

**Time: 3 Hours****Max Marks: 70**

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the Question must be answered at one place

		<u><b>UNIT-I</b></u>	Marks	CO	BTL
1.	a)	Describe in detail the key components of an IoT system.	7	1	K2
	b)	Discuss the importance of PLM in the product development lifecycle. How does PLM help organizations improve efficiency, quality, and time-to-market?	7	1	K2
		<b>(OR)</b>			
2.	a)	Discuss the benefits and limitations of IIoT in industrial applications.	7	1	K2
	b)	Explain the stages of the product lifecycle from a sales and marketing perspective.	7	1	K2
		<u><b>UNIT-II</b></u>			
3.		Explain the product design and development process in detail. Describe each stage from idea generation to final product launch with suitable examples.	14	2	K2
		<b>(OR)</b>			
4.	a)	Discuss various product mix strategies adopted by organizations. How do these strategies help in achieving competitive advantage?	7	2	K2
	b)	Discuss the concept of modular design in product development.	7	2	K2
		<u><b>UNIT-III</b></u>			
5.	a)	Explain the Importance of managing design changes throughout the product lifecycle.	7	3	K2
	b)	Explain engineering change request (ECR) work flow.	7	3	K2
		<b>(OR)</b>			
6.	a)	Explain the role of configuration management in managing product variants in modern product development.	10	3	K2
	b)	Discuss how dependencies between components are managed in complex product structures.	4	3	K2
		<u><b>UNIT-IV</b></u>			
7.	a)	Discuss the importance of real-time data collection and monitoring of products using IIoT technologies.	7	4	K2
	b)	Explain the integration of IIoT with Product Lifecycle Management (PLM) systems for predictive maintenance.	7	4	K2
		<b>(OR)</b>			
8.	a)	Explain the role of sensors and actuators in IIoT data collection for PLM systems.	7	4	K2
	b)	Explain how IIoT enables automated production systems in smart manufacturing environments.	7	4	K2
		<u><b>UNIT-V</b></u>			
9.	a)	Describe the applications of IIoT in smart factories, automated production lines, and robotics in manufacturing.	7	5	K2
	b)	Discuss the applications of machine learning (ML) in IIoT-enabled smart manufacturing.	7	5	K2
		<b>(OR)</b>			
10.		Explain how IIoT and PLM have been integrated in the automotive industry.	14	5	K2

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**UNIT-I**

- |    |  | Marks | CO  | BTL |
|----|--|-------|-----|-----|
| 1. | a) Explain the definition, reasons, and types of automation used in modern production systems.   | 6     | CO1 | K2  |
|    | b) A manufacturer plans to automate a conventional machining section producing medium-volume standardized parts. Suggest a suitable type of automation and justify your choice based on production volume, product variety, and flexibility. | 8     | CO1 | K3  |

**(OR)**

- |    |  |   |     |    |
|----|--|---|-----|----|
| 2. | a) Discuss various automation strategies and explain their importance in improving productivity and quality. | 7 | CO1 | K2 |
|    | b) Explain the role of hydraulic and pneumatic components in automation, with suitable industrial examples.  | 7 | CO1 | K2 |

**UNIT-II**

- |    |  |   |     |    |
|----|--|---|-----|----|
| 3. | a) Explain the classification of transfer lines, workpart transfer mechanisms, and workpart transfer systems used in automated production lines.   | 7 | CO2 | K2 |
|    | b) A transfer line consists of 5 workstations with ideal processing time of 40 s at each station. If one station frequently stops and causes line interruption, discuss how buffer storage can improve line performance. | 7 | CO2 | K3 |

**(OR)**

- |    |   |   |     |    |
|----|---|---|-----|----|
| 4. | a) Explain the terminology used in transfer line analysis and discuss the analysis of transfer lines with and without storage buffers.  | 7 | CO2 | K2 |
|    | b) A production system is partly manual and partly automated. Discuss the concept of partial automation and explain when its implementation is preferable to full automation. | 7 | CO2 | K3 |

### **UNIT-III**

5. a) Explain manual and automated assembly systems, and compare their advantages, limitations, and applications. 7 CO3 K2
- b) The elemental task times in an assembly line are 2, 3, 5, 4, and 6 minutes. If the cycle time is 8 minutes, determine the minimum number of workstations required. 7 CO3 K3

**(OR)**

6. a) Discuss different methods and algorithms used in line balancing. 7 CO3 K2
- b) A production line shows uneven workload distribution among stations. Suggest suitable line-balancing improvement techniques to reduce bottlenecks and improve efficiency. 7 CO3 K2

### **UNIT-IV**

7. a) Explain the principles of material handling and classify different types of material handling systems. 7 CO4 K2
- b) A factory needs to transport components continuously between machining and assembly sections. Compare conveyor systems and automated guided vehicle systems, and recommend a suitable system with justification. 7 CO4 K3

**(OR)**

8. a) Discuss the design and analysis of material handling systems with respect to cost, safety, and efficiency. 7 CO4 K2
- b) Explain different types of conveyor systems and their industrial applications. 7 CO4 K2

### **UNIT-V**

9. a) Explain the types and applications of automated storage systems and AS/RS in industrial practice. 7 CO5 K2
- b) A warehouse must store and retrieve a large number of parts quickly with minimum manual intervention. Explain how AS/RS can be used in this case and discuss its advantages. 7 CO5 K3

**(OR)**

10. a) Explain identification and tracking systems used in automation, with special reference to bar codes and their types. 7 CO5 K2
- b) Discuss inspection methods used in industrial automation, including machine vision, coordinate measuring machines, and contact and non-contact methods. 7 CO5 K2

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		<b><u>UNIT-I</u></b>	<b>Marks</b>	<b>CO</b>	<b>BTL</b>
1.	a)	Explain why Python is widely used in Data Science and also discuss its key features.	7	1	2
	b)	Outline the concept of Data Science and its importance in modern decision-making systems.	7	1	2
		<b>(OR)</b>			
2.	a)	Explain how Data Science is applied in e-commerce, social media and web analytics.	7	1	2
	b)	Identify the major challenges faced in Data Science projects.	7	1	3
		<b><u>UNIT-II</u></b>			
3.	a)	List and explain different NumPy data types. How does dtype influence array operations?	7	2	4
	b)	Compare basic indexing and fancy indexing.	7	2	2
		<b>(OR)</b>			
4.	a)	Demonstrate any ten universal functions including unary and binary functions with examples.	7	2	2
	b)	Make use of sorting and set operations, write any two simple python programs.	7	2	3
		<b><u>UNIT-III</u></b>			
5.	a)	Explain in a detailed manner about the DataFrame data structure with suitable examples.	7	3	2
	b)	Identify the importance of Reindexing and Dropping, explain with an example.	7	3	3
		<b>(OR)</b>			
6.	a)	Illustrate the descriptive statistics methods.	7	3	2
	b)	Demonstrate a python program with pandas.read_csv function arguments.	7	3	2
		<b><u>UNIT-IV</u></b>			
7.	a)	Outline filtering and filling missing data with examples	7	4	2
	b)	Make use of vectorized string functions, write a python program.	7	4	3
		<b>(OR)</b>			
8.	a)	Illustrate Reordering and Sorting Levels, Indexing with a DataFrame's columns with a simple example.	7	4	2
	b)	Explain the concept of reshaping and pivoting in pandas.	7	4	2
		<b><u>UNIT-V</u></b>			
9.	a)	Explain why do modern businesses need Data Visualization?	7	5	2
	b)	Summarize the significance of Plotting with examples.	7	5	2
		<b>(OR)</b>			
10.	a)	Demonstrate the Line plot and Bar plots with examples.	7	5	2
	b)	Explain how Box Plots are useful in Data Visualization.	7	5	2

Time: 3 Hours

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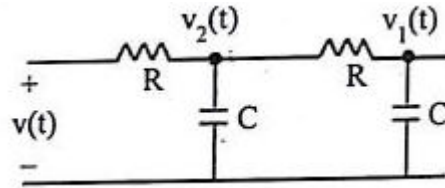
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**UNIT-I**

1. a) Obtain the state model of the electrical network shown in fig.



Marks CO BTL

7 1 L2

- b) A system is described by

$$\dot{X} = \begin{bmatrix} -1 & -4 & -1 \\ -1 & -6 & -2 \\ -1 & -2 & -3 \end{bmatrix} X + \begin{bmatrix} 0 \\ 1 \\ 1 \end{bmatrix} u$$

$$Y = [1 \quad 1 \quad 1] X$$

Find the transfer function.

7 1 L2

(OR)

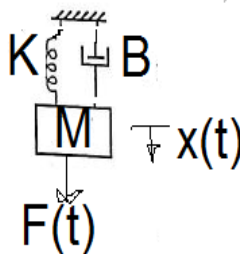
2. a) Obtain the state model of the system whose transfer function is given as

$$\frac{Y(s)}{U(s)} = \frac{10}{s^3 + 4s^2 + 2s + 1}$$

7 1 L2

- b) Construct the state model of the mechanical system shown in fig.

7 1 L3

**UNIT-II**

3. Convert the following system matrix to canonical form and hence calculate the state transition matrix?

14 2 L3

$$A = \begin{bmatrix} 4 & 1 & -2 \\ 1 & 0 & 2 \\ 1 & -1 & 3 \end{bmatrix}$$

(OR)

1 of 2

4. a) Determine the state controllability and observability of the system described by
- $$\dot{X} = \begin{bmatrix} -3 & 1 & 1 \\ -1 & 0 & 1 \\ 0 & 0 & 1 \end{bmatrix} X + \begin{bmatrix} 0 & 1 \\ 0 & 0 \\ 2 & 1 \end{bmatrix} u$$
- $$Y = \begin{bmatrix} 0 & 0 & 1 \\ 1 & 1 & 0 \end{bmatrix} X$$
- b) Given
- $$\dot{X} = \begin{bmatrix} 1 & 0 \\ 1 & 1 \end{bmatrix} X + \begin{bmatrix} 1 \\ 1 \end{bmatrix} u \quad X^T(0) = [1 \quad 0]$$
- Find the response for a step input
- UNIT-III**
5. Consider a linear system described by the transfer function
- $$\frac{Y(S)}{U(S)} = \frac{10}{S(S+1)(S+2)}$$
- Design a feedback controller with a state feedback so that the closed loop poles are placed at -2, -1 ± j1
- (OR)**
6. Consider a linear system state model
- $$\dot{X} = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -1 & -2 & -3 \end{bmatrix} X ; y = [1 \quad 0 \quad 0] X$$
- Design a full order state observer. The desired eigen values for the observer gain matrix are -0.1, -0.2 and -0.3
- UNIT-IV**
7. a) Test stability of the non linear system using Lyapunov function
- $$\dot{x}_1 = x_2 \quad \dot{x}_2 = -x_1 - x_2 - x_1^3$$
- b) Explain Lyapunov stability theorem?
- (OR)**
8. a) Explain Karsovskii method and apply it to determine the stability of a given system
- $$\dot{x}_1 = -x_1 + x_2 \quad \dot{x}_2 = -x_1 - x_2$$
- b) Show that the following quadratic form is positive definite  $V(x) = 8x_1^2 + x_2^2 + 4x_3^2 + 2x_1x_2 - 4x_1x_3 - 2x_2x_3$
- UNIT-V**
9. a) Define adaptive control system and explain its basic structure with a neat block diagram?
- b) Explain the concept of optimal control law and derive it using Hamiltonian formulation?
- (OR)**
10. a) Explain the concept of gain scheduling. Discuss its advantages and disadvantages?
- b) Formulate the linear quadratic regulator problem (LQR) and derive Riccati equation?

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<u><b>UNIT-I</b></u>		<b>Marks</b>	<b>CO</b>	<b>BTL</b>
1.	a) Explain the three segments of GPS configuration.	7M	CO1	K2
	b) Describe how GPS determines the position of a receiver in 3D.	7M	CO1	K2
<b>(OR)</b>				
2.	a) Explain GPS system architecture and its working principle	7M	CO1	K2
	b) Discuss about the Development of NAVSTAR GPS in detail.	7M	CO1	K3
<u><b>UNIT-II</b></u>				
3.	a) Differentiate between C/A code and P code.	7M	CO2	K3
	b) Explain the concept of Selective ability(SA) and Anti-Spoofing (AS) in GPS.	7M	CO2	K2
<b>(OR)</b>				
4.	a) Describe the role of Pseudorandom Noise (PRN) codes in GPS.	7M	CO2	K2
	b) Discuss about signal structure GPS.	7M	CO2	K3
<u><b>UNIT-III</b></u>				
5.	a) Describe the Geodetic Coordinate System.	7M	CO3	K3
	b) State and explain Kepler's Laws of Planetary Motion.	7M	CO3	K2
<b>(OR)</b>				
6.	a) What is World Geodetic System (WGS84)? Explain its role in GPS.	7M	CO3	K2
	b) Explain GPS orbital parameters used to describe satellite motion.	7M	CO3	K2
<u><b>UNIT-IV</b></u>				
7.	a) Describe the structure of RINEX files.	7M	CO4	K3
	b) Explain Ionospheric Delay and Tropospheric Delay?	7M	CO4	K2
<b>(OR)</b>				
8.	a) Explain the observation data in RINEX format.	7M	CO4	K2
	b) How can clock errors in satellites and receivers impact position calculation?	7M	CO4	K3
<u><b>UNIT-V</b></u>				
9.	a) Explain the constellation of Galileo.	7M	CO5	K2
	b) Explain the basic features of IRNSS / NavIC.	7M	CO5	K2
<b>(OR)</b>				
10.	a) Describe the structure of NavIC constellation.	7M	CO5	K2
	b) Compare the following Global Navigation Systems in terms of constellation and services provided	7M	CO5	K3
	(i). GPS                      (iii). GLONASS			

**(ELECTRONICS AND COMMUNICATION ENGINEERING)****Time: 3 Hours****Max Marks: 70**

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<u><b>UNIT-I</b></u>		<b>Marks</b>	<b>CO</b>	<b>BTL</b>
1.	a) Describe the normal distribution and its properties.	7	1	2
	b) Write the differences between supervised and unsupervised learning.	7	1	2
<b>(OR)</b>				
2.	a) Discuss about the fundamental steps involved in building a machine learning model.	7	1	2
	b) Discuss about types of data used in machine learning	7	1	2
<u><b>UNIT-II</b></u>				
3.	a) Describe the components of a DAQ system.	7	2	2
	b) Discuss about encoding techniques for categorical variables.	7	2	3
<b>(OR)</b>				
4.	a) Compare hardware-based and software-based DAQ systems.	7	2	6
	b) Discuss about cross-validation.	7	2	2
<u><b>UNIT-III</b></u>				
5.	a) Discuss the concept of ensemble learning with advantages.	7	3	2
	b) Briefly explain stacking method with architecture.	7	3	3
<b>(OR)</b>				
6.	a) Compare linear and non-linear SVM.	7	3	2
	b) Discuss about boosting and its importance.	7	3	4
<u><b>UNIT-IV</b></u>				
7.	a) Write the advantages and limitations of k-means clustering.	7	4	2
	b) Discuss the steps involved in the EM algorithm.	7	4	2
<b>(OR)</b>				
8.	a) Describe the concept of unsupervised learning with examples.	7	4	4
	b) Briefly explain DBSCAN algorithm and its parameters.	7	4	3
<u><b>UNIT-V</b></u>				
9.	a) Discuss the advantages of FP-Growth over Apriori.	7	5	3
	b) Describe how UMAP works for dimensionality reduction.	7	5	2
<b>(OR)</b>				
10.	a) Describe Singular Value Decomposition (SVD) with an example.	7	5	4
	b) Compare FP-Growth and Apriori algorithms.	7	5	2



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	<b><u>UNIT-I</u></b>	Marks	CO	Blooms Level
1.	a) Explain the co-channel interference reduction factor and derive the general formula for C/I.	7M	CO1	Understanding
	b) What are the parameters that define the uniqueness of mobile radio environment? Explain any two.	7M	CO1	Remembering
	<b>(OR)</b>			
2.	a) Explain the basic cellular system with neat diagram	7M	CO1	Understanding
	b) The 2G GSM has 125 channels in the uplink and 125 channels in the down link. Each channel has a bandwidth of 200 kHz. What is the total bandwidth occupied in both uplink and down link	7M	CO1	Applying
	<b><u>UNIT-II</u></b>			
3.	a) Describe the concept of fading in propagation	7M	CO2	Understanding
	b) Explain the differences between mobile propagation over water and flat area.	7M	CO2	Understanding
	<b>(OR)</b>			
4.	a) Explain different types of propagation models in wireless communication.	7M	CO2	Understanding
	b) Elaborate any one outdoor propagation model.	7M	CO2	Analyzing
	<b><u>UNIT-III</u></b>			
5.	a) Describe the effects of cell site antenna heights and signal coverage cells	7M	CO3	Remembering
	b) Explain the antennas used to reduce interference.	7M	CO3	Applying
	<b>(OR)</b>			
6.	a) Write about forced handoff and delayed handoff mechanisms in detail.	7M	CO3	Understanding
	b) Discuss various vehicle locating methods.	7M	CO3	Understanding
	<b><u>UNIT-IV</u></b>			
7.	a) Draw the diagram of frequency management chart and explain different channels in cellular system.	7M	CO4	Understanding
	b) Write the channel sharing scheme with a neat sketch.	7M	CO4	Applying
	<b>(OR)</b>			
8.	a) Explain the channel assignment to the cell sites based on the adjacent channels.	7M	CO4	Understanding
	b) Explain different types of channel assignment.	7M	CO4	Remembering
	<b><u>UNIT-V</u></b>			
9.	a) Explain the GSM architecture with a neat sketch.	7M	CO5	Understanding
	b) Compare and contrast the various multiple access schemes.	7M	CO5	Understanding
	<b>(OR)</b>			
10.	a) Explain in detail the Code Division Multiple Access technique	7M	CO5	Understanding
	b) Draw the TDMA frame structure and explain the significance of each slot.	7M	CO5	Applying

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<u><b>UNIT-I</b></u>		Marks	CO	Blooms Level
1.	a) Explain the waterfall model and analyse its limitations in modern software development.	7	CO1	K2
	b) Apply software cost estimation principles to estimate effort for a small project.	7	CO1	K4
<b>(OR)</b>				
2.	a) Discuss the evolution of software economics and its importance in project success.	7	CO1	K2
	b) Analyse techniques to improve software economics with suitable examples.	7	CO1	K4
<u><b>UNIT-II</b></u>				
3.	a) Explain the different life cycle phases in software project management.	7	CO2	K2
	b) Analyse the role of artifacts in managing software projects.	7	CO2	K4
<b>(OR)</b>				
4.	a) Describe engineering and production stages with examples.	7	CO2	K2
	b) Compare management artifacts and engineering artifacts.	7	CO2	K4
<u><b>UNIT-III</b></u>				
5.	a) Explain software process workflows and iteration workflows.	7	CO3	K2
	b) Apply work breakdown structure (WBS) in planning a sample project.	7	CO3	K3
<b>(OR)</b>				
6.	a) Describe major and minor milestones in project checkpoints.	7	CO3	K2
	b) Analyse the importance of iterative process planning.	7	CO3	K4
<u><b>UNIT-IV</b></u>				
7.	a) Explain different project organization structures and their roles.	7	CO4	K2
	b) Analyse the importance of process automation in project environments	7	CO4	K4
<b>(OR)</b>				
8.	a) Describe the seven core metrics used in project control.	7	CO4	K2
	b) Analyze how quality indicators help in project assessment.	7	CO4	K4
<u><b>UNIT-V</b></u>				
9.	a) Explain the COCOMO-I model and its application in effort estimation.	7	CO5	K2
	b) Apply PERT technique to analyze project scheduling.	7	CO5	K4
<b>(OR)</b>				
10.	a) Describe Critical Path Analysis (CPA) with an example.	7	CO5	K2
	b) Analyze future trends in software project management	7	CO5	K4

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		Marks	CO	Blooms Level
<b><u>UNIT-I</u></b>				
1.	a) Explain the basic structure of a Java program with an example.	7	1	L2
	b) Write a JavaScript program to change the background color of a webpage when a button is clicked.	7	1	L3
<b>(OR)</b>				
2.	a) Describe CSS3 selectors and box model.	7	1	L2
	b) Write an HTML5 program to design a student registration form using input types like text, email, tel, date, and radio.	7	1	L3
<b><u>UNIT-II</u></b>				
3.	a) Explain JSX in React with examples.	7	2	L2
	b) Explain React Router and its importance.	7	2	L2
<b>(OR)</b>				
4.	a) Explain state in React with an example.	7	2	L2
	b) Write a React program to implement navigation between two pages (Home & About) using React Router.	7	2	L3
<b><u>UNIT-III</u></b>				
5.	a) Explain Request and Response handling in Servlets.	7	3	L2
	b) Explain MVC Architecture with its components.	7	3	L2
<b>(OR)</b>				
6.	a) Explain different JSP elements with examples.	7	3	L2
	b) Write a JSP program to display student details (Name, Roll Number, and Marks) by retrieving values from the request object that are sent from an HTML form.	7	3	L3
<b><u>UNIT-IV</u></b>				
7.	a) Explain CRUD operations with suitable examples.	7	4	L2
	b) Write a Java program using JDBC to insert a record into a student table.	7	4	L3
<b>(OR)</b>				
8.	a) Explain the steps involved in JDBC connectivity.	7	4	L2
	b) Write a JDBC program to execute a parameterized query using Prepared Statement.	7	4	L3
<b><u>UNIT-V</u></b>				
9.	a) Explain core Git commands with examples.	7	5	L2
	b) Demonstrate how to resolve merge conflicts in Git.	7	5	L3
<b>(OR)</b>				
10.	a) Explain collaboration on GitHub (fork, pull request, clone).	7	5	L2
	b) Demonstrate merging of two branches using Git commands.	7	5	L3

**REPAIR AND REHABILITATION OF STRUCTURES****(Professional Elective– III)****(CIVIL ENGINEERING)****Time: 3 Hours****Max Marks: 70**

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<u><b>UNIT-I</b></u>		<b>Marks</b>	<b>CO</b>	<b>BTL</b>
1. a)	Explain in detail the causes of deterioration of concrete structures.	10	1	2
b)	Discuss about the importance of maintenance of civil engineering structures.	4	1	2
<b>(OR)</b>				
2. a)	Discuss the aspects of inspection.	6	1	1
b)	Discuss about the conditions lead to deterioration in Civil Engineering structures.	8	1	1
<u><b>UNIT-II</b></u>				
3. a)	What are the techniques available for the repair of cracks in structures and discuss in detail about any two techniques	8	2	2
b)	Explain about the Gas forming grouts and Salfoalumate grouts and their applications.	6	2	2
<b>(OR)</b>				
4. a)	Discuss about the development of polymer concrete and explain its use as a repair material.	7	2	3
b)	Explain about the Criteria for selection of repair material	7	2	2
<u><b>UNIT-III</b></u>				
5. a)	What are the effects of elevated temperatures on concrete structures, how do you repair damage in structures due to elevated temperatures.	10	3	3
b)	Discuss about the quality control on concrete structures and its importance.	4	3	3
<b>(OR)</b>				
6. a)	Explain different types of cracks occurred in concrete structures and their preventing measures.	7	3	2
b)	What is durability and discuss the factors affect the durability of concrete structures.	7	3	3
<u><b>UNIT-IV</b></u>				
7. a)	Discuss about rebound hammer test to assess concrete structures, mention its advantages and limitations.	10	4	3
b)	Explain about Shoring and Underpinning,	4	4	2
<b>(OR)</b>				
8. a)	Explain mechanism of reinforcement corrosion and also explain about half cell potential technique to detect corrosion.	10	4	3
b)	Discuss about the cathodic protection for preventing reinforcement corrosion.	4	4	3
<u><b>UNIT-V</b></u>				
9. a)	Discuss about the various Strengthening techniques for beams and columns.	10	5	1
b)	Distinguish Repair, Rehabilitation and Retrofitting of Structures.	4	5	1
<b>(OR)</b>				
10. a)	Explain about the ferro cement jacketing, materials and its development	8	5	2
b)	Explain how do you Repair the structures distressed due to corrosion.	6	5	2

III B.Tech II Semester Regular Examinations, April, 2026  
**FLOOD MANAGEMENT AND CHANNEL FLOW**  
(Professional Elective– III)  
(CIVIL ENGINEERING)

Time: 3 Hours

Max Marks: 70

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**UNIT-I**

- |   |       |    |     |
|---|-------|----|-----|
| 1. a) Explain the rating curves.                                | Marks | CO | BTL |
| b) Explain the area-velocity method to measure the stream flow. | 7     | 1  | 2   |
|   | 7     | 1  | 2   |

(OR)

- |   |   |   |   |
|---|---|---|---|
| 2. a) Explain methods to find the depth of flow in a stream.        | 7 | 1 | 2 |
| b) Explain the ultrasonic method to find the discharge in a stream. | 7 | 1 | 2 |

**UNIT-II**

- |  |   |   |   |
|--|---|---|---|
| 3. a) Differentiate between reservoir routing and channel routing.   | 7 | 2 | 2 |
| b) Estimate the downstream hydrograph using the Muskingum method with $K=3\text{hr}$ and $X=0.3$ . At the start of the inflow flood, the outflow discharge is $1\text{ m}^3/\text{s}$ . The upstream hydrograph is as follows: | 7 | 2 | 5 |

Time (hr)	0	3	6	9	12	15	18
Inflow ( $\text{m}^3/\text{s}$ )	1	3	9	15	13	10	6

(OR)

- |   |   |   |   |
|---|---|---|---|
| 4. a) Explain the rational method of computing the peak discharge of a small catchment?                                   | 7 | 2 | 2 |
| b) For the river, the peak flood is as follows. Compute the peak flood at a 200-year return period using Gumbel's method. | 7 | 2 | 5 |

Return Period (T years)	Peak Flood ( $\text{m}^3/\text{s}$ )
50	395
100	435

**UNIT-III**

- |  |   |   |   |
|--|---|---|---|
| 5. a) Derive an expression for loss of energy head due to a hydraulic jump.  | 7 | 3 | 2 |
| b) A rectangular channel has a width of 2 m and carries a discharge of $5\text{ m}^3/\text{s}$ with a depth of 1.6 m. Calculate i) Specific energy of flowing water ii) Critical depth and critical velocity iii) Minimum Specific Energy. | 7 | 3 | 3 |

(OR)

- |  |   |   |   |
|--|---|---|---|
| 6. a) Derive the expression for Chezy's formula for uniform flow.  | 7 | 3 | 2 |
| b) A discharge of $700\text{ m}^3/\text{s}$ flows through a 50 m wide rectangular channel ( $n=0.015$ ) with a velocity of 10 m/s. Whether a hydraulic jump forms or not? If so, find its sequent depth. Also, find the loss of head in the formation of a hydraulic jump. | 7 | 3 | 3 |

#### UNIT-IV

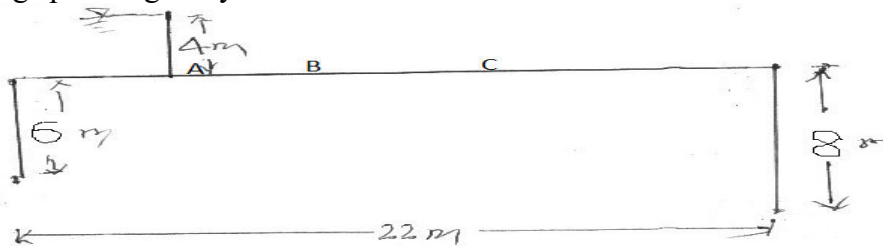
- |    |  |    |   |   |
|----|--|----|---|---|
| 7. | Design the Sarda type fall for the following data: i) full supply discharge u/s / d/s = 40 Cumecs ii) full supply level u/s / d/s = 218.30 m / 216.80 m, iii) full supply depth u/s / d/s = 1.8 m, iv) bed width u/s / d/s = 26 m, v) bed level u/s / d/s = 216.50 m / 215.00 m, vi) drop = 1.5 m vii) Side Slopes of canal 1:1 viii) Safe exit gradient for Khosla's theory is 1/5. | 14 | 4 | 5 |
|----|--|----|---|---|

(OR)

- |    |   |    |   |   |
|----|---|----|---|---|
| 8. | a) Explain the various types of canal falls with neat sketches. | 14 | 4 | 2 |
|----|---|----|---|---|

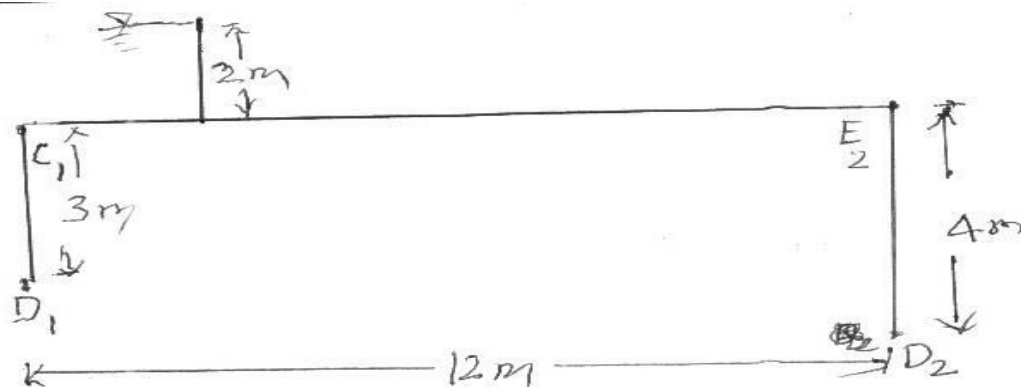
#### UNIT-V

- |    |   |   |   |   |
|----|---|---|---|---|
| 9. | a) Draw a sketch showing all the components of the diversion headworks. Explain the functions of i) Under sluice, ii) Divide wall.  | 7 | 5 | 2 |
| b) | The following figure shows the section of a hydraulic structure founded on sand. Calculate the average hydraulic gradient and also the uplift pressures at points A, B and C, which at a distance of 6m, 12 m and 18m respectively from the u/s end of the floor. Using Bligh's creep theory, find the thickness of the floor at these points, taking specific gravity G as 2.24. | 7 | 5 | 5 |



(OR)

- |     |  |   |   |   |
|-----|--|---|---|---|
| 10. | a) Discuss in detail various causes of failure of weirs in the permeable soils and their remedies.   | 7 | 5 | 2 |
| b)  | Following fig. shows a section of a hydraulic structure. Using Khosla's method of independent variables calculates uplift pressures at C1, D1, E2 & D2. Apply the <u>Mutual Interference of Piles</u> corrections. | 7 | 5 | 5 |



**Time: 3 Hours****Max Marks: 70**

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the Question must be answered at one place

		<u><b>UNIT-I</b></u>	Marks	CO	BTL
1.	a)	Describe the OODA (Observe, Orient, Decide, Act) loop and explain its role in robotic decision-making.	7	CO-1	L2
	b)	Explain the role of ROS in a robot's software architecture with a suitable diagram.	7	CO-1	L3
<b>(OR)</b>					
2.	a)	Compare AI-based robotics with traditional rule-based robotics with examples.	7	CO-1	L4
	b)	Describe the concept of autonomy in robots and explain different levels of autonomy.	7	CO-1	L2
<u><b>UNIT-II</b></u>					
3.	a)	Explain the role of subsumption architecture in coordinating robot behaviours with a diagram.	7	CO-2	L3
	b)	Describe ROS, python software requirements for robotic design.	7	CO-2	L2
<b>(OR)</b>					
4.	a)	Describe the steps involved in mounting tracks and assembling the robot arm base.	7	CO-2	L4
	b)	Explain the role of motors and control systems in a mobile robot's movement.	7	CO-2	L3
<u><b>UNIT-III</b></u>					
5.	a)	Define use cases in robotics and explain how they guide system design.	7	CO3	L2
	b)	Describe the process of decomposing project goals into hardware and software requirements.	7	CO3	L3
<b>(OR)</b>					
6.	a)	Explain how storyboards are used in robotic system design planning.	7	CO3	L3
	b)	Evaluate the systems engineering approach for solving the "put away the toys" problem.	7	CO3	L5
<u><b>UNIT-IV</b></u>					
7.	a)	Explain supervised learning and its role in training an image recognition system.	7	CO4	L2
	b)	Describe how convolution and pooling operations are applied in a CNN with a diagram.	7	CO4	L2
<b>(OR)</b>					
8.	a)	Compare supervised learning and reinforcement learning in the context of object recognition.	7	CO4	L4
	b)	Explain the process of building and testing a toy/not-toy detector using a CNN.	7	CO4	L3
<u><b>UNIT-V</b></u>					
9.	a)	Explain the concept of Q-learning and describe the Q-table structure used in robot arm control.	7	CO5	L2
	b)	Describe the task analysis process for a robot arm picking up objects.	7	CO5	L3
<b>(OR)</b>					
10.	a)	Explain the action-state approach in reinforcement learning for robotic manipulation.	7	CO5	L3
	b)	Compare Q-learning and genetic algorithm approaches for robot arm training.	7	CO5	L4

**Time: 3 Hours****Max Marks: 70**

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the Question must be answered at one place

<b><u>UNIT-I</u></b>		<b>Marks</b>	<b>CO</b>	<b>BTL</b>
1.	a) Describe the various substitution techniques in information security?	7M	CO1	L4
	b) Explain in detail Transposition Technique?	7M	CO1	L2
<b>(OR)</b>				
2.	a) Describe the concepts of plain text, cipher text, encryption, and decryption in cryptography.	7M	CO1	L2
	b) Write short notes on Security attacks	7M	CO1	L3
<b><u>UNIT-II</u></b>				
3.	List the various modes of operation of block ciphers and explain any two of them in detail.	14M	CO2	L2
<b>(OR)</b>				
4.	Explain Data Encryption standard (DES) in detail.	14M	CO2	L3
<b><u>UNIT-III</u></b>				
5.	a) Explain the concept of message authentication and discuss the authentication requirements in secure communication.	7M	CO3	L3
	b) Explain the working principle of Secure Hash Algorithms (SHA) used in cryptographic applications.	7M	CO3	L4
<b>(OR)</b>				
6.	Explain Digital Signature Algorithm in detail	14M	CO3	L4
<b><u>UNIT-IV</u></b>				
7.	Explain the architecture of IP Security	14M	CO4	L3
<b>(OR)</b>				
8.	a) Explain MIME content types.	7M	CO4	L2
	b) Define PGP? Write the services provided by PGP.	7M	CO4	L2
<b><u>UNIT-V</u></b>				
9.	a) Elaborate the operations of secure socket layer.	7M	CO5	L2
	b) What are the advantages and limitations of SET in comparison to other online payment security mechanisms.	7M	CO5	L3
<b>(OR)</b>				
10.	a) Describe the characteristics of firewalls	7M	CO5	L2
	b) Explain about SET Protocol.	7M	CO5	L3



**Time: 3 Hours****Max Marks: 70**

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the Question must be answered at one place

		<u><b>UNIT-I</b></u>	Marks	CO	BTL
1.	a)	Compare different medical imaging modalities such as X-ray, and PET in terms of image formation and application	7	CO1	L2
	b)	Describe the role of histogram processing in medical image enhancement and evaluate its effectiveness.	7	CO1	L2
<b>(OR)</b>					
2.	a)	Explain the principles of image formation in CT and MRI systems. Analyze how different physical interactions influence image contrast.	7	CO1	L2
	b)	Describe spatial filtering techniques used for noise suppression.	7	CO1	L2
<u><b>UNIT-II</b></u>					
3.		Explain the principle of Gaussian filtering and its effect on image smoothing. Analyze its advantages and limitations in medical image processing.	14	CO3	L2
<b>(OR)</b>					
4.	a)	Differentiate between convolution and correlation in image processing.	7	CO2	L2
	b)	Describe the working of Canny edge detection algorithm.	7	CO2	L2
<u><b>UNIT-III</b></u>					
5.	a)	Describe homomorphic filtering and its role in separating illumination and reflectance components.	7	CO3	L2
	b)	Define feature extraction and explain its importance in medical image analysis.	7	CO3	L2
<b>(OR)</b>					
6.	a)	Explain the working of Principal Component Analysis (PCA) for feature extraction.	7	CO3	L2
	b)	Discuss its importance in enhancing fine details in medical images.	7	CO3	L2
<u><b>UNIT-IV</b></u>					
7.	a)	Compare region-based and edge-based segmentation methods in terms of approach, advantages, and limitations.	7	CO4	L3
	b)	Define dilation and erosion. Explain their mathematical representation and effects on binary images.	7	CO4	L2
<b>(OR)</b>					
8.	a)	Discuss the advantages and limitations of region-based segmentation methods in image processing applications.	7	CO4	L3
	b)	Describe region growing and region splitting & merging techniques used in region-based segmentation. Explain their working with examples.	7	CO4	L2
<u><b>UNIT-V</b></u>					
9.	a)	How does the choice of K affect the performance of K-Means clustering? Explain with an example.	7	CO5	L3
	b)	Describe the Maximum Likelihood Estimation (MLE) method. How is it used for parameter estimation in image processing?	7	CO5	L2
<b>(OR)</b>					
10.	a)	Explain the relationship between Maximum Likelihood Estimation and Bayesian classification.	7	CO5	L2
	b)	Explain the architecture of a basic neural network. How is it used for image classification and segmentation?	7	CO5	L2

Time: 3 Hours

Max Marks: 60

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the Question must be answered at one place

**UNIT-I**

- |    |   | Marks | CO  | BTL |
|----|---|-------|-----|-----|
| 1. | a) What is refrigeration? Define one ton of refrigeration.  | 4M    | CO1 | K2  |
|    | b) Explain, with the help of a neat diagram, the Air Refrigerator working on Reversed Carnot cycle. | 6M    | CO1 | K3  |

(OR)

- |    |   |    |     |    |
|----|---|----|-----|----|
| 2. | a) What are the applications of Refrigeration                                   | 4M | CO1 | K3 |
|    | b) Explain the dense air refrigerating system and open-air refrigeration system | 6M | CO1 | K3 |

**UNIT-II**

- |    |  |    |     |    |
|----|--|----|-----|----|
| 3. | a) How does an actual vapour compression cycle differ from that of a theoretical cycle?  | 5M | CO2 | K3 |
|    | b) Explain the effect of change in the following operating conditions on the performance of vapour compression refrigeration cycle using p-h chart.<br>i) Evaporator pressure ii) Condenser pressure | 5M | CO2 | K2 |

(OR)

- |    |  |     |     |    |
|----|--|-----|-----|----|
| 4. | A vapour compression refrigerator uses methyl chloride (R-40) and operates between temperature limits of $-10^{\circ}\text{C}$ and $45^{\circ}\text{C}$ . At entry to the compressor, the refrigerant is dry saturated and after compression it acquires a temperature of $60^{\circ}\text{C}$ . Find the C.O.P. of the refrigerator. The relevant properties of methyl chloride are as follows: | 10M | CO2 | K3 |
|----|--|-----|-----|----|

Saturation Temperature ( $^{\circ}\text{C}$ )	Enthalpy (kJ/kg)		Entropy (kJ/kg·K)	
	Liquid	Vapour	Liquid	Vapour
-10	45.4	460.7	0.183	1.637
45	133.0	483.6	0.485	1.587

**UNIT-III**

- |    |   |    |     |    |
|----|---|----|-----|----|
| 5. | a) Which component of the simple vapour-absorption system replaces the compressor of a vapour-compression system?                       | 4M | CO3 | K2 |
|    | b) Draw a neat diagram of lithium bromide water absorption system and explain its working in major field of applications of this system | 6M | CO3 | K3 |

(OR)

- |    |    |  |    |     |    |
|----|----|--|----|-----|----|
| 6. | a) | Discuss the advantages of vapor absorption refrigeration system over vapor compression refrigeration system. | 4M | CO3 | K2 |
|    | b) | Explain the working principle of three fluid absorption refrigeration system with a neat sketch.             | 6M | CO3 | K3 |

**UNIT-IV**

- |    |    |   |    |     |    |
|----|----|---|----|-----|----|
| 7. | a) | With a neat sketch explain the working of Bell-Coleman cycle.   | 4M | CO4 | K2 |
|    | b) | A Bell-Coleman refrigerator operates between pressure limits of 1.05 bar and 8.5 bar. Air is drawn from the cold chamber at 10°C, Compressed and then it is cooled to 30°C before entering the expansion cylinder. Expansion and compression follow the law $PV^{1.3} = \text{constant}$ . Calculate the theoretical COP of the system. For air take $\gamma = 1.4$ , $C_p = 1.003 \text{ kJ/kg.K}$ . | 6M | CO4 | K2 |

(OR)

- |    |    |   |    |     |    |
|----|----|---|----|-----|----|
| 8. | a) | List the advantages and disadvantages of air refrigeration system.  | 4M | CO4 | K2 |
|    | b) | Draw the schematic of a boot-strap evaporative cycle of air refrigeration system, and show the cycle on T-s diagram | 6M | CO4 | K2 |

**UNIT-V**

- |    |    |  |    |     |    |
|----|----|--|----|-----|----|
| 9. | a) | Why are semiconductors most suited for thermoelectric refrigeration. Discuss             | 4M | CO5 | K2 |
|    | b) | Explain with the help of a neat sketch, the working of a steam jet refrigeration system. | 6M | CO5 | K3 |

(OR)

- |     |    |   |    |     |    |
|-----|----|---|----|-----|----|
| 10. | a) | When is the steam-jet refrigeration system preferred over other systems?        | 4M | CO5 | K2 |
|     | b) | Explain working principle and components of thermoelectric refrigerating system | 6M | CO5 | K3 |

**UNIT-VI**

- |     |    |   |    |     |    |
|-----|----|---|----|-----|----|
| 11. | a) | Define the ``human comfort`` and explain the factors which affect human comfort                           | 4M | CO6 | K2 |
|     | b) | Define room sensible heat factor. How room sensible heat factor line is drawn on the psychrometric chart? | 6M | CO6 | K3 |

(OR)

- |     |    |  |    |     |    |
|-----|----|--|----|-----|----|
| 12. | a) | Explain the working of winter air conditioning system.   | 4M | CO6 | K3 |
|     | b) | What is meant by Effective temperature? List the factors governing optimum effective temperature | 6M | CO6 | K2 |

Time: 3 Hours

Max Marks: 60

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the Question must be answered at one place

		<u>UNIT-I</u>	Marks	CO	BTL
1.	Describe the basic components of an industrial robot system with a neat sketch.		10	CO1	L2
		(OR)			
2.	a Describe magnetic and adhesive grippers with suitable applications.		5	CO1	L2
	b Describe different types of gripper mechanisms		5	CO1	L2
		<u>UNIT-II</u>			
3.	a Describe pneumatic actuators and discuss their applications in industrial robots		5	CO2	L2
	b Explain the concept of a servomotor and its role in robotic systems.		5	CO2	L2
		(OR)			
4.	Describe the working principle of encoders and their types with neat sketches		10	CO2	L2
		<u>UNIT-III</u>			
5.	Write the homogeneous transformation matrix for pure rotation about principal axes.		3	CO3	L2
	A robot end-effector moves 3 units along the X-axis, then Rotates $90^\circ$ and then moves 2 units along the new Y-axis. Find the final position using transformation matrices.		7	CO3	L3
		(OR)			
6.	Explain Denavit–Hartenberg (D-H) parameters and formulate the transformation matrix using D-H parameters		10	CO3	L3
		<u>UNIT-IV</u>			
7.	a List the steps involved in trajectory planning.		4	CO4	L2
	b A robot moves from $q_0 = 0$ to $q_f = 10$ in 5 seconds with zero initial and final velocities.		6	CO4	L3
	<ul style="list-style-type: none"> <li>Determine cubic polynomial trajectory</li> <li>Find position, velocity, acceleration equations</li> </ul>				
		(OR)			
8.	For a 2-link planar manipulator, derive the Jacobian matrix and compute end-effector velocity.		10	CO4	L3
		<u>UNIT-V</u>			
9.	Develop a program for a pick-and-place operation using WAIT, SIGNAL, and Delay commands.		10	CO5	L3
		(OR)			
10.	Explain graph-based motion planning techniques (visibility graph, Voronoi diagram, cell decomposition) with diagrams.		10	CO5	L2
		<u>UNIT-VI</u>			
11.	Describe robotic material handling systems with examples. What are the features of a robot in material handling applications?		10	CO6	L2
		(OR)			
12.	Explain the major considerations in the robot work cell design.		10	CO6	L2

**III B.Tech II Semester Supplementary Examinations, April-2026  
Artificial Intelligence and Machine Learning  
(Information Technology)****Time: 3 Hours****Max Marks: 60**

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the Question must be answered at one place

		<u><b>UNIT-I</b></u>	Marks	CO	BTL
1.	a.	Write a note on History of Artificial intelligence along with Milestones in the history of AI.	5M	CO1	K2
	b.	Explain heuristic search techniques and discuss their importance in Artificial Intelligence.	5M	CO1	K2
<b>(OR)</b>					
2.	a.	Explain about hill climbing heuristic search technique?	5M	CO1	K3
	b.	Discuss A* algorithm in detail	5M	CO1	K4
		<u><b>UNIT-II</b></u>			
3.	a.	Describe the min-max algorithm with an example?	5M	CO2	K3
	b.	Write Unification algorithm and give an example.	5M	CO2	K2
<b>(OR)</b>					
4.	a.	Explain the concept of unification in Artificial Intelligence and its role in logical inference.	5M	CO2	K2
	b.	Write a pseudo code and working of Alpha beta pruning.	5M	CO2	K3
		<u><b>UNIT-III</b></u>			
5.	a.	What are the approaches to knowledge representation? Discuss.	5M	CO3	K2
	b.	What are the different types of semantic network? What do you understand by extension of semantic network?	5M	CO3	K2
<b>(OR)</b>					
6.	a.	Compare different knowledge representation techniques.	5M	CO3	K2
	b.	Write a brief introduction to the technical standards of the semantic web.	5M	CO3	K3
		<u><b>UNIT-IV</b></u>			
7.	a.	Explain the different types of machine learning systems with real-world applications.	5M	CO4	K2
	b.	Describe the steps involved in the Back Propagation algorithm with a suitable diagram.	5M	CO4	K3
<b>(OR)</b>					
8.	a.	Explain the concept of Reinforcement Learning.	5M	CO4	K3
	b.	Distinguish between statistical learning and machine learning with examples.	5M	CO4	K2
		<u><b>UNIT-V</b></u>			
9.	a.	Describe how decision trees are used for classification and regression tasks. Explain the advantages and limitations.	5M	CO5	K2
	b.	Explain the concept of Inductive Bias in machine learning.	5M	CO5	K3
<b>(OR)</b>					
10.	a.	Discuss various issue in Decision Tree Learning	5M	CO5	K3
	b.	Compare Decision Tree Learning and Bayesian Learning techniques.	5M	CO5	K2
		<u><b>UNIT-VI</b></u>			
11.	a.	Explain the Perceptron model and describe how it performs binary classification.	5M	CO6	K2
	b.	Compare Feed Forward Neural Networks and Back Propagation Networks.	5M	CO6	K2
<b>(OR)</b>					
12.	a.	Explain the architecture of Multilayer Neural Networks.	5M	CO6	K2
	b.	Describe the training steps for back propagations networks.	5M	CO6	K3

Time: 3 Hours

Max Marks: 60

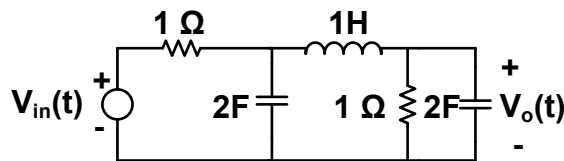
Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the Question must be answered at one place

**UNIT-I**

- |    |   | Marks | CO  | BTL |
|----|---|-------|-----|-----|
| 1. | Obtain the state model for the circuit shown in figure below. | 10    | CO1 | 3   |

**(OR)**

- |       |   |   |     |   |
|-------|---|---|-----|---|
| 2. a) | Derive the expression for transfer function form state model. | 5 | CO1 | 2 |
| b)    | A system is given by the following matrix equations.          | 5 | CO1 | 3 |

$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \end{bmatrix} = \begin{bmatrix} 0 & 1 \\ -4 & -5 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} + \begin{bmatrix} 0 \\ 10 \end{bmatrix} u$$

$$y = [1 \quad 0] \begin{bmatrix} x_1 \\ x_2 \end{bmatrix}$$

Find the transfer function of the system.

**UNIT-II**

- |       |   |   |     |   |
|-------|---|---|-----|---|
| 3. a) | List the properties of state transition matrix.   | 5 | CO2 | 2 |
| b)    | Determine the state transition matrix for a control system whose state equation is given below. | 5 | CO2 | 3 |

$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 1 & 1 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} + \begin{bmatrix} 1 \\ 0 \end{bmatrix} u$$

**(OR)**

- |    |   |    |     |   |
|----|---|----|-----|---|
| 4. | A system is given by the following vector matrix equations. | 10 | CO2 | 3 |
|----|---|----|-----|---|

$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 1 & 1 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u$$

$$y = [1 \quad 0] \begin{bmatrix} x_1 \\ x_2 \end{bmatrix}$$

Examine the controllability and observability of the system.

### UNIT-III

5. a) A Control system is characterized by the below state model. 5 CO3 3

$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \end{bmatrix} = \begin{bmatrix} 0 & 1 \\ 0 & 0 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u$$
$$y = [1 \quad 0] \begin{bmatrix} x_1 \\ x_2 \end{bmatrix}$$

Design a reduced order (First order) state observer whose pole is placed at  $s = -10$ .

- b) List the advantages of reduced order state observer over full order state observer with appropriate example. 5 CO3 2

**(OR)**

6. A system whose transfer function is, 10 CO3 3

$$\frac{Y(s)}{U(s)} = \frac{10}{(s+1)(s+2)}$$

By use of the state-feedback control  $u = -Kx$ , it is desired to place the closed-loop poles at  $s = -5, -8$ . Obtain the necessary state-feedback gain matrix  $K$ .

### UNIT-IV

7. Explain the lyapunov stability and in stability theorems. 10 CO4 3

**(OR)**

8. Check the stability of the system described by the equations 10 CO4 3

$$\dot{x}_1 = -x_1 + 2x_1^2x_2$$
$$\dot{x}_2 = -x_2$$

Using variable gradient method.

### UNIT-V

9. What is adaptive control and Describe different adaptive control schemes in detail. 10 CO5 2

**(OR)**

10. a) Differentiate between series and parallel adaptive control schemes. 5 CO5 3
- b) Discuss the industrial applications of adaptive control systems. 5 CO5 3

### UNIT-VI

11. Describe Minimum time and minimum energy problems. 10 CO6 2

**(OR)**

12. Describe output regulator and tracking problems. 10 CO6 2

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the Question must be answered at one place

		<u><b>UNIT-I</b></u>	Marks	CO	BTL
1.	a)	Define Internet of Things (IoT) and explain its key characteristics with examples.	5M	CO1	K2
	b)	Explain how IoT is used in Environmental Monitoring systems.	5M	CO1	K2
		<b>(OR)</b>			
2.		Explain the different IoT Levels and Deployment Templates used in IoT applications.	10M	CO1	K2
		<u><b>UNIT-II</b></u>			
3.	a)	Explain the concept of Machine-to-Machine (M2M) communication and describe its role in IoT systems.	5M	CO2	K2
	b)	Apply NETCONF and YANG to manage and configure IoT devices in a network environment.	5M	CO2	K3
		<b>(OR)</b>			
4.	a)	Explain the working of the Simple Network Management Protocol (SNMP) and its components.	5M	CO2	K2
	b)	Illustrate how SDN and NFV can be applied to improve the performance and flexibility of an IoT network.	5M	CO2	K3
		<u><b>UNIT-III</b></u>			
5.		Explain the IoT Design Methodology and describe the steps involved in designing an IoT system.	10M	CO3	K2
		<b>(OR)</b>			
6.	a)	Explain the Python data types and data structures commonly used in IoT applications.	5M	CO3	K2
	b)	Demonstrate how file handling in Python can be used to store IoT sensor data.	5M	CO3	K3
		<u><b>UNIT-IV</b></u>			
7.	a)	Explain the concept of IoT Physical Devices and Endpoints and describe their role in IoT systems.	5M	CO4	K2
	b)	Explain the different cloud storage models used in IoT systems.	5M	CO4	K3
		<b>(OR)</b>			
8.		Describe the architecture and features of the Raspberry Pi board used in IoT applications.	10M	CO4	K2
		<u><b>UNIT-V</b></u>			
9.		Explain the working of the MapReduce programming model in Apache Hadoop.	10M	CO5	K2
		<b>(OR)</b>			
10.	a)	Explain the architecture and features of Apache Spark for big data analytics in IoT applications.	5M	CO5	K2
	b)	Discuss the role of Apache Oozie in managing and scheduling Hadoop workflows.	5M	CO5	K2
		<u><b>UNIT-VI</b></u>			
11.		Describe the IoT architecture used in Home Automation systems with suitable examples.	10M	CO6	K2
		<b>(OR)</b>			
12.		Explain how IoT technology is used in Smart Cities to improve urban infrastructure and services.	10M	CO6	K2



# AR18

**CODE: 18ECE321**

**SET-1**

**ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI  
(AUTONOMOUS)**

**III B. Tech II Semester Supplementary Examinations, April, 2026**

**TELECOMMUNICATION SWITCHING SYSTEMS & NETWORKS**

**(Professional Elective – II)**

**(ELECTRONICS AND COMMUNICATION ENGINEERING)**

**Time: 3 Hours**

**Max Marks: 60**

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the Question must be answered at one place

## **UNIT-I**

- |             |    |  |    |
|-------------|----|--|----|
| 1.          | a) | Illustrate in detail about basics of a switching system?           | 6M |
|             | b) | Elaborate in detail about the classification of switching systems? | 6M |
| <b>(OR)</b> |    |  |    |
| 2.          | a) | Discuss in brief about the evolution of telecommunications?        | 6M |
|             | b) | Explain the principle of cross bar switching?                      | 6M |

## **UNIT-II**

- |             |    |   |     |
|-------------|----|---|-----|
| 3.          |    | Explain the operation of distributed and centralized SPC with neat diagrams?                | 12M |
| <b>(OR)</b> |    |   |     |
| 4.          | a) | Discuss the operation of time multiplexed time switching?                                   | 6M  |
|             | b) | Differentiate between time multiplexed time switching and time multiplexed space switching? | 6M  |

## **UNIT-III**

- |             |    |   |    |
|-------------|----|---|----|
| 5.          | a) | Illustrate in detail about subscriber loop systems?                         | 6M |
|             | b) | Explain about numbering plan?   | 6M |
| <b>(OR)</b> |    |   |    |
| 6.          | a) | Illustrate in brief about common channel signalling techniques?             | 6M |
|             | b) | What is grade of service? and discuss in detail about blocking probability? | 6M |

## **UNIT-IV**

- |             |    |   |     |
|-------------|----|---|-----|
| 7.          |    | Explain ISO OSI reference model with neat diagrams?   | 12M |
| <b>(OR)</b> |    |   |     |
| 8.          | a) | Analyse about serial and parallel data transmission two wire versus four wire operation?              | 6M  |
|             | b) | Draw the simplified block diagram of a data communication network and explain function of each block? | 6M  |

## **UNIT-V**

- |             |    |   |     |
|-------------|----|---|-----|
| 9.          | a) | Explain principle of operation of packet switching network with an example? | 6M  |
|             | b) | Differentiate between circuit, message and packet switching networks?       | 6M  |
| <b>(OR)</b> |    |   |     |
| 10.         |    | Describe in brief about concepts and architecture in ISDN?                  | 12M |

Time: 3 Hours

Max Marks: 60

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the Question must be answered at one place

**UNIT-I**

1. A cantilever retaining wall has 6m high wall from the top of the base slab and retains earth with an inclined fill ( $25^\circ$  to the horizontal). Density of the soil retained is  $17\text{kN/m}^3$  and its angle of repose is  $30^\circ$ . Estimate the reinforcement and design the base section of the wall for flexure. 12M

**(OR)**

2. A counterfort retaining wall has a total height of 10m from foundation level. The backfill has a horizontal top. The density and angle of internal friction of soil are  $16\text{kN/m}^3$  and  $30^\circ$  respectively. Base slab width and thickness are 5m and 300mm respectively. Toe width from the face of wall is 600mm. Thickness of wall is 260mm. The counterforts are spaced at 3m centre to centre thickness of counterfort is 300mm. Determine the pressure under the base and design the toe slab. 12M

**UNIT-II**

3. Design a circular water tank to hold 6,00,000 liters of water. Assume rigid joints between the wall and base slab. Adopt M25 concrete and Fe:415 steel. Sketch details of reinforcements. 12M

**(OR)**

4. Design a rectangular water tank 4m x 6m with depth of storage 3m, resting on ground and whose walls are rigidly joined at vertical and horizontal edges. Assume M25 concrete and Fe500 grade steel. Sketch the details of reinforcement in the tank. 12M

### **UNIT-III**

5. A triangular slab has equal side lengths of 5m is supported on two edges and is isotropically reinforced with 8mm dia. bars of Fe:415 grade, spaced at 125mm c/c in both ways. Determine (i) Ultimate moment capacity (ii) Ultimate collapse load using yield line theory, The total thickness of the slab is 120mm and grade of concrete is M20. 12M

**(OR)**

6. Design a circular roof slab of inside dia. 4.5 m, simply supported on brick wall of 230 mm for the following data: 12M
- i. Roof slab thickness = 170 mm
  - ii. Cement concrete thickness = 150
  - iii. Live Load on roof = 1 kN/m<sup>2</sup>
- Use M 20 concrete and Fe 415 steel

### **UNIT-IV**

7. Design a pile under a column transmitting an axial load of 500kN. The pile is to be driven to a hard stratum available at a depth of 8m. Use M25 concrete and Fe:415 steel. 12M

**(OR)**

8. A column 600mm x 600mm carries an axial load of 1000kN and is supported on three piles. The piles are driven to hard strata available at the depth of 12m. Use M20 concrete and Fe:415 steel. Design the pile. 12M

### **UNIT-V**

9. Explain the parameters affecting the ductility of RC sections and discuss various methods of improving the ductility. 12M

**(OR)**

10. A reinforced concrete building of size 50m x 30m consists of six stories and each storey height is 3.3m. It is braced in the transverse direction by frame action and by reinforced concrete in fill walls in the longitudinal direction. Determine wind force on the building 12M