

R20

III BTECH II SEM

END EXAMINATION QUESTION PAPERS

SUPPLEMENTARY

SEPT. 2025

III B.Tech II Semester Supple. Examinations, September-2025

Sub Code: R20CC3201 CRYPTOGRAPHY AND NETWORK SECURITY

Time: 3 hours

(CSE, CSE (AI), IT)

Max. Marks: 70

Note: Answer All FIVE Questions. All Questions Carry Equal Marks (5 X 14 = 70M)

Q.No	Questions	KL	CO	M
1	Unit-I			
	a i) Enumerate the security mechanisms defined by X.800. Explain each.	K2	Co1	7M
	ii) Construct a Playfair matrix with the key largest. encrypt this message: MEET ME AT THE TOGA PARTY	K2	Co1	7M
	OR			
	b i) Explain the differences between stream ciphers and block ciphers.	K2	CO1	7M
	ii) How to perform different permutations on the plain text letters in transposition techniques? Explain with example.	K2	CO1	7M
2	Unit-II			
	a Explain the Modes of Operations of Block Cipher.	K1	CO2	14M
	OR			
	b i) Write about the round functions and key expansion of IDEA algorithm. How it is different from DES?	K4	CO2	7M
	ii) In detail write about block cipher design principles and relate them to Feistel structures.	K4	CO2	7M
	Unit-III			
3	a i) How is GCD calculated with Euclid's algorithm? Calculate the GCD of (270, 192)	K3	CO3	7M
	ii) Discuss the following about ElGamal algorithm i) Encryption ii) Efficiency.	K3	CO3	7M
	OR			
	b i) What is discrete logarithm? What are their properties?	K3	CO3	7M
	ii) Find the secret key shared between user A and user B using Diffie - Hellman algorithm for the variables $Q=353$, α (primitive root)=3, $X_A=45$, $X_B=50$.	K3	CO3	7M
	Unit-IV			
4	a i) Describe HMAC algorithm. Comment on the security of HMAC.	K2	CO2	7M
	ii) Describe signing and verification in Digital Signature Algorithm.	K2	CO2	7M
	OR			
	b i) Differentiate the authentication tied to plain text and cipher text with message authentication codes	K2	CO2	7M
	ii) Explain message digest generation and round function of SHA-512.	K2	CO2	7M
	Unit-V			
5	a i) Give a brief notes on X.509 authentication services.	K2	CO5	7M
	ii) Write the methodology involved in computing the keys in SSL/TLS protocol.	K2	CO5	7M
	OR			
	b i) What is PGP? Examine how authentication and confidentiality is maintained in PGP.	K2	CO5	7M
	ii) Draw the IP security authentication header and describe the functions of each field.	K2	CO5	7M

III B.Tech II Semester Supple. Examinations, September-2025

Sub Code: R20CC3204

MACHINE LEARNING

Time: 3 hours

(CSE, IT)

Max. Marks: 70

Note: Answer All FIVE Questions.

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

Q.No		Questions	KL	CO	M
1	Unit-I				
	a	i) How does the Vapnik-Chervonenkis (VC) Dimension help in understanding a model's capacity and complexity?	K2	CO1	7M
		ii) How does Bayesian classification work, and what role does model selection play in ensuring good generalization?	K2	CO1	7M
	OR				
	b	i) What is Probably Approximately Correct (PAC) Learning, and how does it provide theoretical guarantees for learning algorithms?	K2	CO1	7M
		ii) How does noise in the data impact the performance and generalization of a learning algorithm?	K2	CO1	7M
2	Unit-II				
	a	i) What is maximum likelihood estimation and how is it applied to Bernoulli, multinomial, and Gaussian densities?	K2	CO2	7M
		ii) What techniques are used to tune model complexity, and how do the bias/variance dilemma and model selection procedures play a role?	K2	CO2	7M
	OR				
	b	i) What is the Bayes' estimator and how does it differ from maximum likelihood estimation?	K2	CO2	7M
		ii) How are regression models built using parametric methods, and what challenges do they face?	K2	CO2	7M
3	Unit-III				
	a	i) How does Principal Components Analysis (PCA) reduce the dimensionality of data?	K5	CO3	7M
		ii) What are the basic principles of association learning, and how does the Apriori algorithm identify frequent itemsets?	K5	CO3	7M
	OR				
	b	i) How does Linear Discriminant Analysis (LDA) help in separating classes for classification tasks?	K5	CO3	7M
		ii) How does the FP Growth algorithm improve association rule mining compared to Apriori, and can you provide an example of its application?	K5	CO3	7M
4	Unit-IV				
	a	i) How does k-Means clustering partition data, and what is its basic iterative process?	K4	CO4	7M
		ii) What methods can be used in hierarchical clustering, and how do you choose the optimal number of clusters?	K4	CO4	7M
	OR				
	b	i) How can supervised learning be integrated after clustering to refine classification performance?	K4	CO4	7M
		ii) What is the Expectation Maximization algorithm, and how does it improve clustering results?	K4	CO4	7M

Unit-V					
5	a	i) What distinguishes classification trees from regression trees in univariate tree methods?	K5	CO5	7M
		ii) What methods are used to extract rules from trees, and why is learning rules from data important?	K5	CO5	7M
	OR				
	b	i) Can you describe the Random Forest algorithm with a simple example to illustrate its workflow?	K5	CO5	7M
		ii) How do decision trees differ from Random Forests in terms of construction and performance?	K5	CO5	7M

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

III B.Tech II Semester Supple. Examinations, September-2025

Sub Code: R20CC3205

ADVANCED JAVA AND WEB TECHNOLOGIES

Time: 3 hours

CSE, CSE(AI)

Max. Marks: 70

Note: Answer All FIVE Questions. All Questions Carry Equal Marks (5 X 14 = 70M)

Q.No	Questions	KL	CO	M
1	Unit-I			
	a i) Explain the servlet lifecycle in detail, mentioning key methods such as init(), service(), and destroy().	K2	CO1	7M
	ii) Describe the role of Tomcat as a servlet container and explain how it manages servlet instances and their lifecycle.	K2	CO1	7M
	OR			
	b i) How do cookies work in servlets, and what are the security concerns related to them?	K2	CO1	7M
	ii) What are the key differences between doGet() and doPost() methods in HttpServlet, and in what scenarios should each be used?	K2	CO1	7M
2	Unit-II			
	a i) Explain the basic anatomy of a JSP page. What are its main components?	K2	CO2	7M
	ii) Explain conditional processing in JSP. How can you display different content based on certain conditions?	K3	CO2	7M
	OR			
	b i) What are implicit objects in JSP? List and explain the most commonly used implicit objects.	K2	CO2	7M
	ii) How can you handle session management in JSP, and what are the potential security issues involved?	K3	CO2	7M
3	Unit-III			
	a i) Explain how data can be passed between different JSP pages. Describe the use of the forward and include actions in this context. Also, explain how the request and session objects can be used for sharing data across pages	K2	CO1	14M
	OR			
	b i) Write a JSP program which accepts user Id and PWD from form and prints "Hello User" if user Id and PWD are correct.	K3	CO1	14M
4	Unit-IV			
	a i) What is JDBC, and how does it enable Java applications to interact with relational databases?	K3	CO1	7M
	ii) What are the differences between executeQuery(), executeUpdate(), and execute() methods in JDBC? When would you use each one?	K3	CO1	7M
	OR			
	b i) What are the different types of JDBC drivers, and how do they differ from each other?	K3	CO1	7M
	ii) Explain the importance of closing resources like Connection, Statement, and ResultSet in JDBC. What are the best practices for managing these resources?	K3	CO1	7M
5	Unit-V			
	a i) Describe the control structures available in PHP to control program flow. Provide examples for if-else, switch-case, and loops.	K3	CO1	7M
	ii) Explain user-defined functions in PHP. What are the advantages of using functions, and how do you declare and call a function? Provide an example	K3	CO1	7M

		of a recursive function.			
		OR			
		i) What are variables in PHP? How do you define and use them? Provide an example.	K3	CO1	7M
	b	ii) How does PHP interact with MySQL databases? Explain the process of connecting to a MySQL database and performing CRUD (Create, Read, Update, Delete) operations using MySQLi.	K3	CO1	7M

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

III B.Tech II Semester Supple. Examinations, September-2025

Sub Code: R20CC3206

BIG DATA ANALYTICS

Time: 3 hours

(CSE, IT)

Max. Marks: 70

Note: Answer All FIVE Questions. All Questions Carry Equal Marks (5 X 14 = 70M)

Q.No	Questions	KL	CO	M
1	Unit-I			
	a i) Explain the Google File System and its role in the development of Hadoop	2	1	7M
	ii) Describe the different modes of running Hadoop: Local (standalone), pseudo-distributed, and fully distributed modes	2	1	7M
	OR			
	b i) Describe the building blocks of Hadoop and how they interact.	2	1	7M
	ii) Build a distributed file system by installing Hadoop in pseudo Distributed Mode and explain with an example.	3	1	7M
2	Unit-II			
	a i) How would you use Hadoop MapReduce to analyze a weather dataset? Explain	2	2	7M
	ii) What are the differences between the old and the new Java MapReduce APIs? Explain	2	2	7M
	OR			
	b i) How do you analyze data with Hadoop using MapReduce? Explain	2	2	7M
	ii) Write the word count program using Hadoop MapReduce	3	2	7M
3	Unit-III			
	a i) What is Apache Spark, and how does it relate to RDDs? Explain	2	3	7M
	ii) How do you pass functions to Spark, and why is it important?	2	3	7M
	OR			
	b i) Discuss the basics of RDDs in Spark?	2	3	7M
	ii) Explain RDD operations, and how do they work?	2	3	7M
4	Unit-IV			
	a i) Explain the architecture of Apache Pig, and how does it enhance big data processing?	2	4	7M
	ii) How do local and distributed modes of running Pig scripts compare, and when should each be used?	2	4	7M
	OR			
	b i) Describe the Pig Latin application flow and its role in big data processing.	2	4	7M
	ii) What are the key data types and syntax in Pig Latin, and how are they used in data processing?	2	4	7M
5	Unit-V			
	a i) Explain the architecture of Apache Hive and how its components work together to process large datasets.	2	5	7M
	ii) How does the Hive Data Manipulation Language (DML) work? Provide examples of LOAD DATA, INSERT, and Create Table As Select (CTAS) operations.	2	5	7M
	OR			
	b i) What are the different Hive clients available, and how do they facilitate data interaction? Explain	2	5	7M
	ii) Explain the process of joining tables in Hive and provide an example	3	5	7M

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

III B.Tech II Semester Supple. Examinations, September-2025

Sub Code: R20CC3208

DESIGN AND ANALYSIS OF ALGORITHMS

Time: 3 hours

CSE(DS), CSE(AIML)

Max. Marks: 70

Note: Answer All FIVE Questions.

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

Q.No	Questions	KL	CO	M
1	Unit-I			
	a i) Explore Time Complexity and Space Complexity in the context of algorithm performance analysis.	3	1	7M
	ii) What are Asymptotic Notations in algorithm analysis?	3	1	7M
	OR			
	b i) Critically assess why Big-O notation is widely used for performance analysis despite its limitations.	5	1	7M
	ii) Given two algorithms with complexities $O(n \log n)$ and $O(n^2)$, which one performs better for large inputs? Why?	5	1	7M
2	Unit-II			
	a i) How does Divide and Conquer differ from Dynamic Programming and Greedy Algorithms?	3	2	7M
	ii) Design an optimized version of Quick Sort that avoids worst-case performance.	5	2	7M
	OR			
	b i) Write the Merge Sort algorithm and demonstrate how it sorts the array with elements 38, 27, 43, 3, 9, 82, 10.	3	2	7M
	ii) Describe the general method of Divide and Conquer.	2	2	7M
3	Unit-III			
	a i) Explain the general method of a greedy algorithm.	2	3	7M
	ii) Explain why a greedy approach may not always find the optimal solution for the Travelling Salesman Problem (TSP).	4	3	7M
	OR			
	b i) Why does the greedy algorithm work for the Fractional Knapsack problem but not for the 0/1 Knapsack problem?	4	3	7M
	ii) Explain Job sequencing with deadlines with an example.	3	3	7M
4	Unit-IV			
	a i) Write a dynamic programming algorithm to solve the 0/1 Knapsack problem with an example.	4	4	7M
	ii) How does Dynamic Programming differ from the Greedy method?	3	4	7M
	OR			
	b i) Design an efficient variation of Matrix Chain Multiplication for extremely large matrices with memory constraints.	4	4	7M
	ii) What are the different approaches to implementing Dynamic Programming?	2	4	7M
5	Unit-V			
	a i) Write a backtracking algorithm for solving the N-Queens problem.	3	5	7M
	ii) Explain Graph Coloring problem using backtracking with an example.	3	5	7M
	OR			
	b i) Compare the efficiency of Branch & Bound vs. Dynamic Programming for solving the 0/1 Knapsack problem.	4	5	7M
	ii) List key differences between Backtracking and Branch & Bound.	3	5	7M

III B.Tech II Semester Supple. Examinations, September-2025

Sub Code: R20CE3201

DESIGN AND DRAWING OF STEEL STRUCTURES

Time: 3 hours

(CE)

Max. Marks: 70

Answer any ONE Question from Part – A & Any THREE Questions from Part – B

Q.No	Questions	KL	CO	Marks
PART A				
1	Design a 18 m long simply supported welded plate girder and its component elements carrying UDL dead load (exclude self weight) 50 kN/m, and two point loads located at quarter span on each side, each 300 kN. Assume the girder is supported laterally throughout its length. Use thin web and stiffened plate girder as per Tension field method. Assume stiff bearing length at support 180 mm. Design and detail the girder and elements with necessary design checks as per I.S code. Assume shop weld joints.	K4	CO5	[28M]
OR				
2	A steel column is to take a central load of 1600kN is to be built of four equal angles forming a 50 cm × 50 cm square. The height of the column is to be 6m with hinged ends. Design a suitable column section and a lacing system. Draw to scale the plan and elevation.	K4	CO3	[28M]
PART B				
3	Design a connection to joint two plates of size 200 mm x 10 mm of grade Fe 410 to mobilize full plate tensile strength using shop fillet welds if (i) a lap joint is used (ii) a double cover butt joint is used.	K1	CO1	[14M]
4	A tension member consisting of two channel sections 200mm × 75mm @22.1 kg/m back to back is to be connected to gusset plate. Design the welded joint for the condition that the section is loaded to its full strength. Take A= 3000 sq.mm. Thickness of the flange is 11.4 mm and the thickness of the web is 6.1mm. Take the safe stress in the weld material equal to 110 N/mm ² . Take the safe stress in axial tension equal to 150 N/mm ² .	K4	CO2	[14M]
5	A simply supported beam has an effective span of 7m and carries a uniformly distributed load of 50 kN/m (i.e DL = 25kN/m and LL = 25 kN/m). Taking $f_y = 250 \text{ N/mm}^2$ and $E = 2 \times 10^5 \text{ N/mm}^2$, design the beam, if it is laterally supported.	K4	CO3	[14M]
6	A laced column 10 m long to carry a factored axial load of 1100 kN. The column is restrained in position but not in direction at both the ends. Provide single lacing system with welded connection. Design the column with two channels placed toe-to-toe. Design the cross-section and also the lacing system. Draw to a scale the cross-section and sectional elevation of the column with lacing details.	K4	CO4	[14M]

7	Design a gantry girder (without lateral restraint along its span) for an Industrial building to support overhead travelling crane. Use the following data: Centre to centre distance between column (span of gantry) 6 m, Crane capacity 150 kN, Self weight of crane girder (exclude trolley) 160 kN, Self weight of trolley motor and other accessories 40 kN. Minimum hook approach 1.00 m, Distance between wheel centers of trolley 2.00 m, Centre to centre between gantry rails (span of crane) 12 m, Self weight of rail section 250 N/m, Yield strength of steel 250 MPa. Apply necessary design checks.	K4	CO5	[14M]
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KL: Blooms Taxonomy Knowledge Level CO: Course Outcome M: Marks

III B. Tech II Semester Supple. Examinations, September-2025

Sub Code: R20CE3202

ENVIRONMENTAL ENGINEERING

Time: 3 hours

(CE)

Max. Marks: 70

Note: Answer All FIVE Questions.

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

Q.No		Questions	KL	CO	M
1	Unit-I				
	a	i) Discuss about softening of water and also removal of color and odour.	K3	C01	7M
		ii) Write a note on significance of MPN in water quality.	K1	C01	7M
	OR				
	b	i) What are the factors affecting the design period? Explain	K2	C01	7M
		ii) Explain the importance of protected water supply systems.	K2	C01	7M
2	Unit-II				
	a	What do you understand by plain sedimentation? Describe the design principles of a settling tank.	K1	C02	14M
	OR				
	b	i) Draw a neat flow chart of water treatment plant.	K3	C02	7M
3		ii) Explain the working of a rapid sand gravity filter.	K1	C02	7M
	Unit-III				
	a	Discuss about self purification of rivers in detail.	K4	C03	14M
	OR				
4	b	i) Derive a mathematical model for first stage BOD reaction. Mention basic assumptions.	K3	C03	7M
		ii) The $BOD_{5@20^{\circ}C}$ of a sewage is 220mg/L. Determine $BOD_{5@30^{\circ}C}$. Assume $k_{20} = 0.12d^{-1}$.	K2	C03	7M
	Unit-IV				
5	a	Mention various formulae generally used in the design of sewers and analyze.	K2	C04	14M
	OR				
	b	i) What are the design criteria for design of septic tank?	K4	C04	7M
		ii) Write short note on i) Screening and ii) Grit chamber	K3	C04	7M
5	Unit-V				
	a	i) Discuss the activated sludge process for treatment of sewage.	K4	C05	7M
		ii) Explain about the low cost waste treatment methods.	K2	C05	7M
	OR				
	b	i) Differentiate between the aerobic and anaerobic lagoons.	K4	C05	7M
		ii) Explain the design of oxidation ponds.	K2	C05	7M

KL: Knowledge Level CO: Course Outcome M: Marks

III B.Tech II Semester Supple. Examinations, September-2025

Sub Code: R20CE3203

HYDROLOGY AND IRRIGATION ENGINEERING

Time: 3 hours

(CE)

Max. Marks: 70

Note: Answer All FIVE Questions. All Questions Carry Equal Marks (5 X 14 = 70M)

Q.No	Questions	KL	CO	M
1	Unit-I			
	a i) Explain the hydrologic cycle and its significance in the study of hydrology.	K2	1	7M
	ii) Define Probable Maximum Precipitation (PMP) and explain its use in the design of hydraulic structures.	K2	1	7M
	OR			
	b i) Describe the different types and forms of precipitation, providing examples of where each type commonly occurs.	K2	1	7M
2	ii) A region experiences a design storm with a 1-hour rainfall intensity of 30 mm/h. Using the Intensity-Duration-Frequency (IDF) curve, estimate the return period of the storm.	K2	1	7M
	Unit-II			
	a i) Describe the factors that affect evaporation and how it is measured in hydrological studies.	K2	2	7M
	ii) An infiltration test yielded the following data: initial infiltration rate = 10 mm/h, final infiltration rate = 3 mm/h. Calculate the infiltration index using the Horton infiltration equation.	K3	2	7M
	OR			
3	b i) Explain evapotranspiration and its importance in the hydrologic cycle. How can it be controlled or reduced in agricultural settings?	K2	2	7M
	ii) A soil sample shows an infiltration capacity of 15 mm/h under constant rainfall intensity of 20 mm/h. Compute the amount of runoff generated after 1 hour.	K3	2	7M
	Unit-III			
	a i) Define runoff and discuss the factors that influence the amount of runoff in a catchment area.	K2	3	7M
	ii) Describe the procedure for separating base flow from a hydrograph. Why is this process important?	K2	3	7M
4	OR			
	b i) Explain the components of a hydrograph? Explain the significance of base flow in hydrograph analysis.	K2	3	7M
	ii) Discuss about a unit hydrograph? List its assumptions and explain its application in hydrological studies.	K2	3	7M
	Unit-IV			
	a i) Explain the difference between confined and unconfined aquifers and their importance in groundwater storage.	K2	4	7M
4	ii) Define transmissivity and storage coefficient, and explain their role in the movement of groundwater.	K2	4	7M
	OR			
	b i) Explain Darcy's law, and how is it used to calculate the flow of water through porous media?	K2	4	7M
	ii) Describe the different types of wells and their respective uses in groundwater extraction.	K2	4	7M

5	Unit-V				
	a	i)Discuss the main objectives and benefits of irrigation? Discuss the ill-effects of improper irrigation practices.	K2	5	7M
		ii)Compare surface irrigation methods like basin flooding and furrow irrigation. In what situations would each method be more efficient?	K2	5	7M
	OR				
	b	i)Define the terms “duty” and “delta” in irrigation. How are these parameters used to calculate the water requirements of crops?	K2	5	7M
		ii)Explain the concept of irrigation efficiencies, including water conveyance efficiency and water application efficiency.	K2	5	7M

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

III B.Tech II Semester Supple. Examinations, September-2025

Sub Code: R20CE3204

FOUNDATION ENGINEERING

Time: 3 hours

(CE)

Max. Marks: 70

Note: Answer All FIVE Questions.

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

Q.No	Questions	KL	CO	M
1	Unit-I			
	a i) Explain the importance of soil exploration in foundation engineering. How does it contribute to the design and safety of a structure?	K2	1	7M
	ii) Discuss the purpose of a pressure meter test, and in which situations is it preferable over other field tests?	K3	1	7M
	OR			
	b i) Describe the penetration test and explain its role in determining soil properties.	K2	1	7M
	ii) Compare different boring methods such as auger boring and rotary drilling. When would each method be most suitable in practice?	K3	1	7M
2	Unit-II			
	a i) Describe the Swedish arc method for slope stability analysis. How is it applied in slope failure analysis?	K2	2	7M
	ii) Calculate the factor of safety for an infinite slope in dry sand with an internal friction angle of 30° and a slope angle of 15° . Assume a unit weight of soil as 18 kN/m^3 .	K3	2	7M
	OR			
	b i) Compare Rankine's and Coulomb's theories of earth pressure. How do they differ in their assumptions and applications?	K2	2	7M
	ii) Determine the active earth pressure acting on a retaining wall of height 4 meters, retaining cohesionless soil with a unit weight of 20 kN/m^3 and an internal friction angle of 30° . Use Rankine's theory.	K3	2	7M
3	Unit-III			
	a i) Explain the significance of bearing capacity in foundation design. What factors influence the selection of foundation types?	K2	3	7M
	ii) Using Terzaghi's theory, calculate the ultimate bearing capacity for a strip footing of width 2 meters, resting on clay with a cohesion value of 30 kPa. Assume the depth of foundation is 1.5 meters and the water table is below the foundation depth.	K3	3	7M
	OR			
	b i) List the factors that should be considered while locating shallow foundations in a building project?	K2	3	7M
	ii) A square footing has a width of 3 meters and is subjected to a vertical load of 500 kN. Determine the bearing pressure under the foundation, assuming uniform load distribution.	K3	3	7M
4	Unit-IV			
	a i) Discuss the relationship between safe bearing capacity and allowable settlement? How is it determined in practice?	K2	4	7M
	ii) plate load test yields an allowable bearing pressure of 150 kPa for a foundation. If the foundation size is $2.5 \text{ m} \times 2.5 \text{ m}$, determine the total load	K3	4	7M

		that can be safely applied to the foundation.			
		OR			
	b	i) Explain the different types of settlements that can occur in shallow foundations. What are the causes of each type?	K2	4	7M
		ii) Given an N-value of 20 from an SPT, calculate the safe bearing pressure for a shallow foundation at a depth of 1.5 meters.	K3	4	7M
		Unit-V			
	a	i) Explain the different types of piles and their load-bearing mechanisms. In what situations would each type be most effective?	K2	5	7M
		ii) Explain the process of sinking of wells with neat sketches?	K2	5	7M
5		OR			
	b	i) Discuss the construction and design criteria for well foundations. How do the different shapes of wells influence their performance?	K2	5	7M
		ii) Explain the forces acting on a well foundation. How do these forces affect the design and stability of the foundation?	K2	5	7M

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

III B.Tech II Semester Supple. Examinations, September-2025

Sub Code: R20EE3201 MICROPROCESSOR AND MICROCONTROLLERS

Time: 3 hours

(EEE)

Max. Marks: 70

Note: Answer All FIVE Questions.

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

Q.No	Questions	KL	CO	M
1	Unit-I			
	a i) What is segmented memory and what are its advantages? Explain logical and physical address in 8086. What are default segment assignments and what is segment override? Explain with suitable examples.	K3	CO2	9M
	ii) Write features of 80386 Microprocessor.	K1	CO1	5M
	OR			
	b i) Draw the 8086 microprocessor internal architecture and explain the operation of each block.	K2	CO2	9M
	ii) Write features of 80486 Microprocessor.	K1	CO1	5M
2	Unit-II			
	a i) Explain maximum mode of 8086 microprocessor. Draw timing diagram for write operation in maximum mode of 8086 and explain it.	K2	CO2	7M
	ii) Explain with suitable examples the following instructions of 8086. CBW, TEST, LAHF, XLAT and LEA.	K3	CO3	7M
	OR			
	b i) Draw the timing diagrams of minimum mode read operation and explain in detail.	K3	CO2	7M
	ii) Define addressing mode and explain different addressing modes presented in 8086 microprocessor.	K2	CO1	7M
3	Unit-III			
	a i) Write a short note on various assembly language directives and Macro functions.	K2	CO3	7M
	ii) Write an ALP in 8051 to find the largest of three numbers.	K3	CO2	7M
	OR			
	b i) What are the major components of systems development tools and explain?	K2	CO3	7M
	ii) Write an 8086 assembly language program to divide 16-bit number by 4-bit number.	K3	CO3	7M
4	Unit-IV			
	a i) Write a brief note on programmable peripheral interface (PPI) IC-8255 and its modes of operation.	K2	CO4	7M
	ii) Explain 8086 interrupt structure and its method of interfacing with 8086 microprocessor with a suitable example.	K2	CO4	7M
	OR			
	b i) Draw the Interfacing diagram of D/A Converter with 8086 Microprocessor along with 8255 PPI and explain its operation.	K3	CO4	7M
	ii) Describe the importance of DMA controller. Explain method of interfacing 8057 DMA controller with 8086 microprocessor.	K2	CO4	7M

5	Unit-V					
	a	i)	Explain the following registers (i) IP (ii) IE (iii) PCON (iv) TMOD.	K2	CO5	7M
		ii)	Explain the internal and external interrupts in 8051.	K2	CO5	7M
	OR					
	b	i)	Explain the differences between microprocessor and microcontroller	K2	CO5	7M
		ii)	Explain the timer and counter operations of 8051 Microcontroller.	K2	CO5	7M

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

III B.Tech II Semester Supple. Examinations, September-2025

Sub Code: R20EE3202

POWER SYSTEM ANALYSIS

Time: 3 hours

(EEE)

Max. Marks: 70

Note: Answer All FIVE Questions.
All Questions Carry Equal Marks (5 X 14 = 70M)

Q.No		Questions	KL	CO	M
1	Unit-I				
	a	i) Write the algorithm for Y-bus formulation by direct inspection method?	2	1	7M
		ii) Two alternators are connected in parallel to the same bus and have sub transient reactance of 11%. Alternator 1 is rated 2.3MVA and alternator 2 is rated 4.7MVA and voltages both are 2.7kV. Find the per unit reactance of each alternator for a 15MVA, 2.7kV base values? Find also the reactance in per unit of a single alternator equivalent to two alternators in parallel on a 15MVA, 2.7kV base values?	3	1	7M
	OR				
	b	i) Explain the process and features of impedance diagram of power system?	2	1	7M
		ii) A single phase transformer of 11kV/415V, 50Hz 148kVA has primary resistance and reactance are 1.7 ohms and 9.2 ohms. The secondary resistance and reactance are 0.03 ohms and 0.06 ohms respectively. Find the per unit values of the transformer?	3	1	7M
2	Unit-II				
	a	i) Write the algorithm for Fast decoupled load flow method and write the demerits?	2	2	7M
		ii) Summarize the objectives and outcomes of power flow studies?	3	2	7M
	OR				
	b	i) Write the algorithm for decoupled load flow method and write the demerits?	2	2	7M
		ii) Describe the process of deriving the Jacobean matrix with an example?	2	2	7M
3	Unit-III				
	a	i) Derive and analyze the symmetrical components of unsymmetrical phasors?	4	3	7M
		ii) A 3 phase, 32MVA, 33kV alternator has internal reactance of 5.2% and negligible resistance. Calculate the external reactance per phase to be connected in series with the alternator so that the steady current on short circuit does not exceeds 12 times the full load current?	3	3	7M
	OR				
	b	i) Compare the desired properties of positive, negative and zero sequence networks?	3	3	7M
		ii) Explain the importance and justify the short circuit MVA calculations?	2	3	7M
4	Unit-IV				
	a	i) Derive the expression for the fault current and analyze the line to line fault on the unloaded alternator?	4	4	7M

		ii) Derive the expression for the fault current and analyze the line to ground fault on the unloaded alternator?	4	4	7M
	OR				
		i) Derive the expression for the fault current and analyze the line to line to ground fault on the unloaded alternator?	4	4	7M
	b	ii) A 22MVA, 14.6kV alternator with solidly grounded neutral has a sub transient reactance of 0.18 p.u. The negative and zero sequence reactances are 0.42 p.u and 0.2 p.u respectively. A single line to ground fault occurs at the terminals of an un loaded alternator. Find the fault current and the line to line voltages by neglecting the resistance?	3	4	7M
	Unit-V				
5	a	i) Summarize the methods to improve the transient stability in power systems with drawbacks?	3	5	7M
		ii) Derive and explain in detail about the importance of swing equation?	2	5	7M
	OR				
	b	i) Summarize the methods to improve the steady state stability in power systems with drawbacks?	4	5	7M
		ii) Justify the role of equal area criterion with respect to transient stability aspects?	5	5	7M

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

III B.Tech II Semester Supple. Examinations, September-2025

Sub Code: R20EE3203

MEASUREMENTS AND INSTRUMENTATION

Time: 3 hours

(EEE)

Max. Marks: 70

Note: Answer All FIVE Questions.

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

Q.No	Questions	KL	CO	M
1	Unit-I			
	a i) What do you understand by static characteristics? List the different types of static characteristics. Define the terms: Instrument, accuracy, precision, Resolution, sensitivity and errors.	K3	1	7M
	ii) Draw the block diagram of continuous balance type digital voltmeters and explain.	K2	1	7M
	OR			
	b i) Explain the calibration technique in detail.	K2	1	7M
	ii) Explain in detail about the resolution and sensitivity of digital meters.	K3	1	7M
2	Unit-II			
	a i) Explain how a power measurement range can be extended with a wattmeter in conjunction with an instrument transformer.	K3	2	7M
	ii) A single phase KWh meter makes 500 revolutions per KWh. It is found, on testing, as making 40 revolutions in 58 seconds at 5 KW full load. Find out the percentage error.	K3	2	7M
	OR			
	b Explain the working of Induction type single phase Energy meter with a neat sketch.	K3	2	14M
3	Unit-III			
	a i) Draw and explain the working of a Wheatstone bridge in detail.	K3	3	7M
	ii) What is Maxwell's bridge? Derive the equation of balance for the bridge.	K3	3	7M
	OR			
	b i) Explain about the multiple earth and earth loops.	K2	3	7M
	ii) Explain about Electrostatic and Electromagnetic Interference.	K2	3	7M
4	Unit-IV			
	a i) With a neat sketch explain the working principle of digital storage Oscilloscope and list its advantages over conventional CRO.	K3	4	7M
	ii) Explain about digital plotters and printers.	K2	4	7M
	OR			
	b i) Explain about Dot matrix display Recorders.	K2	4	7M
	ii) Explain about Magnetic disk and tape.	K2	4	7M
5	Unit-V			
	a i) What are the factors that should be considered while selecting a transducer? Explain.	K3	5	7M
	ii) Briefly discuss about the working of piezoelectric transducers and draw its electric equivalent circuit?	K3	5	7M
	OR			

		i) Explain with diagram the functions of a resistive transducer.	K2	5	7M
	b	ii) Show with an example how the capacitive transducer has excellent frequency response.	K3	5	7M

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

III B.Tech II Semester Supple. Examinations, September-2025

Sub Code: R20ME3201

DESIGN OF MACHINE ELEMENTS-II

Time: 3 hours

(ME)

Max. Marks: 70

Note: Answer All FIVE Questions.

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

Q.No	Questions	KL	CO	M
1	Unit-I			
	a A journal bearing supports a shaft of 100 mm diameter rotating at 1200 rpm. The bearing length is 100 mm, radial clearance is 0.1 mm, and the lubricant used has a viscosity of 20 mPa.s. Calculate the bearing modulus. Also, comment on whether the bearing operates under hydrodynamic lubrication. Assume load on 5KN	K3	CO1	14M
	OR			
2	b A ball bearing is subjected to a dynamic load of 2.8 kN. Its dynamic load rating is 4.5 kN. Calculate the expected life of the bearing in million revolutions and in hours, if the shaft rotates at 1440 rpm.	K3	CO1	14M
	Unit-II			
	a A connecting rod is subjected to a gas load of 30 kN and an inertia force due to reciprocating mass of 8 kg at 3000 rpm. Calculate the total force acting on the connecting rod at top dead center. Consider the crank radius to be 60 mm. Also determine the resultant axial thrust in the rod.	K3	CO2	14M
3	OR			
	b A connecting rod of length 250 mm and mass 2.2 kg undergoes high-speed operation at 4000 rpm. Calculate the whipping stress induced at the big end of the rod due to dynamic bending. Assume radius of gyration $k=0.3 \times l = 0.3$, and use appropriate formulas for dynamic stress.	K3	CO2	14M
	Unit-III			
3	a A piston of diameter 80 mm and mass 0.75 kg operates at 3600 rpm in a single-cylinder engine. Calculate: a) Inertia force at top dead center b) Maximum gas force if peak pressure is 4 MPa c) Net force acting on the piston (Assume crank radius = 40 mm)	K3	CO3	14M
	OR			
	b Design a piston for a single-cylinder 4-stroke engine with the following data: Bore = 100 mm, Maximum pressure = 4 MPa, Mean effective pressure = 1 MPa	K3	CO3	14M

		Length of piston = $1.2 \times \text{bore}$, Allowable bearing pressure on piston skirt = 0.3 MPa Determine: a) Piston head thickness b) Skirt length c) Total length of piston			
4	Unit-IV				
	a	A curved beam with a rectangular cross-section (width = 40 mm, depth = 60 mm) is loaded with a vertical force of 12 kN. The inner radius of the beam is 50 mm. Calculate: a) Radius of the neutral axis b) Maximum tensile and compressive stress in the beam (Use curved beam theory formulas)	K3	CO3	14M
	OR				
	b	A crane hook has a trapezoidal cross-section : Top width = 60 mm, bottom width = 30 mm, height = 70 mm, Inner radius = 80 mm If it carries a load of 20 kN, determine the maximum stress developed. Use curved beam stress formula for trapezoidal sections.	K3	CO3	14M
5	Unit-V				
	a	A flat belt transmits power between two pulleys. Given: Diameter of driving pulley = 400 mm, Speed = 600 rpm Tension on tight side = 1200 N, Tension on slack side = 400 N Calculate: a) Power transmitted b) Belt velocity c) Efficiency of transmission	K3	CO3	14M
	OR				
	b	A V-belt is used to transmit 15 kW from a motor running at 1440 rpm to a compressor at 720 rpm. The center distance between pulleys is 1.2 m. Determine: a) The diameter of driver and driven pulleys b) Belt speed c) Number of belts required if each belt can transmit 3 kW Assume belt slip = 5%	K3	CO3	14M

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

III B.Tech II Semester Supple. Examinations, September-2025

Sub Code: R20ME3202

HEAT TRANSFER

Time: 3 hours

(ME)

Max. Marks: 70

Note: Answer All FIVE Questions.

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

Q.No	Questions	KL	CO	M
Unit-I				
1	a i) Explain the difference between steady-state and transient heat conduction. Discuss the conditions under which each type of conduction occurs.	K2	CO1	7M
	ii) Define thermal resistance and explain its importance in heat conduction through composite slabs.	K2	CO1	7M
OR				
1	i) Discuss the significance of thermal conductivity in heat transfer. How does thermal conductivity vary for different materials and with temperature?	K2	CO1	7M
	ii) A composite wall consists of a 10 cm thick layer of brick ($k = 0.7 \text{ W/m-K}$) and a 5 cm thick layer of insulation ($k = 0.04 \text{ W/m-K}$). The inner and outer surface temperatures are maintained at 80°C and 20°C , respectively. Determine: a) The heat flux through the wall (in W/m^2) b) The interface temperature between the brick and insulation layers.	K5	CO1	7M
Unit-II				
2	a i) Explain the concept of fin efficiency and its significance in heat transfer enhancement. Derive the expression for the fin efficiency of a straight, thin fin with uniform cross-section.	K3	CO2	7M
	ii) A rectangular aluminum fin ($k = 236 \text{ W/m-K}$) is 5 cm long, 1 cm wide, and 2 mm thick. The base of the fin is maintained at a constant temperature of 120°C , while the surrounding environment is at 30°C with a convective heat transfer coefficient of $15 \text{ W/m}^2\text{-K}$. Determine the heat transfer rate from the fin.	K5	CO2	7M
OR				
2	i) Describe the different types of fins used in heat transfer applications. Explain the factors affecting the selection of a fin material.	K3	CO2	7M
	ii) A lumped capacitance system consists of a metallic block with a mass of 2 kg and specific heat of 500 J/kg-K . If the block initially at 300°C is suddenly exposed to a fluid at 100°C , determine the time required for the block to reach 150°C .	K5	CO2	7M
Unit-III				
3	a i) Describe the concept of boundary layers in forced convection heat transfer. Explain the significance of boundary layer thickness in heat transfer calculations.	K3	CO3	7M
	ii) Explain the concept of internal flow and discuss the use of empirical relations for convective heat transfer in horizontal pipe flow.	K3	CO3	7M
OR				
3	i) Discuss the applications of forced convection heat transfer in various engineering fields	K5	CO3	7M
	ii) Water ($\rho = 1000 \text{ kg/m}^3$, $c_p = 4.18 \text{ kJ/kg-K}$) at a velocity of 2 m/s flows through a circular tube with a diameter of 1 cm. The bulk temperature of the water is 60°C , and the tube wall is maintained at a constant temperature of 20°C . Determine: a) The Reynolds number (Re) for this flow. b) Assuming turbulent flow, calculate the average Nusselt number (Nu)	K5	CO3	7M

	using an appropriate correlation. c) Estimate the average heat transfer coefficient (h) between the water and the tube wall. d) Calculate the heat transfer rate per unit length of the tube.			
	Unit-IV			
a	i) Explain the concept of natural convection heat transfer and the factors influencing it. Discuss the role of the Grashof number (Gr) in natural convection.	K4	CO4	7M
	ii) Explain the LMTD and NTU methods of heat exchanger analysis and their applications in design.	K4	CO4	7M
	OR			
4	i) A vertical plate 1 m high and 0.5 m wide is maintained at a constant temperature of 80°C in a room where the ambient air temperature is 20°C. The properties of air at the average temperature can be assumed as: $\rho = 1 \text{ kg/m}^3$, $\mu = 1.8 \times 10^{-5} \text{ kg/m-s}$, $c_p = 1005 \text{ J/kg-K}$. Determine: a) The Rayleigh number (Ra) for this case. b) Using appropriate correlations, estimate whether the flow over the plate is laminar or turbulent. c) Assuming a suitable flow regime, calculate the average Nusselt number (Nu) for the plate.	K4	CO4	7M
	ii) Describe different regimes of natural convection flow (laminar vs. turbulent) and the transition between them. Explain the influence of these regimes on heat transfer.	K4	CO4	7M
	Unit-V			
a	i) Explain the basic principles of thermal radiation heat transfer. Define emissivity, absorptivity, and reflectivity of surfaces. Derive the Stefan-Boltzmann law for blackbody radiation.	K3	CO5	7M
	ii) Describe the phenomenon of condensation on a vertical surface. Explain the factors affecting the condensation heat transfer coefficient. Discuss the difference between film wise and dropwise condensation.	K5	CO5	7M
	OR			
5	i) A large furnace wall at a temperature of 800°C is radiating heat to a black surrounding at 300°C. The emissivity of the furnace wall is 0.8. Determine: a) The radiative heat emissivity of the furnace wall. (Emissivity multiplied by Stefan-Boltzmann constant) b) The net heat transfer rate per unit area from the furnace wall to the surrounding.	K4	CO5	7M
	ii) Discuss the theory of film-wise and drop-wise condensation and their differences.	K4	CO5	7M

KL: Bloom's Taxonomy Knowledge Level CO: Course Outcome M: Marks

III B.Tech II Semester Supple. Examinations, September-2025

Sub Code: R20ME3203

DYNAMICS OF MACHINERY

Time: 3 hours

(ME)

Max. Marks: 70

Note: Answer All FIVE Questions. All Questions Carry Equal Marks (5 X 14 = 70M)

Q.No	Questions	KL	CO	M
1	Unit-I			
	a An aircraft consists of a propeller. It also consists of engine and propeller of mass moment of inertia 150 kg m ² . The engine rotates at 3600 r.p.m. in a sense clockwise looking from rear. The aircraft completes half circle of radius 100 m towards left when flying at 360 km per hr. Determine the gyroscopic couple on the air-craft and state its effect	K3	CO1	14 M
	OR			
	b A racing car weighs 20 kN. It has a wheelbase of 2 m, track width 1 m and height of C.G. 0.30 m above the ground level and lies midway between the front and rear axle. The engine flywheel rotates at 3000 r.p.m. clockwise when viewed from the front. The moment of inertia of the flywheel is 4 kg-m ² and moment of inertia of each wheel is 3 kg-m ² . Find the reaction between the wheels and the ground when the car takes a curve of 15 m radius towards right at 30 km/hr, taking into consideration the gyroscopic and centrifugal effects. Each wheel radius is 0.40 m	K4	CO1	14 M
2	Unit-II			
	a Single plate clutch consists of one pair of contacting surfaces. The inner and outer diameters of the friction disk are 125 and 250mm respectively. The coefficient of friction is 0.25 and the total axial force is 15KN. Calculate the power transmitting capacity of clutch at 500rpm using (i) uniform wear theory; and ii) uniform pressure theory	K3	CO2	14 M
	OR			
	What are the various types of the brakes?	K3	CO2	5M
3	a In a Porter governor, the arms and links are each 25 cm long and intersect on the main axis. Each ball weighs 40N and the central load is 200N. The sleeve is in its lowest when the arms are inclined 30° to the axis. The lift of the sleeve is 50 mm. What is the force of friction at sleeve, if the speed at the beginning of ascent from the lowest position is equal to the speed at the beginning of descent from the highest position? What is then the range of speed of the governor	K3	CO3	14 M

	OR				
b	Define Flywheel. Compare the differences between flywheel and governor?	K4	CO3	[7M]	
	Explain about the turning moment diagrams and its applications	K3	CO3	[7M]	
4	Unit-IV				
	a	A shaft carries four rotating masses A,B,C and D which are completely balanced. The masses B, C and D are 50 kg, 80 kg and 70 kg respectively. The masses C and D make angles of 90° and 195° respectively with mass B in the same sense. The masses A, B, C and D are concentrated at radii 75 mm, 100 mm, 50 mm and 90 mm respectively. The plane of rotation of masses B and C are 250 mm apart. Determine: a) The mass A and its angular position b) The position of planes of A and D	K4	CO4	14 M
	OR				
	b	Four masses P,Q,R and S rotating in different planes are to be arranged to give complete balance. Planes containing Q and R are 50 cm apart. The masses Q and R are at right angles to one another and the mass 'S' makes angles of 140° and 230° respectively with masses Q and R in the same sense. Find where the planes containing P and S should be placed and also the magnitude and angular position of mass 'P'. The masses Q,R and S are 200 kg, 300 kg and 225 kg respectively. The radii of P,Q,R and S are 300 mm, 500 mm, 200 mm and 400 mm respectively	K3	CO5	14 M
5	Unit-V				
	a	The following data apply to an outside cylinder uncoupled locomotive Mass of rotating parts per cylinder=3602 kg; Mass of reciprocating parts per cylinder =300 kg; Angle between of cranks= 90°; crank radius =0.3m; cylinder centre =1.75m; radius of balance masses 0.75m; Wheel centre=1.45m If whole of the rotating and two-thirds of reciprocating parts are to be balanced in planes of the driving wheels, find 1. Magnitude and angular positions of balanced masses, 2. Speed in kilometers per hour at which the wheel will lift off the rails when the load on each driving wheel is 30KN and the diameter of tread of driving wheels is 1.8m, and 3. Swaying couple at speed arrived at in (2) above	K5	CO5	14 M
	OR				
	b	It is required to balance an inside cylinder locomotive in such a way that the driving wheel is on the point of lifting from the rails when the locomotive is running at 120 kmph. If all the revolving parts are to be balanced, determine what fraction of the reciprocating parts must be balanced for the following data. Load on each of the driving wheels = 60 KN Distance between wheel centers = 1.5 m Distance between cylinder center lines = 700 mm Diameter of driving wheels = 2.1 m Length of each Crank = 325 mm Weight of reciprocating parts per cylinder = 3.6 KN	K4	CO5	14 M

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

III B.Tech II Semester Supple. Examinations, September-2025

Sub Code: R20ME3207

ROBOTICS AND APPLICATIONS

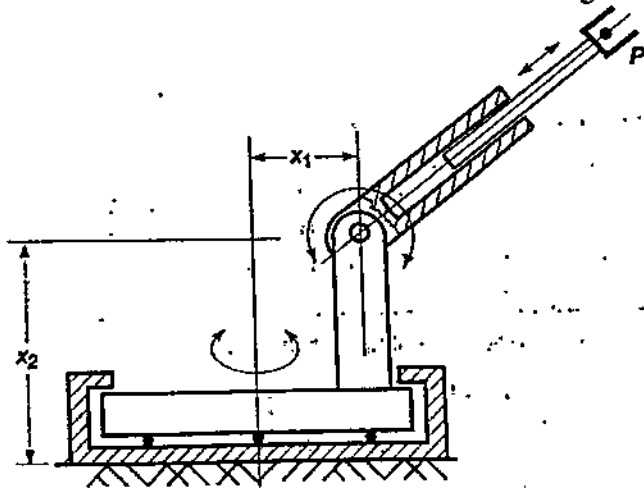
Time: 3 hours

(ME)

Max. Marks: 70

Note: Answer All FIVE Questions.

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

Q.No	Questions	KL	CO	M
Unit-I				
1	a i) Classify the robots according to the coordinates of motion and explain the features of each type of robot	K2	CO1	7M
	ii) Determine the revolution matrix for a rotation of 60° about y-axis followed by a rotation of 45° about z-axis, and a final rotation of 90° about x-axis.	K4	CO1	7M
	OR			
	b i) With the help of line diagram explain basic components of a Robot system	K2	CO1	7M
	ii) Given the two points $a_{uvw} = (4, 3, 1)^T$ and $b_{uvw} = (8, 2, 4)^T$ with respect to the rotated O_{uvw} coordinate system, determine the corresponding points a_{xyz} , b_{xyz} with respect to the reference coordinate system if it has been rotated 90° about the O_z axis.	K4	CO1	7M
Unit-II				
2	a i) Describe the working of brushless-DC motors and give its advantages and limitations	K3	CO2	7M
	ii) Explain the working principles and classifications of position and velocity sensors.	K2	CO2	7M
	OR			
	b i) Explain different types of Hydraulic actuators used in robotics?	K3	CO2	7M
	ii) How do different types of sensors measure position and velocity in mechanical and electronic systems?	K3	CO2	7M
Unit-III				
3	a Determine the forward kinematics of a 3-DOF Polar Arm given below	K4	CO3	14M
				

	OR				
b	i) What is redundant manipulator and determine the Inverse kinematics model for a 2-link planar robot.	K4	CO3	7M	
	ii) Discuss about Kinematic modeling of the manipulator and Explain about Manipulator Transformation matrix	K4	CO3	7M	
4	Unit-IV				
	a	Derive the equation of motion for 2-DOF planar manipulator using LE formulation. Assume equal length and mass of the links of manipulator.	K4	CO4	14M
	OR				
	b	i) Describe Newton-Euler formulation in dynamic modeling of robotics control.	K4	CO4	7M
		ii) What are singularities of a manipulator? How are they classified & determined? Explain briefly	K2	CO4	7M
5	Unit-V				
	a	i) What are the advancements in robotic automation improved the efficiency and safety of material handling processes?	K3	CO5	7M
		ii) How do vision systems and end effectors contribute to accurate and efficient loading and unloading operations?	K3	CO5	7M
	OR				
	b	i) Compare and contrast the working principles and applications of spot welding and continuous arc welding in robotic systems	K3	CO5	7M
		ii) Discuss the challenges of path planning of robots in dynamic environments.	K3	CO5	7M

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

III B.Tech II Semester Supple. Examinations, September-2025

Sub Code: R20EC3201

MICRO WAVE AND OPTICAL COMMUNICATIONS

Time: 3 hours

(ECE)

Max. Marks: 70

Note: Answer All FIVE Questions.

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

Q.No		Questions	KL	CO	M
1	Unit-I				
	a	i) Describe the key applications of microwaves in fields like communication, radar, and medical systems.	K2	1	7M
		ii) Derive the field equations for TM modes in rectangular waveguides.	K3	1	7M
	OR				
	b	i) Explain degenerate modes and the difference between these and dominant modes.	K2	1	7M
		ii) A rectangular waveguide has dimensions $a=2.3$ $b=1.1$ cm. Determine the operating frequency if the waveguide operates at a mode that is 10% above the cut-off frequency for the TE_{10} mode.	K3	1	7M
2	Unit-II				
	a	i) Derive the scattering matrix for an E-plane Tee junction.	K3	2	7M
		ii) Derive the scattering matrix for a Magic Tee junction.	K3	2	7M
	OR				
	b	i) Define velocity modulation and use the Applegate diagram to explain how it occurs in a Two Cavity Klystron.	K2	2	7M
		ii) A Two Cavity Klystron has a beam voltage of 15 kV and a beam current of 1 A. If the output power is 100 W, calculate the efficiency of the Klystron amplifier.	K3	2	7M
3	Unit-III				
	a	i) Discuss the Gunn diode's working mechanism, highlighting how negative differential resistance leads to microwave oscillations.	K2	3	7M
		ii) Explain the working principle of the IMPATT (Impact Avalanche Transit-Time) diode, focusing on how it generates microwave frequencies.	K2	3	7M
	OR				
	b	i) Discuss the process of measuring attenuation using a microwave bench setup.	K2	3	7M
		ii) Discuss the principle of the Bolometer method for microwave power measurement.	K2	3	7M
4	Unit-IV				
	a	i) Discuss the conditions under which light is confined within the fiber core through total internal reflection.	K2	4	7M
		ii) Derive the expression for numerical aperture and discuss its importance in determining the light-gathering capacity of an optical fiber.	K3	4	7M
	OR				
	b	i) Define the cutoff wavelength and mode field diameter, and explain their roles in determining fiber performance.	K2	4	7M
		ii) A single-mode fiber has a core refractive index of 1.48 and operates at a wavelength of 1550 nm. Calculate the mode field diameter for this fiber.	K3	4	7M

Unit-V					
5	a	i) Explain their principle of operation, including quantum efficiency and modulation capabilities.	K2	5	7M
		ii) Discuss different modes of operation and the significance of external quantum efficiency in laser diodes.	K3	5	7M
	OR				
	b	i) Define link power budget and explain how it is calculated.	K2	5	7M
		ii) A laser diode emits 5 mW of optical power for an input current of 50 mA. The wavelength of the emitted light is 850 nm. Calculate the external quantum efficiency of the diode.	K3	5	7M

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

III B.Tech II Semester Supple. Examinations, September-2025

Sub Code: R20EC3202

VLSI DESIGN

Time: 3 hours

(ECE)

Max. Marks: 70

Note: Answer All FIVE Questions.

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

Q.No		Questions	KL	CO	M
1	Unit-I				
	a	i) Describe the VLSI Design Flow using Y-chart.	K3	1	7M
		ii) Consider a pMOS with following process parameters: N_D (substrate doping) = 10^{15} cm^{-3} , N_{PD} (poly gate doping) = 10^{20} cm^{-3} , t_{ox} (gate oxide thickness) = 650 Å, and N_{ox} (oxide-interface charge density) = $2 \times 10^{10} \text{ cm}^{-3}$. Assume, dielectric constant of Si and Silicon Dioxide as $\epsilon_{si} = 11.7 \epsilon_0$, and $\epsilon_{SiO2} = 3.97 \epsilon_0$. Calculate the threshold voltage V_{th} , and determine the type and channel ion implantation which are necessary to achieve a threshold voltage of $V_{th} = -2\text{V}$.	K3	1	7M
	OR				
	b	i) Derive the expression of threshold voltage for nMOS transistor.	K3	1	7M
		ii) State the fabrication steps for CMOS n-Well process.	K3	1	7M
2	Unit-II				
	a	i) State the thumb rule for determining transmission-line models.	K3	2	7M
		ii) Consider a uniform polysilicon line whose dimensions are 1000 μm length and 4 μm width. Assuming a sheet resistance of 30 Ω/□, calculate the total lumped resistance of the line, and total capacitance (parallel plate and fringe) associated with the line. Use unit area capacitance and unit length capacitance as 0.066 fF/μm ² , and 0.046 fF/μm, respectively.	K3	2	7M
	OR				
	b	i) State the Elmore Delay model.	K3	2	7M
		ii) Consider a CMOS inverter with $V_{DD} = 3.3 \text{ V}$, and output load capacitance of 300 fF. The I-V characteristics is considered under the condition $V_{GS} = 3.3 \text{ V}$, $I_{DSAT} = 2 \text{ mA}$ for $V_{DS} = 2.5 \text{ V}$. Assuming the input signal applied at the gate as step pulse that switches instantaneously from 0 to 3.3 V. Calculate the delay time for which the output falls from its initial value of 3.3 V to 1.65 V.	K3	2	7M
3	Unit-III				
	a	i) Consider CMOS logic $F = (A+B) \cdot (C+D)$, draw the stick diagram.	K3	3	7M

		ii) State the Full Scaling (Constant-Field Scaling) method.	K3	3	7M
	OR				
	b	i) Pictorially show the design rules used for determining the dimensions of a minimum size transistor.	K3	3	7M
		ii) Describe the working principle of a single stage amplifier with resistive load.	K4	3	7M
4	Unit-IV				
	a	i) Write a short note on Complementary CMOS, and Pass Transistor Logic. Draw proper diagrams of requisite circuits.	K4	4	7M
		ii) Design a circuit to compute $F = AB + CD$ using NANDs and NORs. Further, calculate the minimum delay, required to compute F. Assume that each input present a maximum of 20 of transistor width. The output must drive a load equivalent to 100 of transistor width, and choose transistor sizes accordingly to achieve this delay.	K3	4	7M
	OR				
	b	i) State the most prevalent issue in the dynamic logic circuit, and the technique to overcome it.	K4	4	7M
		ii) Describe how positive feedback in a circuit leads to instability.	K3	4	7M
5	Unit-V				
	a	i) What are the FPGA technologies?	K3	5	7M
		ii) Mention and describe the common short channel effects in a transistor.	K3	5	7M
	OR				
	b	i) Explain the operating principle of TFET.	K3	5	7M
		ii) Describe the FPGA Design flow.	K3	5	7M

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

III B.Tech II Semester Supple. Examinations, September-2025

Sub Code: R20EC3203

MICROPROCESSOR AND MICRO CONTROLLERS

Time: 3 hours

(ECE)

Max. Marks: 70

Note: Answer All FIVE Questions.

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

Q.No		Questions	KL	CO	M
1	Unit-I				
	a	i) Explain register organization of 8086 processor.	KL3	CO1	7M
		ii) Explain different addressing modes of 8086 processor.	KL2	CO1	7M
	OR				
	b	i) Analyze the architecture of the 8085 processor.	KL4	CO1	7M
		ii) Explain stack and it's structure of 8086 microprocessor.	KL3	CO1	7M
2	Unit-II				
	a	i) Explain the interrupt cycle of 8086 processor.	KL2	CO2	7M
		ii) Explain maximum mode of 8086 system.	KL3	CO2	7M
	OR				
	b	i) Explain priority of interrupts in 8086 processor.	KL4	CO2	7M
		ii) Explain salient features of Pentium processor.	KL3	CO2	7M
3	Unit-III				
	a	i) Explain interfacing of D/A and A/D converters.	KL3	CO3	7M
		ii) Explain DMA 8257 in detail.	KL3	CO3	7M
	OR				
	b	i) Explain the block diagram of ADC 0808/0808.	KL4	CO3	7M
		ii) Explain 8251 USART interface in detail.	KL3	CO3	7M
4	Unit-IV				
	a	i) Analyze 8051 microcontroller architecture.	KL4	CO4	7M
		ii) Explain memory organization of 8051 microcontroller.	KL3	CO4	7M
	OR				
	b	i) Explain addressing modes of 8051 microcontroller.	KL3	CO4	7M
		ii) Explain interrupts in 8051 microcontroller.	KL3	CO4	7M
5	Unit-V				
	a	i) Explain interfacing of 8051 microcontroller to ADC and DAC.	KL3	CO5	7M
		ii) Explain interfacing seven segment display using 8051 microcontroller.	KL4	CO5	7M
	OR				
	b	i) Explain 8051 microcontroller interfacing to LED.	KL3	CO5	7M
		ii) Explain 8051 microcontroller interfacing to keyboard.	KL3	CO5	7M

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

III B.Tech II Semester Supple. Examinations, September-2025

Sub Code: R20EC3207

DIGITAL IMAGE PROCESSING

Time: 3 hours

(ECE)

Max. Marks: 70

Note: Answer All FIVE Questions.

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

Q.No		Questions	KL	CO	M
1	Unit-I				
	a	i) Explain 2D-wavelet transformation for images using relevant equations and figures.	KL4	CO1	7M
		ii) Explain basic pixels relationship.	KL3	CO1	7M
	OR				
	b	i) Explain imaging in different bands.	KL3	CO1	7M
		ii) Explain 2D-DFT and DCT for the images.	KL3	CO1	7M
2	Unit-II				
	a	i) Explain image restoration model.	KL3	CO2	7M
		ii) Explain image enhancement in frequency domain.	KL2	CO2	7M
	OR				
	b	i) Explain any two noise restoration filters.	KL4	CO2	7M
		ii) Explain estimation of degradation functions.	KL3	CO2	7M
3	Unit-III				
	a	i) Explain CMY color model of images.	KL3	CO3	7M
		ii) Explain color image compression approach.	KL3	CO3	7M
	OR				
	b	i) Explain smoothing and sharpening techniques for color images.	KL4	CO3	7M
		ii) Explain HIS color model of images.	KL3	CO3	7M
4	Unit-IV				
	a	i) Explain digital water marking.	KL4	CO4	7M
		ii) Explain lossless compression techniques.	KL2	CO4	7M
	OR				
	b	i) Explain lossy image compression techniques.	KL2	CO4	7M
		ii) Explain the fast wavelet transform.	KL3	CO4	7M
5	Unit-V				
	a	i) Explain Hit-or-miss transformation.	KL3	CO5	7M
		ii) Explain edge detection with example.	KL4	CO5	7M
	OR				
	b	i) Explain Erosion and dilation operation on images.	KL3	CO5	7M
		ii) Explain image segmentation using morphological watersheds.	KL3	CO5	7M

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

III B.Tech II Semester Supple. Examinations, September-2025

Sub Code: R20IT3202

AGILE METHODOLOGIES

Time: 3 hours

(IT)

Max. Marks: 70

Note: Answer All FIVE Questions.

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

Q.No	Questions	KL	CO	M
1	Unit-I			
	a i) Describe the history and evolution of Agile methodologies. How did it emerge as an alternative to traditional software development approaches like the Waterfall model?	K2	CO1	7M
	ii) Indicate the importance of user stories in agile documentation	K3	CO1	7M
	OR			
	b i) Categorize different agile methods based on their core principles and practices.	K3	CO1	7M
	ii) What are the principles behind the Agile manifesto	K3	CO1	7M
2	Unit-II			
	a i) Explain the basics and fundamentals of Agile and Lean Software Development. What are the key differences between Agile and Lean approaches in the context of software development?	K2	CO2	7M
	ii) Interpret the concept of adaptive software development and its relevance in dynamic project environments.	K3	CO2	7M
	OR			
	b i) Analyze the principles of Scrum and Extreme Programming (XP). How do these two methodologies address common challenges in software development, such as changing requirements and team collaboration	K4	CO2	7M
	ii) Outline the roles and responsibilities of a Product Owner, Scrum Master, and Scrum Team in a SCRUM project with suitable example.	K4	CO2	7M
3	Unit-III			
	a i) What are some common tools used in Agile development? Explain their basic function	K2	CO3	7M
	ii) Describe the challenges of migrating to Agile Methodologies and agile Knowledge sharing.	K2	CO3	7M
	OR			
	b i) Illustrate the role of story cards and key features of Story card Maturity Model (SMM).	K3	CO3	7M
	ii) How do story cards facilitate communication within an Agile team?	K3	CO3	7M
4	Unit-IV			
	a i) Mention the impact of agile processes in Requirements Engineering	K2	CO4	7M

		ii) What are the key challenges in managing unstable requirements in Agile projects?	K2	CO4	7M
	OR				
	b	i) Explain the different types of agile requirements modeling and concurrency in agile requirements generation	K2	CO4	7M
		ii) Analyze the importance of requirements elicitation and requirements elicitation methods.	K4	CO4	7M
5	Unit-V				
	a	i) Recall the importance of write and correct the failed tests before writing new code in TDD	K2	CO5	7M
		ii) Define "Agile Metrics" and explain their importance.	K2	CO5	7M
	OR				
	b	i) What are the advantages of using FDD in software development?	K3	CO5	7M
		ii) What are the challenges of applying Agile methodologies in a global software development environment?	K3	CO5	7M

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

III B.Tech II Semester Supple. Examinations, September-2025

Sub Code: R20AI3204

DEEP LEARNING

Time: 3 hours

CSE (AI)

Max. Marks: 70

Note: Answer All FIVE Questions.

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

Q.No		Questions	KL	CO	M
1	Unit-I				
	a	i) Explain what model capacity is and describe how it relates to overfitting and underfitting, with examples.	K2	CO1	7M
		ii) Compare Maximum Likelihood Estimation and Bayesian Statistics in terms of parameter estimation, noting the benefits and limitations of each.	K2	CO1	7M
	OR				
	b	i) Describe the role of hyperparameters in a machine learning algorithm and explain how validation sets help in tuning these parameters.	K2	CO1	7M
		ii) Define supervised and unsupervised learning algorithms and provide two examples of each with their common applications	K2	CO1	7M
2	Unit-II				
	a	i) What are deep feed-forward networks, and how can they be used to learn the XOR function?	K3	CO4	7M
		ii) How does the back-propagation algorithm update network weights during training?	K3	CO4	7M
	OR				
	b	i) How does dataset augmentation improve noise robustness in deep learning models?	K3	CO2	7M
		ii) What role do hidden units play in deep feed-forward networks, and why are they important?	K3	CO2	7M
3	Unit-III				
	a	i) What are effective strategies for initializing parameters in deep networks?	K4	CO3	7M
		ii) What are approximate second-order methods, and why are they useful in deep model optimization?	K4	CO3	7M
	OR				
	b	i) How does learning in deep models differ from pure optimization methods?	K4	CO3	7M
		ii) How do adaptive learning rate methods differ from traditional gradient descent approaches?	K4	CO5	7M
4	Unit-IV				
	a	i) What is the convolution operation in convolutional networks and why is it important?	K3	CO4	7M
		ii) What are some efficient algorithms for performing convolutions in deep learning?	K3	CO4	7M
	OR				
	b	i) How does the pooling process work and what benefits does it provide in CNNs?	K2	CO1	7M
		ii) How do random or unsupervised feature extraction methods contribute to CNNs, and what neuroscientific evidence supports these approaches?	K2	CO1	7M
5	Unit-V				
	a	i) What does it mean to unfold a computational graph in recurrent and recursive nets?	K4	CO5	7M

		ii) What advantages do bidirectional RNNs offer compared to traditional RNNs?	K3	CO4	7M
	OR				
	b	i) What are recursive neural networks, and how are they applied to structured data?	K3	CO2	7M
		ii) What challenges do long-term dependencies pose, and how can optimization techniques and explicit memory address them?	K4	CO5	7M

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

III B.Tech II Semester Supple. Examinations, September-2025

Sub Code: R20AM3203

DEEP LEARNING TECHNIQUES

Time: 3 hours

CSE(AIML)

Max. Marks: 70

Note: Answer All FIVE Questions.

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

Q.No	Questions	KL	CO	M
1	Unit-I			
	a i)What are the different types of Probabilistic Models? Explain with examples.	2	1	7M
	ii)Explain the difference between training, validation, and test datasets in machine learning model evaluation. Why are all three necessary?	4	1	7M
	OR			
	b i)What are common regularization techniques used in Gradient Boosting?	3	1	7M
2	ii)What is overfitting in Decision Tree and explain how can it be prevented?	5	1	7M
	Unit-II			
	a i)What are the key differences between biological vision and machine vision?	2	2	7M
	ii)What are the common challenges in training deep networks? How can they be overcome?	3	2	7M
	OR			
3	b i)How does Machine Learning help in Natural Language Processing (NLP)?	5	2	7M
	ii)What are the different types of Artificial Neural Networks?	2	2	7M
	Unit-III			
	a i)What is TensorFlow, and why is it widely used for deep learning?	4	3	7M
	ii)What is Keras, and how does it simplify deep learning model development?	3	3	7M
4	OR			
	b i)What are activation functions in Keras and explain why are they important?	4	3	7M
	ii)What is CNTK, and how does it compare to other deep learning frameworks?	5	3	7M
	Unit-IV			
	a i)What are Convolutional Layers, and why are they important in Deep Learning?	3	4	7M
5	ii)What are PyTorch Tensors, and how do they differ from NumPy arrays?	4	4	7M
	OR			
	b i)What are Recurrent Neural Networks (RNNs), and how do they work?	4	4	7M
	ii)How do you implement a simple CNN in PyTorch?	5	4	7M
	Unit-V			
5	a i)What are Generative Adversarial Networks (GANs) and how do they work?	4	5	7M
	ii)How does Deep Learning power interactive virtual assistants like Siri, Google Assistant, and ChatGPT?	5	5	7M
	OR			
	b i)What is a Restricted Boltzmann Machine (RBM), and how does it work?	2	5	7M
	ii)What is Deep Reinforcement Learning, and how does it differ from traditional Reinforcement Learning?	3	5	7M

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

III B.Tech II Semester Supple. Examinations, September-2025

Sub Code: R20AM3204

SOFT COMPUTING

Time: 3 hours

CSE(AIML)

Max. Marks: 70

Note: Answer All FIVE Questions. All Questions Carry Equal Marks (5 X 14 = 70M)

Q.No	Questions	KL	CO	M
1	Unit-I			
	a i)What is Dempster-Shafer Theory (DST) and how does it differ from classical probability theory?	3	1	7M
	ii)Describe the Dempster's Rule of Combination, and how does it work?	2	1	7M
	OR			
	b i)What are the main types of Aggregation Operators?	3	1	7M
	ii)What is Dempster-Shafer Theory (DST) and how does it handle uncertainty?	4	1	7M
2	Unit-II			
	a i)Illustrate the fundamental differences between supervised and unsupervised learning. Provide real-world examples for both.	4	2	7M
	ii)What are the main types of Bayesian Network learning algorithms? How do they differ?	3	2	7M
	OR			
	b i)Compare rule induction algorithms with decision trees. Which is better?	4	2	7M
	ii)What are the key algorithms used in decision tree induction? Explain their differences.	3	2	7M
3	Unit-III			
	a i)How does backpropagation work in supervised learning for neural networks?	3	3	7M
	ii)In what scenarios would Fuzzy Decision Trees be preferred over Neural Networks, and vice versa?	5	3	7M
	OR			
	b i)How does a Fuzzy Decision Tree (FDT) work? Explain the algorithm.	3	3	7M
	ii)How do Neural Networks improve Reinforcement Learning?	4	3	7M
4	Unit-IV			
	a i)How does Genetic Algorithm optimize weights in Neural Networks?	3	4	7M
	ii)How do Neuro-Fuzzy Systems integrate the principles of Neural Networks and Fuzzy Logic?	4	4	7M
	OR			
	b i)What is the fundamental working mechanism of Neuro-Fuzzy Systems?	4	4	7M
	ii)What are the advantages of using Fuzzy Logic in Backpropagation Networks for handling uncertainty and imprecision in data?	5	4	7M
5	Unit-V			
	a i)How is the fitness value computed in a Genetic Algorithm, and why is it important?	4	5	7M
	ii)What are the advantages and limitations of fitness-proportionate selection in reproduction?	3	5	7M
	OR			
	b i)How can fitness-proportionate selection be implemented in a genetic algorithm?	4	5	7M
	ii)What are the key challenges in designing an effective fitness function?	4	5	7M

III B.Tech II Semester Supple. Examinations, September-2025

Sub Code: R20AM3205

SOFTWARE PROJECT MANAGEMENT

Time: 3 hours

CSE(AIML)

Max. Marks: 70

Note: Answer All FIVE Questions.

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

Q.No	Questions	KL	CO	M
1	Unit-I			
	a i)What are the key challenges organizations face in improving their software development processes, and how can they address them?	2	1	7M
	ii)What are the major challenges faced in Conventional Software Management, and how can they be mitigated?	4	1	7M
	OR			
b	What are the key performance indicators (KPIs) used to measure the success of conventional software management?	4	1	14M
2	Unit-II			
	a i)What are the key tools and frameworks used in model-based software architecture, and how do they support development?	4	2	7M
	ii)What are the major types of software artifacts generated during different phases of the software development life cycle (SDLC)?	3	2	7M
	OR			
	b i)What are the advantages and challenges of adopting model-based software architectures?	3	2	7M
	ii)What are the key phases of the software development life cycle (SDLC) in software project management?	4	2	7M
3	Unit-III			
	a i)List and define the major activities involved in software process workflows.	2	3	7M
	ii)Explain the relationship between cost estimation, scheduling, and risk management in software projects.	4	3	7M
	OR			
	b i)What are software process workflows, and why are they important in software development?	3	3	7M
	ii)What factors influence the accuracy of schedule estimation in iterative software development?	3	3	7M
4	Unit-IV			
	a i)What challenges arise when automating software development processes, and how can they be addressed?	4	4	7M
	ii)Describe how the project environment influences software development outcomes.	4	4	7M
	OR			
	b i)Assess the impact of automation on job roles in software development organizations.	5	4	7M
	ii)What is the evolution of organizations in software development?	3	4	7M
5	Unit-V			
	a i)What are the Seven Core Metrics in software project management?	2	5	7M
	ii)How do Life Cycle Expectations vary across different software development models?	4	5	7M
	OR			
b	i)How do Management Indicators influence software project success?	3	5	7M

		ii)What steps should be taken to implement effective Management Indicators in a software development project?	4	5	7M
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KL: Blooms Taxonomy Knowledge Level CO: Course Outcome M:Marks

III B.Tech II Semester Supple. Examinations, September-2025

Sub Code: R20DS3201

DATA ANALYTICS & VISUALIZATION

Time: 3 hours

(DS)

Max. Marks: 70

Note: Answer All FIVE Questions.

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

Q.No	Questions	KL	CO	M
1	Unit-I			
	a i) Explain the different types of data analytics with suitable examples.	2	1	7M
	ii) Describe the role of Python in data analytics. How does Jupyter Notebook help in data analysis?	2	1	7M
	OR			
	b i) Explain the importance of measures of central tendency and dispersion in data analysis.	2	1	7M
	ii) Discuss the various data structures available in pandas and their applications.	2	1	7M
2	Unit-II			
	a i) Explain one-way ANOVA with a suitable example.	2	2	7M
	ii) Discuss the difference between simple linear regression and multiple linear regression.	2	2	7M
	OR			
	b i) What is Maximum Likelihood Estimation (MLE)? Explain its importance in statistical modeling.	2	2	7M
	ii) Describe the concept of logistic regression and its applications in real-world problems.	2	2	7M
3	Unit-III			
	a i) Compare and contrast bar charts, histograms, and pie charts with respect to their use in data analysis.	4	3	7M
	ii) Analyze how different levels of validation contribute to accurate data analysis.	4	3	7M
	OR			
	b i) Given a dataset, determine the most suitable visualization technique for representing trends and justify your choice.	4	3	7M
	ii) Explain how regression curves are used in data visualization. How do they help in predictive modeling?	4	3	7M
4	Unit-IV			
	a i) Apply multidimensional visualization techniques to represent high-dimensional data effectively.	3	4	7M
	ii) Demonstrate how vector visualization techniques can be used in geospatial data analysis.	3	4	7M
	OR			
	b i) Explain how hierarchical clustering can be visualized to interpret grouped data effectively.	3	4	7M
	ii) Illustrate the differences between K-means clustering and hierarchical clustering in terms of visualization.	3	4	7M
5	Unit-V			
	a i) Apply Power BI's DAX logical functions to perform conditional calculations in a dataset.	3	5	7M

		ii) Demonstrate how Power BI can be used to visualize sales data using statistical functions.	3	5	7M
	OR				
	b	i) Show how date and time functions in Power BI can be used to analyze trends over time.	3	5	7M
		ii) Illustrate the use of mathematical and trigonometric functions in Power BI for financial data analysis.	3	5	7M

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

III B.Tech II Semester Supple. Examinations, September-2025

Sub Code: R20DS3202

PRINCIPLES OF MACHINE LEARNING

Time: 3 hours

(DS)

Max. Marks: 70

Note: Answer All FIVE Questions.

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

Q.No		Questions	KL	CO	M
1	Unit-I				
	a	i)List and explain perspectives and issues in machine learning.	2	1	7M
		ii)How the concept learning can be viewed as the task of searching? Explain.	2	1	7M
	OR				
	b	i)Explain candidate elimination algorithm with example.	2	1	14 M
2	Unit-II				
	a	i)Define decision tree learning.List and explain appropriate problems for decision tree learning.	2	2	7M
		ii)Explain basic decision tree learning algorithm.	2	2	7M
	OR				
	b	i)Describe hypothesis space search in decision tree learning.	2	2	7M
		ii)List and explain issues in decision tree learning.	2	2	7M
3	Unit-III				
	a	i) What are the common methods for estimating the accuracy of a hypothesis?	3	3	14 M
	OR				
	b	i) Discuss about basic sampling theorem.	2	3	7M
		ii)Discuss about the general steps for deriving confidence interval.	2	3	7M
4	Unit-IV				
	a	i) Explain probably approximately correct (PAC) learning.	4	4	14 M
	OR				
	b	i)What is VC Dimension? Explain with suitable example.	2	4	7M
		ii)Explain the concept of learning in the limit.	2	4	7M
5	Unit-V				
	a	i)Differentiate Generative vs. discriminative training.	2	5	7M
		ii)Explain Naive Bayes learning algorithm	2	5	7M
	OR				
	b	i) Illustrate Logistic regression with an example.	2	5	7M
		ii) Explain K-Nearest neighbour learning algorithm.	2	5	7M

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

III B.Tech II Semester Supple. Examinations, September-2025

Sub Code: R20DS3205

ETL PRINCIPLES

Time: 3 hours

(DS)

Max. Marks: 70

Note: Answer All FIVE Questions.

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

Q.No	Questions	KL	CO	M
1	Unit-I			
	a i) Define a staging area in ETL and explain its purpose.	L1	CO1	7M
	ii) Compare fact tables and dimension tables with examples	L2	CO1	7M
	OR			
	b i) Differentiate between different data structures in ETL systems	L2	CO1	7M
	ii) Define Fact table. Write the characteristics of fact and dimension table.	L2	CO1	7M
2	Unit-II			
	a i) Explain the steps involved in building a Logical Data Map.	L2	CO2	7M
	ii) Assume your organization extracts sales data from both flat files and ERP systems. Demonstrate how you would integrate these heterogeneous data sources.	L4	CO2	7M
	OR			
	b i) Explain various components of the Logical Data Map	L3	CO2	7M
	ii) What are the various challenges of Extracting data from FLAT Files and Json Files	L3	CO2	7M
3	Unit-III			
	a i) List any four data quality checks used in ETL cleaning	L2	CO3	7M
	ii) Evaluate the role of conformed dimensions in ensuring consistency across business processes.	L4	CO3	7M
	OR			
	b i) How do we define the quality aspects of data	L2	CO3	7M
	ii) List and explain the steps involved in design the conformed facts	L3	CO3	7M
4	Unit-IV			
	a i) Describe the three types of fact tables (transaction grain, periodic snapshot, accumulating snapshot) with suitable use cases	L2	CO4	14M
	OR			
	b i) Write a short note on handling inserts, updates and delete in incremental data loading.	L2	CO4	7M
	ii) How a typical surrogate key pipeline works in ETL process.	L3	CO4	7M
	Unit-V			
5	a i) Demonstrate how you would estimate load time for a large ETL job running daily in production.	L3	CO5	7M
	ii) Analyze the vulnerabilities of long-running ETL processes and suggest strategies to minimize load failures.	L3	CO5	7M
	OR			
	b i) Explain the importance of scheduling and monitoring in ETL operations.	L3	CO5	7M
	ii) Propose a security framework to safeguard an ETL system against unauthorized access and data breaches.	L3	CO5	7M

III B.Tech II Semester Supple. Examinations, September-2025

Sub Code: R20CY3202 MALWARE ANALYSIS & REVERSE ENGINEERING

Time: 3 hours

(CS)

Max. Marks: 70

Note: Answer All FIVE Questions.

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

Q.No	Questions	KL	CO	M
1	Unit-I			
	a i) Explain the key differences between Behavioural Analysis and Code Analysis in malware detection.	2	1	7M
	ii) Apply the process of creating a custom ClamAV database to detect a new malware variant.	3	2	7M
	OR			
	b i) Describe the methodology used in Reverse Engineering Malware (REM).	2	1	7M
	ii) Analyze the role of ClamAV signatures in malware detection.	4	3	7M
2	Unit-II			
	a i) Explain the significance of The Sleuth Kit (TSK) in network and host discoveries for malware forensics.	2	1	7M
	ii) Demonstrate the use of Microsoft Offline API for registry discoveries.	1	5	7M
	OR			
	b i) Apply PEID to identify packers in an executable file.	3	2	7M
	ii) Utilize techniques for detecting rogue PKI certificates in a compromised system.	4	4	7M
3	Unit-III			
	a i) Apply Python scripts to control program execution in a debugging environment.	4	4	7M
	ii) Evaluate different methods of debugging a VMware guest machine infected with malware.	4	3	7M
	OR			
	b i) Analyze DLL export enumeration and its significance in malware debugging.	4	3	7M
	ii) Demonstrate setting and catching breakpoints in a debugger.	1	5	7M
4	Unit-IV			
	a i) Describe the steps involved in memory dumping using MoonSols Windows Memory Toolkit.	2	1	7M
	ii) Evaluate methods for finding forensic artifacts in process memory.	4	3	7M
	OR			
	b i) Demonstrate how to access VM memory files for forensic analysis.	1	5	7M
	ii) Apply Volatility to investigate running processes in a memory dump.	3	2	7M
5	Unit-V			
	a i) Explain the importance of WHOIS in researching malicious domains.	2	1	7M
	ii) Apply Passive DNS queries to detect suspicious domain activities.	3	2	7M
	OR			
	b i) Evaluate the significance of static and interactive mapping techniques in threat intelligence.	4	3	7M
	ii) Utilize Python to automate the process of mapping suspicious IP addresses.	4	4	7M

III B.Tech II Semester Supple. Examinations, September-2025

Sub Code: R20CY3203

ETHICAL HACKING

Time: 3 hours

(CY)

Max. Marks: 70

Note: Answer All FIVE Questions.
All Questions Carry Equal Marks (5 X 14 = 70M)

Q.No		Questions	KL	CO	M
1	Unit-I				
	a	i) List the types of hackers and describe their key characteristics.	K1	1	7M
		ii) Explain the difference between authenticity and non-repudiation in information security.	K2	1	7M
	OR				
	b	i) Demonstrate how penetration testing methodology can be applied to assess a network's security.	K3	1	7M
		ii) Compare and contrast intruder attacks on networks and computers with physical security threats like keyloggers and backdoors.	K4	1	7M
2	Unit-II				
	a	i) Describe the difference between Trojans, Backdoors, Viruses, and Worms with examples.	K2	2	7M
		ii) Illustrate the process of network scanning and enumeration with a real-world example.	K2	2	7M
	OR				
	b	i) Demonstrate how a hacker could use sniffing tools to capture network traffic and identify vulnerabilities.	K3	2	7M
		ii) Compare and contrast sniffing attacks with Denial of Service (DoS) attacks, highlighting their impact on network security.	K4	2	7M
3	Unit-III				
	a	i) Explain the importance of physical security in preventing cyberattacks and data breaches.	K2	3	7M
		ii) Describe how SQL injection attacks work and how they exploit input validation vulnerabilities	K2	3	7M
	OR				
	b	i) Differentiate between Windows Hacking and Linux Hacking, highlighting key attack techniques used in each	K3	3	7M
		ii) Demonstrate how input validation attacks can be used to exploit web applications, and suggest ways to mitigate them.	K3	3	7M
4	Unit-IV				
	a	i) Describe how firewalls, routers, and honeypots contribute to network security and intrusion prevention.	K2	4	7M
		ii) Explain the concept of session hijacking and how attackers exploit it.	K2	4	7M
	OR				
	b	i) Demonstrate how penetration testing is used to identify vulnerabilities in a web application	K3	4	7M
		ii) Apply security best practices to protect against buffer overflow attacks in software applications.	K3	4	7M
5	Unit-V				
	a	i) Describe the key legal considerations that ethical hackers must follow while performing penetration testing.	K2	5	7M

		ii) Discuss the difference between ethical hacking and malicious hacking, providing examples.	K2	5	7M
	OR				
	b	i) Explain the importance of making appropriate use of hacking tools and techniques in cybersecurity assessments.	K3	5	7M
		ii) Apply ethical hacking frameworks to assess the risks and limitations of using penetration testing tools.	K3	5	7M

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

III B.Tech II Semester Supple. Examinations, September-2025

Sub Code: R20CY3205

BLOCK CHAIN TECHNOLOGIES

Time: 3 hours

(CY)

Max. Marks: 70

Note: Answer All FIVE Questions.

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

Q.No	Questions	KL	CO	M
1	Unit-I			
	a i) Describe the emergence of Bitcoin and its role in the birth of blockchain technology. How did Bitcoin revolutionize digital transactions?	K2	1	7M
	ii) Analyze the shortcomings of current transaction systems and explain how blockchain technology addresses these issues.	K4	2	7M
	OR			
	b i) Discuss how blockchain technology builds trust within a traditional business network. Give an example of a real-world blockchain application that demonstrates this concept.	K4	3	7M
	ii) Explain how blockchain technology revolutionizes the traditional business network with an example of a blockchain application.	K4	3	7M
2	Unit-II			
	a i) Analyze the role of a shared ledger in blockchain technology and explain how it enhances transparency and trust within a business environment.	K4	2	7M
	ii) Discuss how permissions and consensus mechanisms in blockchain contribute to building a secure and reliable business network.	K4	3	7M
	OR			
	b i) Examine the role of smart contracts in blockchain technology and discuss their importance in automating business processes. Provide a relevant example.	K4	3	7M
	ii) Evaluate the key factors that make blockchain technology suitable for business use and how they differ from traditional systems.	K5	3	7M
3	Unit-III			
	a i) Explain the concept of market frictions and discuss how blockchain technology helps reduce information friction in business networks.	K2	1	7M
	ii) Summarize the key ways in which blockchain can move businesses closer to friction-free networks, highlighting the reduction of information, interaction, and innovation frictions.	K5	2	7M
	OR			
	b i) Evaluate how increased visibility through blockchain technology can transform ecosystems and reduce market frictions.	K3	5	7M
	ii) Analyze how blockchain technology eases interaction friction and contributes to more efficient business transactions. Provide examples to support your answer.	K4	3	7M
4	Unit-IV			
	a i) Evaluate how blockchain is used in supply chain management to improve transparency and traceability. Give examples of successful implementations.	K4	2	14M
	OR			
	b i) Critically analyze the adoption of blockchain by government sectors to enhance efficiency and data security. Provide examples to illustrate your answer.	K3	5	14M

Unit-V					
5	a	i) Critically evaluate the key security challenges faced by blockchain, including attacks on exchanges and scalability issues.	K4	2	7M
		ii) Discuss the major factors hindering blockchain adoption and explain how scalability and network attacks impact blockchain technology.	K3	5	7M
	OR				
	b	i) Illustrate the common network attacks that can disrupt blockchain networks, including the destruction of Bitcoin. How can these threats be mitigated?	K2	4	7M
		ii) Analyze the reasons behind the failure of some blockchain-based currencies and discuss the lessons learned from these case studies.	K3	5	7M

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

III B.Tech II Semester Supple. Examinations, September-2025

Sub Code: R20CC2OE01

REMOTE SENSING AND GIS

Time: 3 hours

(CE)

Max. Marks: 70

Note: Answer All FIVE Questions.

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

Q.No	Questions	KL	CO	M
1	Unit-I			
	a i) Explain Stefan-Boltzmann's law for the study of radiation and its applications in remote sensing.	1	1	7M
	ii) Give an account of the different platforms used for Remote Sensing with suitable examples.	2	1	7M
	OR			
	b i) Define a sensor in Remote Sensing. Discuss the different types of sensors used in Remote Sensing.	1	1	7M
	ii) Briefly explain how energy interacts with earth features, i.e. soil and vegetation in remote sensing.	2	1	7M
2	Unit-II			
	a i) Define an image and explain the image interpretation procedure.	2	2	7M
	ii) What do you mean by the classification of an image? Explain the procedure of supervised classification with an example.	3	2	7M
	OR			
	b i) Write the various elements of visual interpretation techniques.	2	2	7M
	ii) Define the contrast of an image. Explain the various contrast enhancement techniques in detail.	3	2	7M
3	Unit-III			
	a i) Briefly explain spatial and attribute data.	2	3	7M
	ii) Describe the primary functions of GIS software and how they facilitate data manipulation, visualization, and decision-making.	3	3	7M
	OR			
	b i) Define the GIS and explain the components of GIS.	2	3	7M
	ii) Discuss the advantages of using GIS in various fields such as urban planning, environmental management, and emergency response.	3	3	7M
4	Unit-IV			
	a i) Describe spaghetti, vertex dictionary and DIME.	3	4	7M
	ii) Differentiate between spatial and non-spatial databases and provide examples of each.	4	4	7M
	OR			
	b i) Differentiate between TIN and DEM.	3	4	7M
	ii) Explain block encoding and quadtree data model.	4	4	7M
5	Unit-V			
	a i) What is topology? Explain its importance in vector data.	3	5	7M
	ii) Explain briefly the database management in GIS.	4	5	7M
	OR			
	b i) What are the characteristics of cylindrical map projections? Explain the different types of cylindrical map projections.	3	5	7M
	ii) Explain the process of digitizing and scanning.	4	5	7M

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

III B.Tech II Semester Supple. Examinations, September-2025

R20

Sub Code: R20CC2OE03

HYBRID ELECTRIC VEHICLES

Time: 3 hours

(EEE)

Max. Marks: 70

Note: Answer All FIVE Questions. All Questions Carry Equal Marks (5 X 14 = 70M)

Q.No	Questions	KL	CO	M
1	Unit-I			
	a i) Sketch the roadway on the fixed co-ordinate system and explain the importance of roadway fundamentals.	K2	1	7M
	ii) Explain about the Power Transmission path in EV and HEV.	K3	1	7M
	OR			
	b i) Develop the vehicle kinetics model with the help of dynamic equation.	K2	1	7M
	ii) Explain about Propulsion System Design in EV with relevant sketches.	K3	1	7M
2	Unit-II			
	a i) Explain about the Capacity, Discharge rate, State of charge, state of Discharge, Depth of Discharge and the Technical characteristics of Batteries used for electrical vehicles.	K2	2	8M
	ii) What are the properties of batteries? Explain them in brief.	K3	2	6M
	OR			
	b i) Neatly explain the complete process of battery pack design of electric vehicle.	K2	2	7M
	ii) Explain the process of Calculating the Pack Energy, Capacity and Pack Energy at End of Life of electric vehicle	K3	2	7M
3	Unit-III			
	a i) Which DC motor which is suitable for electric vehicle? Draw and explain the torque-Speed characteristics of it.	K2	3	7M
	ii) Explain about squirrel cage induction machine and derive the expression for electromagnetic torque.	K3	3	7M
	OR			
	b i) Draw and explain the torque-Speed characteristics of permanent magnet machines which are suitable for electric vehicles.	K3	3	7M
	ii) Discuss is it the Switched reluctance machines are suitable for electric vehicles are not?	K3	3	7M
4	Unit-IV			
	a i) What is the significance of Gears, Gear Mechanism and explain about various types of Gears and also explain the Gear Ratio	K3	4	7M
	ii) Neatly explain the front wheel and rear wheel drive system with relevant sketches.	K3	4	7M
	OR			
	b i) Explain the regenerative braking of EVs with suitable diagram.	K3	4	7M
	ii) Discuss about the Motor sizing of EVs.	K3	4	7M
5	Unit-V			
	a i) Explain about the Drive train and Sizing of components in HEV.	K3	5	7M
	ii) With neat sketch explain the power transmission in parallel hybrid vehicle and write its advantages and disadvantages.	K3	5	7M
	OR			
	b i) Explain different modes of operations to deliver the power to wheels in series hybrid vehicle system.	K3	5	7M

		ii) Discuss the scenario and impact of HEV in Indian market.	K4	5	/M
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KL: Blooms Taxonomy Knowledge Level CO: Course Outcome M: Marks

III B.Tech II Semester Supple. Examinations, September-2025

Sub Code: R20CC2OE10

OOPS THROUGH JAVA

Time: 3 hours

(ECE)

Max. Marks: 70

Note: Answer All FIVE Questions.

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

Q.No	Questions	KL	CO	M
1	Unit-I			
	a i) List and explain the principles of OOP.	K2	1	7M
	ii) Explain, how JAVA achieves platform independence.	K2	1	7M
	OR			
	b i) Identify the differences between POP and OOP.	K3	1	7M
	ii) Explain buzzwords of JAVA programming.	K2	1	7M
2	Unit-II			
	a i) Illustrate the use of this keyword with a suitable example.	K2	2	7M
	ii) Develop a JAVA program to check whether the given number is even or odd.	K3	2	7M
	OR			
	b i) Explain constructor overloading with an example program.	K2	2	7M
	ii) Construct a JAVA program that performs addition of two numbers. Take input from command line argument.	K3	2	7M
3	Unit-III			
	a i) Illustrate the use of super keyword in JAVA with an example program with respect to immediate super class constructor.	K2	3	7M
	ii) Develop a JAVA program that demonstrates the use of finally in exceptions.	K3	3	7M
	OR			
	b i) Infer the differences between abstract class and interface.	K2	3	7M
	ii) Illustrate method overriding with an example program.	K2	3	7M
4	Unit-IV			
	a i) Draw the life cycle of a thread and explain thread states.	K2	4	7M
	ii) Explain thread priority in JAVA with suitable example.	K2	4	7M
	OR			
	b i) Explain thread synchronization in JAVA.	K2	4	7M
	ii) Create two threads where one thread print "NEC" for every two seconds and another thread prints "AP" for every four seconds.	K3	4	7M
5	Unit-V			
	a i) Identify the need of Applets in JAVA and discuss about life cycle of an Applet.	K3	5	7M
	ii) Discuss about different layout managers in AWT.	K2	5	7M
	OR			
	b i) Explain key event handling mechanism with an example program.	K2	5	7M
	ii) List and explain any three AWT components with suitable code snippet.	K2	5	7M

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

III B.Tech II Semester Supple. Examinations, September-2025

Sub Code: R20CC2OE13

DIGITAL MARKETING

Time: 3 hours

(ME)

Max. Marks: 70

Note: Answer All FIVE Questions.

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

Q.No		Questions	KL	CO	M
1	Unit-I				
	a	i) Discuss the basics of digital marketing	K3	CO1	7M
		ii) How digital marketing differ from traditional marketing	K2	CO1	7M
	OR				
	b	i) Explain the process and steps in digital marketing	K3	CO1	7M
ii) Illustrate R.E.A.N marketing engagement framework.		K2	CO1	7M	
2	Unit-II				
	a	i) Discuss the marketing mix (7Ps) in online context.	K3	CO2	7M
		ii) Illustrate in detail about PPC advertising with an example	K1	CO2	7M
	OR				
	b	i) Explain the opportunities for building brand website.	K3	CO2	7M
ii) Summarize the concepts of planning and creation of website design.		K2	CO2	7M	
3	Unit-III				
	a	i) Discuss Social media marketing with an example.	K2	CO3	7M
		ii) Explain how Email automation is performed?	K3	CO3	7M
	OR				
	b	i) How email is used with social media and mobile?	K3	CO3	7M
ii) What is mobile marketing? Explain in detail.		K2	CO3	7M	
4	Unit-IV				
	a	i) Discuss in detail about keyword strategy in search engine optimization.	K3	CO4	7M
		ii) Explain On-page and Off-page optimization in detail.	K3	CO4	7M
	OR				
	b	i) What is SEM? Explain the need of SEM in Digital Advertising.	K2	CO4	7M
ii) What is SEO? Explain the need of SEO on Internet.		K3	CO4	7M	
5	Unit-V				
	a	i) How twitter Marketing is different than other forms of digital marketing	K2	CO5	7M
		ii) What are the Forms of Mobile Marketing? Explain the Features of Mobile marketing.	K2	CO5	7M
	OR				
	b	i) What are the Digital Marketing Strategies through Instagram and snapchat	K3	CO5	7M
ii) Explain the Twitter Advertising Campaigns		K2	CO5	7M	

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

III B.Tech II Semester Supple. Examinations, September-2025

Sub Code: R20CC2OE16

CLOUD COMPUTING

Time: 3 hours

(IT, CSE)

Max. Marks: 70

Note: Answer All FIVE Questions. All Questions Carry Equal Marks (5 X 14 = 70M)

Q.No	Questions	KL	CO	M
1	Unit-I			
	a i) Explain the history of Cloud Computing	1	1	7M
	ii) What is cloud computing? List the characteristics of cloud computing.	1	1	7M
	OR			
b	i) List any three of the real-world usage scenarios of Cloud Computing and also mention the advantages and limitations of Cloud Computing.	3	1	14M
2	Unit-II			
	a i) Define virtualization. List all the virtualization services and explain	3	2	14M
	OR			
	b i) Differentiate between Grid Computing and Cloud Computing.	4	2	7M
	ii) Describe the key design aspects of cloud computing architecture.	5	2	7M
3	Unit-III			
	a i) Briefly explain any two of the Cloud Deployment Models.	2	2	7M
	ii) What is Cloud Stack? Briefly explain the usage of cloud stack in ensuring optimal cloud storage.	2	2	7M
	OR			
b	i) Write short note on cloud service models.	1	2	7M
	ii) Give the functional details of alternative deployment models that can be used when cloud deployment models are not supporting.	2	2	7M
4	Unit-IV			
	a i) Differentiate between cloud providers and traditional IT service providers	4	2	7M
	ii) Explain about cloud accessing and how to migrate applications or data to cloud.	1	2	7M
	OR			
b	i) What is Cloud Management and mention the various categories of cloud management products with an example for each category.	1,2	3	7M
	ii) Highlight the most common disasters in the cloud. How the cloud implement disaster management to safeguard its data.	1,2	3	7M
5	Unit-V			
	a i) Explain about traditional and Azure cloud models. How are they different from each other and list the pros and cons of both models.	3,4	4	7M
	ii) Briefly explain the working principle of Storage and Content Delivery Network in AWS.	2	4	7M
	OR			
b	i) Differentiate between Azure and AWS cloud models.	4	4	7M
	ii) Write about azure key concepts and domains.	2	4	7M