7.	2	5	6M

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

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NARASARAOPETA ENGINEERING COLLEGE
(AUTONOMOUS)

I M.TECH I Semester Regular Examinations, March-2026

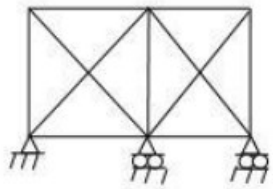
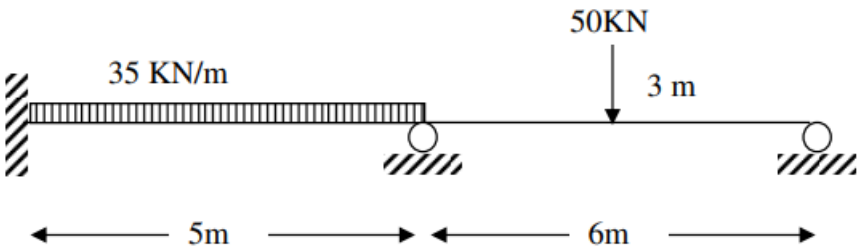
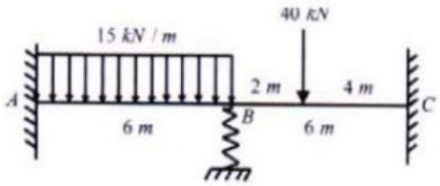
R25

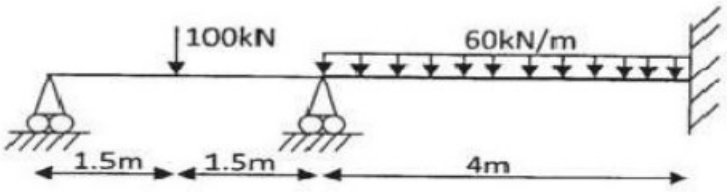
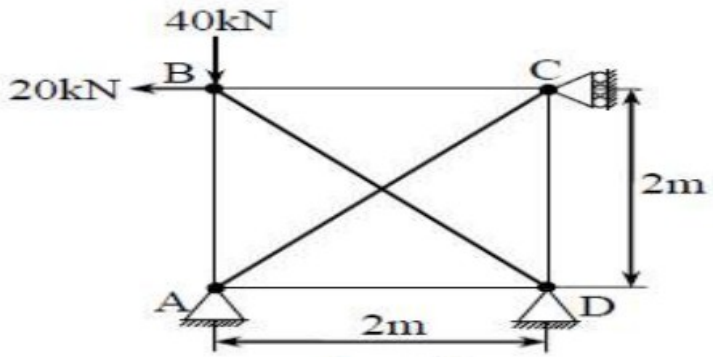
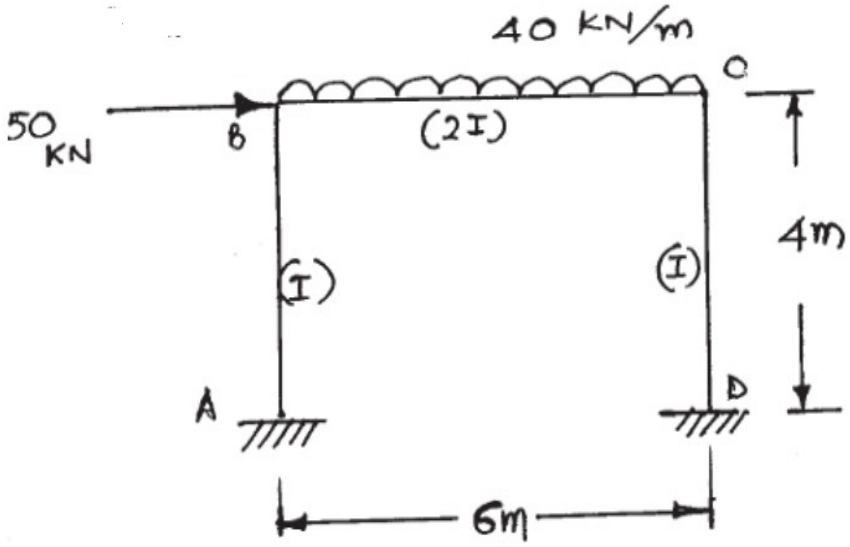
Sub Code: D2518703 **MATRIX ANALYSIS OF STRUCTURE**

Time: 3 hours (CE) Max. Marks: 60

Note: Answer All **FIVE** Questions.

All Questions Carry Equal Marks (5 X 12M = 60M)

Q.No		Questions	KL	CO	M
1		Unit-I			
	a	i) Explain (a) Static indeterminacy and kinematic indeterminacy with examples (b) Explain 'Structural Idealization'	2	1	6M
		ii) Calculate the degree of redundancy and degree of freedom for Figure 	3	1	6M
		OR			
	b	i) Explain the classification of structures with examples	2	1	6M
		ii) Differentiate between DOF and DOR.	3	1	6M
2		Unit-II			
	a	A two span continuous beam carries loading as shown. Solve the problem by stiffness method. 	3	2	12M
		OR			
	b	Analyze the continuous beam ABC as shown in Figure using stiffness matrix method. The beam is fixed at A and C and supported by spring at B. Take EI constant. Draw BMD.  Figure	3	2	12M
3		Unit-III			
	a	i) Derive Stiffness matrix for a grid element.	3	3	6M
		i) Develop stiffness matrix for the given beam?	3	3	6M

					
		OR			
	b	Explain procedure for analysis of curved beam element in vertical plane deriving stiffness formulation	2	3	12M
4		Unit-IV			
	a	i) Explain (a) Banded matrix and semi band width. Give examples how band width can be reduced with nodal numbering scheme.	3	4	6M
		ii) Explain the Method of static condensation	2	4	6M
		OR			
	b	i) Explain about inertial and thermal stresses	2	4	6M
		ii) Write about Beams on elastic foundation by stiffness method.	1	4	6M
5		Unit-V			
		Develop stiffness matrix for a given truss 	3	5	12M
		OR			
	b	Using first principles, establish relationship between local & global stiffness matrix of portal frame member. State clearly transformation matrix 	3	5	12M

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

NARASARAOPETA ENGINEERING COLLEGE
(AUTONOMOUS)

I M.TECH I Semester Regular Examinations, March-2026

R24

Sub Code: R24MCS104 **BIG DATA ANALYTICS**

Time: 3 hours (CSE) Max. Marks: 60

Note: Answer All **FIVE** Questions.
All Questions Carry Equal Marks (5 X 12M = 60M)

Q.No		Questions	KL	CO	M
1		Unit-I			
	a	i) What is SSH, and why is it essential for setting up a Hadoop cluster?	K2	1	6M
		ii) Describe the building blocks of Hadoop and their respective functions in a Hadoop cluster.	K2	1	6M
		OR			
	b	i) Compare the architecture and performance of Local (standalone) mode and Fully distributed mode in Hadoop.	K2	1	6M
		ii) Describe the transition process from Pseudo-distributed mode to Fully distributed mode in Hadoop.	K2	1	6M
2		Unit-II			
	a	i) Describe how a weather dataset can be used to demonstrate the functionality of MapReduce. Provide an example use case.	K4	2	6M
		ii) Compare the old and the new Java MapReduce APIs. Highlight their key differences and improvements in the new API.	K4	2	6M
		OR			
	b	i) Explain the concept of MapReduce and its role in processing large datasets in Hadoop.	K2	2	6M
		ii) How does the Hadoop framework handle data flow in a MapReduce job? Explain with a focus on the Mapper, Combiner, and Reducer phases.	K4	2	6M
3		Unit-III			
	a	i) What is Apache Spark, and how does it differ from Hadoop in terms of data processing and performance?	K4	3	6M
		ii) Define Resilient Distributed Datasets (RDDs) in Apache Spark. What are their key characteristics?	K2	3	6M
		OR			
	b	i) Discuss the role of Actions in Spark RDDs. Explain the purpose of collect(), count(), and reduce() actions with examples.	K4	3	6M
		ii) What is Persistence (Caching) in Apache Spark, and why is it important for RDDs? Explain with an example of how to cache an RDD.	K4	3	6M
4		Unit-IV			
	a	i) Explain the architecture of Apache Pig and its key components. How does it simplify data processing compared to writing MapReduce jobs?	K4	4	6M
		ii) Discuss the differences between Local Mode and Distributed Mode in running Pig scripts. What are the key use cases for each mode?	K4	4	6M
		OR			
	b	i) Compare the various interfaces provided by Apache Pig for scripting. Highlight the differences between the Grunt shell, PigServer, and embedded scripts.	K4	4	6M
		ii) What are some of the common operators in Pig Latin for transformations? Provide examples of using the FILTER, GROUP, and FOREACH operators in Pig scripts.	K2	4	6M

5	Unit-V				
	a	i) Explain the architecture of Apache Hive and its components. How does Hive provide structure to Hadoop data?	K4	5	6M
		ii) How does the Hive Data Manipulation Language (DML) work? Provide examples of the LOAD DATA, INSERT INTO, and Create Table As Select (CTAS) commands.	K4	5	6M
	OR				
	b	i) Explain the concept of windowing in HiveQL. Provide an example of using windowing functions for analyzing data.	K2	5	6M
		ii) What are the different Hive clients available? Compare the CLI, JDBC/ODBC interfaces, and Beeline.	K4	5	6M

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

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NARASARAOPETA ENGINEERING COLLEGE
(AUTONOMOUS)

I M.TECH I Semester Regular Examinations, March-2026

R25

Sub Code: D251BAA4 **ADVANCED SOFTWARE ENGINEERING**

Time: 3 hours (CSE) Max. Marks: 60

Note: Answer All **FIVE** Questions.
All Questions Carry Equal Marks (5 X 12M = 60M)

Q.No		Questions	KL	CO	M
1		Unit-I			
	a	Define the generic process model in software engineering and list the specific framework activities and task sets required to establish a standard software engineering practice.	KL1	1	12M
		OR			
	b	Contrast the iterative nature of the Scrum framework with the overarching philosophy of agility, and justify how Scrum's "3-5-3" structure prevents the return of traditional, process-heavy bottlenecks.	KL4	1	12M
2		Unit-II			
	a	Describe the fundamental objectives of requirements analysis and demonstrate how class-based, functional, and behavioural models collectively represent a complete software system.	KL2	2	12M
		OR			
	b	Analyze how the psychological profile of individual software engineers influences team dynamics, and evaluate the effectiveness of different team structures in optimizing productivity within high-pressure development environments.	KL5	2	12M
3		Unit-III			
	a	Illustrate how fundamental design concepts are applied during the architectural design process to transform requirements into a specific software architecture style for a given system.	KL3	3	12M
		OR			
	b	Apply the Mobile Development Life Cycle (MDLC) and the Web Design Pyramid to demonstrate how specific mobile architecture choices and design best practices ensure high mobility and design quality.	KL3	3	12M
4		Unit-IV			
	a	Critique the effectiveness of Statistical Software Quality Assurance in achieving high software reliability, and propose a comprehensive SQA Plan that integrates ISO 9000 standards with specific quality metrics.	KL6	4	12M
		OR			
	b	Define the strategic approach to software testing and explain the fundamental differences between white-box and black-box test case design techniques.	KL2	4	12M
5		Unit-V			
	a	Contrast the roles of integration and regression testing in ensuring system stability, and explain how security testing strategies must be adapted for the unique vulnerabilities of web applications.	KL4	5	12M
		OR			
	b	Outline the fundamental principles of software measurement and describe how specific metrics for testing and maintenance contribute to the overall software analytics process.	KL2	5	12M

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

NARASARAOPETA ENGINEERING COLLEGE
(AUTONOMOUS)

I M.TECH I Semester Regular Examinations, March-2026

R25

Sub Code: D25115A3 **GEOMETRIC MODELLING**

Time: 3 hours (MD) Max. Marks: 60

Note: Answer All **FIVE** Questions.
All Questions Carry Equal Marks (5 X 12M = 60M)

Q.No.		Questions	KL	CO	M
1		Unit-I			
	a	What do you understand by Implicit and Explicit equations? Explain.	**K3**	1	12M
		OR			
	b	Distinguish between parametric and non-parametric equations. Explain why nonparametric equations are not suitable for CAD.	**K3**	1	12M
2		Unit-II			
	a	i) What are the characteristics of a cubic spline?	**K2**	2	6M
		ii) What do you mean by blending function? Explain how these are evaluated.	**K2**	2	6M
		OR			
	b	Derive the four-point form of a cubic spline curve using blending functions.	**K4**	2	12M
3		Unit-III			
	a	A Cubic Bezier curve is defined by the control points as P_0 (1,1), P_1(2,4), P_2(4,3), P_3(5,1). Find the equation of the curve and its midpoint.	**K4**	3	12M
		OR			
	b	Explain the B-Spline curves in detail. Discuss basis functions, knot vectors, properties, and derivatives.	**K3**	3	12M
4		Unit-IV			
	a	Write short notes on the following terms: i) Sweep surfaces. ii) Ruled surfaces. iii) Tabulated cylinder. iv) Gaussian curvature.	**K3**	4	12M
		OR			
	b	Derive the parametric form of the following: i) Bezier surface. ii) B-Spline surface.	**K3**	4	12M
5		Unit-V			
	a	Derive the half-space representation of a solid and explain point classification mathematically.	**K4**	5	12M
		OR			
	b	Explain the solid modeling concepts of wire frames and Boundary representation methods. Discuss the advantages of each method.	**K4**	5	12M

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

NARASARAOPETA ENGINEERING COLLEGE
(AUTONOMOUS)

I M.TECH I Semester Regular Examinations, March-2026

R25

Sub Code: D25142A2

POWER QUALITY ENHANCEMENT USING CUSTOM POWER DEVICES

Time: 3 hours (PID) Max. Marks: 60

Note: Answer All **FIVE** Questions. All Questions Carry Equal Marks (5 X 12M = 60M)

Q.No		Questions	KL	CO	M
1		Unit-I			
	a	i) Write a short notes on (1) Voltage Unbalances (2) Interruptions	K2	1	6M
		ii) List and briefly describe the general classes of Power Quality problems.	K2	1	6M
		OR			
	b	i) With a waveform sketch, explain the terms (1) Voltage sag (2) Voltage interruption (3)Voltage swells	K2	1	6M
		ii) Describe the reasons behind the growing concern for power quality in recent times	K3	1	6M
2		Unit-II			
	a	i) Discuss any two devices used for over-voltage protection and explain their working principles.	K2	2	6M
		ii) Elucidate the end-user capacitor applications for voltage control and power factor improvement.	K2	2	6M
		OR			
	b	i) Explain why capacitor switching is considered the main source of transient over voltages in utility power systems.	K3	2	6M
		ii) Explain the application of utility voltage regulators in distribution networks.	K3	2	6M
3		Unit-III			
	a	i) Explain the power system response characteristics under the presence of harmonics	K2	3	6M
		ii) Explain the procedure for harmonic distortion evaluation in power systems.	K2	3	6M
		OR			
	b	i) Define Total Harmonic Distortion and Total Demand Distortion. List the devices used for controlling harmonic distortion.	K2	3	6M
		ii) Explain the harmonic sources from Industrial loads.	K2	3	6M
4		Unit-IV			
	a	i) Explain the interaction of custom power devices with distribution equipment.	K3	4	6M
		ii) Explain how custom power devices compensate for voltage interruptions in distribution systems.	K3	4	6M
		OR			
	b	i) Define custom power and explain the need for custom power devices in distribution systems.	K2	4	6M
		ii) Explain the working principle of a static shunt compensator	K2	4	6M
5		Unit-V			
	a	i) Explain the operation of Unified Power Quality Conditioner (UPQC) used for sag mitigation	K2	5	6M
		ii) With a neat circuit diagram explain the construction and working of solid state breaker.	K2	5	6M
		OR			
	b	i)With a neat circuit diagram explain the construction and working of solid state current limiter	K2	5	6M
		ii) Discuss the mechanism for protecting the sensitive loads using DVR	K2	5	6M

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

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NARASARAOPETA ENGINEERING COLLEGE
(AUTONOMOUS)

I M.TECH I Semester Regular Examinations, March-2026

R25

Sub Code: D25168A3 **VLSI SYSTEM DESIGN**

Time: 3 hours (ECE-VLSI&ES) Max. Marks: 60

Note: Answer All **FIVE** Questions. All Questions Carry Equal Marks (5 X 12M = 60M)

Q.No		Questions	KL	CO	M
1		Unit-I			
	a	i) Design a 2-input NAND gate using CMOS logic. Draw its transistor-level schematic and explain its operation for all four input combinations.	2	1	6M
		ii) Explain the DC transfer characteristics of a static CMOS inverter. Identify the different operating regions of both the NMOS and PMOS transistors along the VTC curve.	2	1	6M
		OR			
	b	i) List and discuss in detail the major steps involved in the standard CMOS fabrication process.	1	1	6M
		ii) Describe the front-end and back-end processes in a standard VLSI design flow. Give examples of tasks performed in each.	2	1	6M
2		Unit-II			
	a	i) Explain the concept of Design Rule Checking (DRC) and Layout Versus Schematic (LVS) checks. Why are both essential for a successful tape-out?	1	2	6M
		ii) Explain SPICE simulation and device modeling.	1	2	6M
		OR			
	b	i) Design a positive edge-triggered D flip-flop using CMOS transmission gates and inverters. Explain its operation.	3	2	6M
		ii) Define interconnect scaling. What is the main challenge associated with it as technology scales down?	2	2	6M
3		Unit-III			
	a	i) Explain the working of a Magnitude Comparator. Design a 2-bit comparator that checks if A > B.	3	3	6M
		ii) Derive the equations for dynamic and static power.	2	3	6M
		OR			
	b	i) Design a 1-bit CMOS Full Adder. Draw its transistor-level schematic using a mirror adder structure. Explain how the Sum and Carry signals are generated for the input condition A=1, B=1, Cin=1.	3	3	6M
		ii) Define propagation delay of a logic gate. Explain transient response in digital circuits. What is the RC delay model and why is it useful? Define logical effort and state what it represents.	1	3	6M
4		Unit-IV			
	a	i) Design a simple 4x4 ROM array that implements a given set of Boolean functions. Explain how the connections in the ROM matrix determine the stored data.	4	4	6M
		ii) Define SRAM and DRAM. Write the key differences between them.	1	4	6M
		OR			
	b	i) Discuss the architecture of a Programmable Logic Array (PLA). Explain how a PLA can be used to implement a finite state machine (FSM).	2	4	6M
		ii) Draw the circuit diagram of a standard 6T SRAM cell and explain it in detail.	3	4	6M

5	Unit-V				
	a	i) Explain the difference between a fault and a defect in VLSI circuits, giving one example of each. Also, define the Stuck-At Fault model and state its two types.	2	5	6M
		ii) Explain how layout design for improved testability can help in Fault Diagnosis.	2	5	6M
	OR				
	b	i) Explain the process of fault diagnosis using layout information. If a scan chain test indicates a failure in a specific logic block, how would a failure analysis engineer use the layout to locate the physical defect?	3	5	6M
		ii) What is Design for Testability (DFT)? Explain the techniques used in Design for Testability.	1	5	6M

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

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NARASARAOPETA ENGINEERING COLLEGE
(AUTONOMOUS)

I M.TECH I Semester Regular Examinations, March-2026

R25

Sub Code: D25187A2

ANALYTICAL & NUMERICAL METHODS FOR STRUCTURAL ENGINEERING

Time: 3 hours (CE) Max. Marks: 60

Note: Answer All **FIVE** Questions.

All Questions Carry Equal Marks (5 X 12M = 60M)

Q.No		Questions	KL	CO	M
1		Unit-I			
	a	Using the Fourier Transform method, solve the one-dimensional heat conduction equation. $$\frac{\partial u}{\partial t}=\alpha\frac{\partial^2 u}{\partial x^2}$$ in an infinite rod $-\infty<x<\infty$, given the initial condition $u(x,0)=f(x)$. Obtain the solution in integral form and comment on the role of the heat kernel.	KL4	1	6M
		i) Compare Laplace and Fourier transform methods in solving linear PDEs. ii) Discuss their suitability for Infinite domain problems, Semi-infinite domain problems, Problems with initial vs boundary conditions.	KL2	1	6M
		OR			
	b	A uniform elastic string of length L is stretched tightly between two fixed points (0,0) and (L,0). The string is initially displaced in the form $$u(x,0)=A\sin\left(\frac{2\pi x}{L}\right)$$ and released from rest at time t=0. Find the displacement $u(x,t)$ of any point on the string at any time t.	KL3	1	6M
		Write the Laplace transform of $t^{3/2}$	KL2	1	6M
2		Unit-II			
	a	Solve Laplace equation $\frac{\partial^2 u}{\partial x^2}+\frac{\partial^2 u}{\partial y^2}=0$ in the half-plane $y>0$ subjected to $u(x,0)=f(x)$, $-\infty<x<\infty$ Using Fourier transform with respect to x, obtain the solution in integral form.	KL3	2	12M
		OR			
	b	Explain the principle of the Ritz method in solving boundary value problems	KL2	2	6M
		Find the curve y(x) that extremises the functional $$J[y]=\int_0^1 (y'^2+8xy)\,dx$$ subject to the boundary conditions y(0)=1, y(1)=2.		2	6M
3		Unit-III			
	a	Solve the Volterra integral equation using successive substitution: $y(x)=1+\int_0^x (x-t)\,y(t)\,dt$ Find the solution up to the third approximation and obtain the exact solution.	KL3	3	6M
		Convert $\frac{d^2y}{dx^2}+xy=1$, $y(0)$, $y(1)=1$ into an integral equation.	KL4	3	6M

		OR			
	b	Use the iterative method to solve $y(x)=1+\int_0^1 \frac{x+t}{2}y(t)dt$ Find the first three approximations.	KL3	3	6M
		Convert the boundary value problem y \(x \) = − x , y \(0 \) = 0 , y \(1 \) = into an equivalent integral equation using Green's function and solve it	KL2	3	6M
4		Unit-IV			
	a	The value of derivative of a function at x=1, using step size h=0.2, h=0.1 are D(h=0.2)=2.135, D(h=0.1)=2.082. Use Richardson's extrapolation to obtain an improved estimate of the derivative	KL3	4	6M
		Find, by Taylor's series method, the value of y at $x=0.1$ and $x=0.2$ correct to five decimal places, given $\frac{dy}{dx}=xy+x^2,\ y(0)=1.$	KL2	4	6M
		OR			
	b	<table><tr><td>X</td><td>1</td><td>1.3</td><td>1.6</td></tr><tr><td>Y</td><td>2</td><td>2.9</td><td>4.1</td></tr></table> i)Using interpolation with unevenly spaced pivotal points, estimate $\frac{dy}{dx}$ at $x=1.3$.	KL3	4	6M
		ii)A simply supported beam of length L=4 m carries a uniform load, $w=10\ \ kN/m$. The governing equation is $\frac{d^4y}{dx^4}=\frac{w}{EI}$, take $EI=200\,KN\ \ m^2$ formulate the finite difference equations and compute the deflection at interior nodes, using step size $h=1\,m$.	KL4	4	6M
5		Unit-V			
	a	i) Use the composite Trapezoidal Rule with $m=n=2$ to evaluate the double integral $\int_0^2\int_0^1 (x^2+y^2)dx\ \ dy$	KL3	5	6M
		ii) Derive the three-point forward difference formula using the method of undetermined coefficients	KL2	5	6M
		OR			
	b	i) Evaluate $\int_0^4 \frac{1}{1+x^2}dx$ using composite Simpson's rule with $n=4$	KL3	5	6M
		ii) Explain the concept of optimum step length in numerical differentiation.	KL2	5	6M

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

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NARASARAOPETA ENGINEERING COLLEGE
(AUTONOMOUS)

I M.TECH I Semester Regular Examinations, March-2026

R25

Sub Code: D251BAB3 **AGILE METHODOLOGIES**

Time: 3 hours (CSE) Max. Marks: 60

Note: Answer All **FIVE** Questions.
All Questions Carry Equal Marks (5 X 12M = 60M)

Q.No		Questions	KL	CO	M
1		Unit-I			
	a	i) Describe how methodologies help in organizing development activities.	2	1	6M
		ii) Demonstrate how customer collaboration can be implemented in a mobile app project.	3	1	6M
		OR			
	b	i) Analyze the impact of ignoring Agile values in a project.	4	1	6M
		ii) Illustrate how Agile supports continuous improvement.	2	1	6M
2		Unit-II			
	a	i) Explain how Agile supports better working environments.	2	2	6M
		ii) Demonstrate how daily stand-ups improve project execution.	3	2	6M
		OR			
	b	i) Analyze how continuous improvement increases team performance.	4	2	6M
		ii) Demonstrate how Agile can improve communication gaps in a team.	3	2	6M
3		Unit-III			
	a	i) Describe how Daily Scrum improves collaboration	2	3	6M
		ii) Analyze the impact of weak Product Ownership on Sprint success.	4	3	6M
		OR			
	b	i) Explain why Scrum practices should align with Scrum values.	2	3	6M
		ii) Analyze how company culture affects Scrum adoption.	4	3	6M
4		Unit-IV			
	a	i) Describe how incremental design differs from monolithic design.	2	4	6M
		ii) Demonstrate how continuous integration can detect design problems early.	3	4	6M
		OR			
	b	i) Demonstrate how incremental design helps in building scalable systems.	3	4	6M
		ii) Compare incremental design vs big upfront design (BUFD).	4	4	6M
5		Unit-V			
	a	i) Explain how Value Stream Mapping helps identify inefficiencies.	2	5	6M
		ii) Demonstrate visualizing workflow using a Kanban board.	3	5	6M
		OR			
	b	i) Analyze how bottlenecks create delays across the system.	4	5	6M
		ii) Evaluate the importance of visualizing workflow.	5	5	6M

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

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NARASARAOPETA ENGINEERING COLLEGE
(AUTONOMOUS)

I M.TECH I Semester Regular Examinations, March-2026

R25

Sub Code: D25115B1 DESIGN FOR MANUFACTURING & ASSEMBLY

Time: 3 hours (MD) Max. Marks: 60

Note: Answer All **FIVE** Questions.
All Questions Carry Equal Marks (5 X 12M = 60M)

Q.No		Questions	KL	CO	M
1		Unit-I			
	a	i) Explain the concept of Design for Manufacturing (DFM) and discuss its importance in product development.	K2	1	6M
		ii) Describe the general design guidelines for manual assembly and explain the effect of part symmetry on assembly time.	K3	1	6M
		OR			
	b	i) Differentiate between DFM, DFA and DFMA with suitable examples.	K4	1	6M
		ii) Discuss the advantages of implementing DFMA during the early design stage.	K4	1	6M
2		Unit-II			
	a	i) State the general design guidelines for machining with respect to tolerances and surface finish.	K2	2	6M
		ii) Explain how component redesign improves machining ease with suitable examples.	K3	2	6M
		OR			
	b	i) Analyze the influence of material selection on machining cost and productivity.	K4	2	6M
		ii) Evaluate in detail about the dimensional tolerance before machining process	K5	2	6M
3		Unit-III			
	a	i) List the common casting defects and explain their causes.	K2	3	6M
		ii) Analyze the effect of casting discontinuities on mechanical properties of cast components.	K4	3	6M
		OR			
	b	i) Explain the Keeler–Goodwin Forming Limit Diagram and its significance.	K2	3	6M
		ii) Discuss the design principles for sheet metal operations such as bending and deep drawing.	K3	3	6M
4		Unit-IV			
	a	i) Discuss the factors affecting the design of weldments.	K2	4	6M
		ii) Analyze the effect of thermal stresses in welded joints.	K4	4	6M
		OR			
	b	i) Explain the general design recommendations for closed die forging.	K3	4	6M
		ii) Sketch and justify the selection of parting line in forging design.			6M

			K4	4	
5	Unit-V				
	a	i) Explain the fundamentals of automated assembly systems.	K2	5	6M
		ii) Compare single station and multi-station automated assembly systems.	K4	5	6M
	OR				
	b	i) Describe various parts delivery systems used in automated assembly.	K3	5	6M
		ii) Perform a brief quantitative analysis of an assembly system considering production rate and efficiency.	K5	5	6M

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

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NARASARAOPETA ENGINEERING COLLEGE
(AUTONOMOUS)

I M.TECH I Semester Regular Examinations, March-2026

R25

Sub Code: D25142B2 **RENEWABLE ENERGY TECHNOLOGIES**

Time: 3 hours (PID) Max. Marks: 60

Note: Answer All **FIVE** Questions.All Questions Carry Equal Marks (5 X 12M = 60M)

Q.No		Questions	KL	CO	M
1		Unit-I			
	a	i) Explain the concept of Distributed Generation and its advantages in renewable energy systems.	K2	1	6M
		ii) Discuss Supply-Side Management Options and its benefits	K2	1	6M
		OR			
	b	i) Analyze the role of Demand-Side Management options in optimizing renewable energy-based power systems. Compare their effectiveness in grid stability.	K4	1	6M
		ii) Describe the control strategies used in renewable energy-based power systems to maintain voltage and frequency stability.	K3	1	6M
2		Unit-II			
	a	i) Explain the principles of operation of induction generators and derive the equivalent circuit representation for steady-state operation	K2	2	6M
		ii) Discuss the magnetizing curves and mathematical description of the self-excitation process in Self-Excited Induction Generators (SEIG).	K2	2	6M
		OR			
	b	i) Analyze the power and losses generated in a self-excited induction generator. Compare the performance characteristics of interconnected operation versus stand-alone operation modes. Illustrate with suitable examples and control methods for speed and voltage regulation.	K4	2	12M
3		Unit-III			
	a	i) Describe the site selection criteria for wind power plants, including evaluation of wind intensity and topographical considerations.	K3	3	6M
		ii) Explain the general classification of wind turbines. Differentiate between rotor turbines, drag turbines, and lifting turbines with suitable diagrams.	K2	3	6M
		OR			
	b	Discuss the generators and speed control techniques used in wind power energy conversion systems. Perform a detailed analysis of small wind energy conversion systems, including power coefficient, tip speed ratio, and performance characteristics.	K2	3	12M
4		Unit-IV			
	a	Analyze the effect of temperature and irradiance on the input-output characteristics of PV cells. Derive the equivalent circuit model for photovoltaic panels and explain each parameter. Compare different MPPT schemes including perturb & observe and incremental conductance methods under partial shaded conditions.	K4	4	12M
		OR			
	b	i) Explain the generation of electricity by photovoltaic effect and the factors affecting PV cell efficiency.	K2	4	6M
		ii) Describe various applications of photovoltaic solar energy and conduct an economic analysis comparing solar energy with conventional energy sources.	K3	4	6M

5	Unit-V				
	a	i) Explain the constructional features and working principle of Proton Exchange Membrane (PEM) fuel cells. Discuss the role of reformers and electrolyzer systems.	K2	5	6M
		ii) Describe the advantages and disadvantages of fuel cells compared to conventional power generation methods. Discuss the aspects of hydrogen storage technologies.	K3	5	6M
	OR				
	b	Derive the fuel cell equivalent circuit model and explain the practical determination of equivalent model parameters. Compare low-temperature and high-temperature fuel cells in terms of efficiency, applications, and commercial viability. Discuss manufacturing issues and current market trends.	K4	5	12M

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

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NARASARAOPETA ENGINEERING COLLEGE
(AUTONOMOUS)

I M.TECH I Semester Regular Examinations, March-2026

R25

Sub Code: D25168B2 **EMBEDDED SYSTEM DESIGN USING FPGA**

Time: 3 hours (ECE-VLSI&ES) Max. Marks: 60

Note: Answer All **FIVE** Questions. All Questions Carry Equal Marks (5 X 12M = 60M)

Q.No		Questions	KL	CO	M
1		Unit-I			
	a	i) Explain the architecture of an FPGA-based Embedded SoC with a neat block diagram.	K1	1	6M
		ii) Analyze the process of assembling platform-based FPGA systems by integrating custom compute cores.	K4	1	6M
		OR			
	b	i) Describe the components of platform FPGA systems and their functions.	K2	1	6M
		ii) Discuss the use of VLSI circuit technology in enabling reconfigurable FPGA platforms for embedded applications.	K3	1	6M
2		Unit-II			
	a	i) Describe the steps involved in HDL to FPGA configuration bit-stream generation	K2	2	6M
		ii) Compare VHDL and Verilog in terms of design abstraction and synthesis.	K4	2	6M
		OR			
	b	i) Compare VHDL and Verilog in terms of syntax, abstraction levels, and typical applications.	K2	2	6M
		ii) Discuss cohesion and coupling in modular FPGA system design.	K3	2	6M
3		Unit-III			
	a	i) Explain the role of cross-development tools in FPGA-based embedded systems.	K2	3	6M
		ii) Describe the integration techniques of monitors in FPGA systems.	K2	3	6M
		OR			
	b	i) Discuss the importance of boot-loaders in platform-based FPGA development.	K1	3	6M
		ii) Describe the role of root file systems and system software options in FPGA-based embedded applications.	K2	3	6M
4		Unit-IV			
	a	i) Define the partitioning problem in FPGA system design. What performance gains can be expected from effective partitioning	K2	4	6M
		ii) Analyze the expected performance gain and resource considerations in partitioning.	K4	4	6M
		OR			
	b	i) Explain invocation and coordination mechanisms in scheduling.	K2	4	6M
		ii) Construct a control flow graph for a sample FPGA-based application and analyze its impact on scheduling and communication.	K4	4	6M
5		Unit-V			
	a	i) Describe spatial parallelism within FPGA hardware cores.	K2	5	6M
		ii) Discuss contemporary challenges and emerging technologies in embedded FPGA system design.	K2	5	6M
		OR			
	b	i) Explain parallelism across FPGA designs with suitable examples.	K2	5	6M
		ii) Identify and analyze parallelism in a real-time signal processing application implemented on FPGA.	K4	5	6M

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

NARASARAOPETA ENGINEERING COLLEGE
(AUTONOMOUS)

I M.TECH I Semester Regular Examinations, March-2026

R25

Sub Code: D25187B2 REPAIR & REHABILITATION OF STRUCTURES

Time: 3 hours (CE) Max. Marks: 60

Note: Answer All **FIVE** Questions. All Questions Carry Equal Marks (5 X 12M = 60M)

Q.No		Questions	KL	CO	M
1		Unit-I			
	a	i) Differentiate between mineral and chemical admixtures. Discuss in detail about any two natural admixtures.	3	1	6M
		ii) What are the tests used to measure the corrosion in concrete? Explain any one of them.	2	1	6M
		OR			
	b	i) Describe the procedure to assess the condition of concrete using Ultrasonic Pulse Velocity method.	2	1	6M
		ii) Write the short notes on deterioration of concrete due to carbonation and chloride attack.	3	1	6M
2		Unit-II			
	a	i) Discuss available methods for increasing the shear strength of beams.	2	2	6M
		ii) Write the causes for initiation of cracks and methods for stabilization of cracks	3	2	6M
		OR			
	b	i) How does column jacketing increase the load carrying capacity of existing column?	3	2	6M
		ii) Write about various stabilization and strengthening techniques to increase the flexural strength of beams.	3	2	6M
3		Unit-III			
	a	i) Illustrate on increasing the seismic capacity of existing beams using Fiber Reinforced Polymers (GFRP and CFRP).	3	3	12M
		OR			
	b	i) Discuss in detail about the various techniques available for floor strengthening.	3	3	12M
4		Unit-IV			
	a	i) How does fiber reinforced concrete increase the mechanical properties of Concrete?	3	4	6M
		ii) Discuss about the increase in durability of concrete with the addition of flyash.	3	4	6M
		OR			
	b	i) Write short notes on light-weight aggregate concrete and no-fines concrete.	2	4	6M
		ii) Discuss the mix design requirements and proportions of fiber reinforced concrete.	3	4	6M
5		Unit-V			
	a	i) Discuss in detail the applications of High Performance Concrete.	3	5	6M
		ii) Write short notes on self-compacting concrete.	2	5	6M
		OR			
	b	i) What are the material requirements of self-compacting concrete.	3	5	6M
		ii) Discuss the necessity for development of High-Performance Concrete.	2	5	6M

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

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