| Hall Ticket Number : | | | | | | | | | | |
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**R-20**

**Code: 20A445T**

II B.Tech. II Semester Regular & Supplementary Examinations July 2023

# Microprocessor and Interfacing

(Common to CSE, AI&DS and AI&ML )

Max. Marks: 70 Time: 3 Hours

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Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**
2. In Part-A, each question carries **Two marks.**
3. Answer **ALL** the questions in **Part-A** and **Part-B**

## PART-A

**(Compulsory question)**

| **1. Answer ALL the following short answer questions** ( 5 X 2 = 10M ) | CO | BL |
|---|---|---|
| a) Illustrate the following Arithmetic instructions of 8086 i) AAA ii) MUL | CO1 | L2 |
| b) Analyze the different types of command words used in 8259? | CO2 | L6 |
| c) What are the modes of operation supported by 8255? | CO3 | L6 |
| d) What is USART? | CO4 | L6 |
| e) What are the different registers in 80286? | CO5 | L2 |

## PART-B

Answer *five* questions by choosing one question from each unit ( 5 x 12 = 60 Marks )

| | | Marks | CO | BL |
|---|---|---|---|---|
| | **UNIT–I** | | | |
| 2. a) | Explain the functions of different registers in 8086. Also discuss the flag register contents. | 6M | CO1 | L2 |
| b) | How procedure CALL and RET take place in 8086. Explain CALL and RET instructions in 8086 instruction set. | 6M | CO1 | L2 |
| | **OR** | | | |
| 3. | Explain branch instructions of 8086 with examples. | 12M | CO1 | L2 |
| | **UNIT–II** | | | |
| 4. a) | With the help of basic cell explain SRAM and DRAM? | 6M | CO2 | L6 |
| b) | With a neat pin diagram explain the minimum mode operation of 8086. | 6M | CO2 | L2 |
| | **OR** | | | |
| 5. a) | What is the purpose of ALE, BHE, DT/R and DEN pins of 8086? Show their timing in the system bus cycle of 8086? | 6M | CO2 | L2 |
| b) | Draw and discuss the status registers of 8257? | 6M | CO2 | L6 |

**UNIT–III**

| | | | | | |
|---|---|---|---|---|---|
| 6. | a) | Draw and explain the interfacing of cascaded 8259s with 8086. | 6M | CO3 | L6 |
| | b) | Write an ALP in 8086 to generate a symmetrical square wave form with 1KHz frequency? Give the necessary circuit setup with a DAC? | 6M | CO3 | L6 |
| | | **OR** | | | |
| 7. | a) | Describe the interrupt structure in 8086. | 4M | CO3 | L6 |
| | b) | Which interrupt type is associated with TF flag? What is its vector address? | 4M | CO3 | L6 |
| | c) | What is meant by vector address? How the vector address is used to service the interrupts? | 4M | CO3 | L6 |

**UNIT–IV**

| | | | | | |
|---|---|---|---|---|---|
| 8. | a) | Give the specifications of RS232C? | 4M | CO4 | L6 |
| | b) | Explain about line driver and line receiver used in serial communication? | 4M | CO4 | L6 |
| | c) | Give the status register of 8251 and explain each bit. | 4M | CO4 | L6 |
| | | **OR** | | | |
| 9. | | Draw and explain the architecture of 8251. | 12M | CO4 | L6 |

**UNIT–V**

| | | | | | |
|---|---|---|---|---|---|
| 10. | a) | Draw and discuss the register organization of 80286. | 6M | CO5 | L2 |
| | b) | What are the salient features of protected virtual address mode of 80386? | 6M | CO5 | L2 |
| | | **OR** | | | L2 |
| 11. | a) | Draw and discuss the flag register of 80386 in details. | 6M | CO5 | L2 |
| | b) | Enumerate the salient features of Pentium and Pentium Pro. | 6M | CO5 | L2 |

*** End ***

| Hall Ticket Number : | | | | | | | | | | |
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**R-20**

**Code: 20A543T**

II B.Tech. II Semester Regular & Supplementary Examinations July 2023

# Operating Systems

(Common to CSE, AI&DS and AI&ML)

Max. Marks: 70 Time: 3 Hours

*********

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**
2. In Part-A, each question carries **Two marks.**
3. Answer **ALL** the questions in **Part-A** and **Part-B**

## PART-A

**(Compulsory question)**

| **1. Answer ALL the following short answer questions** ( 5 X 2 = 10M ) | CO | BL |
|---|---|---|
| a) Define the term "Inter process Communication". | CO1 | L1 |
| b) List out the advantages of using multithreaded programming. | CO2 | L1 |
| c) What do you mean by Demand Paging? | CO3 | L1 |
| d) Explain the importance of disk scheduling. | CO4 | L2 |
| e) Discuss the principles of protection in a modern computer system | CO5 | L2 |

## PART-B

**Answer *five* questions by choosing one question from each unit ( 5 x 12 = 60 Marks )**

| | | | Marks | CO | BL |
|---|---|---|---|---|---|
| | | **UNIT–I** | | | |
| 2. | a) | Explain the Dual-Mode operation of an operating system. | 6M | CO1 | L2 |
| | b) | What are the three main purposes of an operating system? | 6M | CO1 | L2 |
| | | **OR** | | | |
| 3. | a) | Consider Four jobs to be executed on a single processor system arrive at time 0 in the order A, B, C, D. Their burst CPU time requirements are 4, 1, 8, 1 time units respectively. Apply FCFS and SJF CPU scheduling algorithms to calculate average waiting time, average turnaround time. | 8M | CO1 | L3 |
| | b) | Explain the criteria for evaluating the CPU scheduling algorithms? Why do we need it? | 4M | CO1 | L2 |
| | | **UNIT–II** | | | |
| 4. | a) | Write in detail about the thread libraries. | 4M | CO2 | L2 |
| | b) | Apply semaphores to provide synchronization for Producer Consumer problem. | 8M | CO2 | L3 |
| | | **OR** | | | |
| 5. | a) | Discuss Mutual-exclusion implementation with Test And Set instruction. | 6M | CO2 | L2 |
| | b) | What is a Semaphore? Explain various operations defined on it. | 6M | CO2 | L2 |
| | | **UNIT–III** | | | |
| 6. | a) | Apply first-fit, best-fit, and worst-fit algorithms to place processes of size 115 KB, 500 KB, 358 KB, 200 KB, and 375 KB (in order) for the given six memory partitions of 300 KB, 600 KB, 350 KB, 200 KB, 750 KB, and 125 KB (in order). | 6M | CO3 | L3 |
| | b) | Apply FIFO and LRU page replacement algorithms to calculate number of page faults would occur by consider the following page reference string with five page frames: 1, 2, 3, 4, 2, 1, 5, 6, 2, 1, 2, 3, 7, 6, 3, 2, 1, 2, 3, 6. | 6M | CO3 | L3 |

**OR**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 7. | a) | Explain in detail about deadlock detection Techniques. | 6M | CO3 | L2 |
| | b) | Consider a system with five processes P0 through P4 and three resource types A, B, and C. Resource type A has ten instances, resource type B has five instances, and resource type C has seven instances. Suppose, at time T0, the following snapshot of the system has been taken: | | | |

| | Allocation | | | Max | | | Available | | |
|---|---|---|---|---|---|---|---|---|---|
| | A | B | C | A | B | C | A | B | C |
| P0 | 0 | 1 | 0 | 7 | 5 | 3 | 3 | 3 | 2 |
| P1 | 2 | 0 | 0 | 3 | 2 | 2 | | | |
| P2 | 3 | 0 | 2 | 9 | 0 | 2 | | | |
| P3 | 2 | 1 | 1 | 2 | 2 | 2 | | | |
| P4 | 0 | 0 | 2 | 4 | 3 | 3 | | | |

| | | | | | |
|---|---|---|---|---|---|
| | | Apply safety algorithm to find out whether the system is in safe state or not? | 6M | CO3 | L3 |

**UNIT–IV**

| | | | | | |
|---|---|---|---|---|---|
| 8. | a) | Discuss the advantages and disadvantages of disk space allocation methods. | 4M | CO4 | L2 |
| | b) | Apply FCFS, SSTF and SCAN disk-scheduling algorithms to calculate total distance (in cylinders) that the disk arm moves to satisfy all the pending requests. The queue of pending requests, in FIFO order is: 2,069, 1,212, 2,296, 2,800, 544, 1,618, 356, 1,523, 4,965, and 368. Let as assume that a disk drive has 5,000 cylinders, numbered 0 to 4,999. The drive is currently serving a request at cylinder 2,150, and the previous request was at cylinder 1,805. | 8M | CO4 | L3 |

**OR**

| | | | | | |
|---|---|---|---|---|---|
| 9. | a) | Write short notes on<br>i. File Attributes ii. File System | 4M | CO4 | L2 |
| | b) | Apply LOOK, C-SCAN and C-LOOK disk-scheduling algorithms to calculate total distance (in cylinders) that the disk arm moves to satisfy all the pending requests. The queue of pending requests, in FIFO order, is: 86, 147, 91, 177, 94, 150, 102, 175, and 130. Let as assume that a disk drive has 200 cylinders, numbered 0 to 199. The drive is currently serving a request at cylinder 143, and the previous request was at cylinder 125. | 8M | CO4 | L3 |

**UNIT–V**

| | | | | | |
|---|---|---|---|---|---|
| 10. | a) | What is access matrix? Explain the different implementations of access matrix | 6M | CO5 | L2 |
| | b) | Describe in detail how firewalls protect systems & networks. | 6M | CO5 | L2 |

**OR**

| | | | | | |
|---|---|---|---|---|---|
| 11. | a) | Explain the following program threats.<br>i) Trojan horse ii) Trap door iii) Stack and Buffer overflow | 6M | CO5 | L2 |
| | b) | Explain the computer-security classifications. | 6M | CO5 | L2 |

*** End ***

| Hall Ticket Number : | | | | | | | | | | |
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**R-20**

**Code: 20AC41T**

II B.Tech. II Semester Regular & Supplementary Examinations July 2023

# Probability and Statistics

(Common to CE, ME, CSE, AI&DS and AI&ML)

Max. Marks: 70 Time: 3 Hours

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Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**
2. In Part-A, each question carries **Two marks.**
3. Answer **ALL** the questions in **Part-A** and **Part-B**

## PART-A

**(Compulsory question)**

| | | | |
|---|---|---|---|
| 1. | **Answer ALL the following short answer questions** ( 5 X 2 = 10M ) | CO | BL |
| a) | Write the formula for Rank correlation coefficient with repeated ranks. | CO1 | L1 |
| b) | Two cards are drawn from a well shuffled pack of cards .Find probability that they are both aces if the first card is (i) replaced (ii) not replaced | CO2 | L2 |
| c) | If the mean of a Poisson variable is 1.8, then find P(X>1) | CO3 | L3 |
| d) | Define Type-I and Type-II Errors. | CO4 | L3 |
| e) | Explain briefly the Variance Ratio test(F-Test) | CO5 | L2 |

## PART-B

**Answer *five* questions by choosing one question from each unit ( 5 x 12 = 60 Marks )**

| | | | Marks | CO | BL |
|---|---|---|---|---|---|

### UNIT–I

2. Calculate Mean, Median and Mode from the following data.

| Class interval | 10-20 | 20-30 | 30-40 | 40-50 | 50-60 | 60-70 | 70-80 | 80-90 |
|---|---|---|---|---|---|---|---|---|
| Frequency | 5 | 9 | 13 | 21 | 20 | 15 | 8 | 3 |

12M CO1 L3

**OR**

3. Find Karl Pearson's coefficient of correlation from the following data

| Wages | 100 | 101 | 102 | 102 | 100 | 99 | 97 | 98 | 96 | 95 |
|---|---|---|---|---|---|---|---|---|---|---|
| Cost of living | 98 | 99 | 99 | 97 | 95 | 92 | 95 | 94 | 90 | 91 |

12M CO1 L3

### UNIT–II

4. a) State Baye's Theorem 2M CO2 L-1

b) In a bolt factory machines A, B, C manufacture 20%, 30% and 50% of the total of their output and 6%, 3% and 2% are defective. A bolt is drawn at random and found to be defective. Find the probabilities that is manufactured from (i) Machine A (ii) Machine B (iii) Machine C 10M CO2 L-3

**OR**

5. a) A random variable X is defined as the sum of the numbers on the faces when two dice are thrown. Construct Probability distribution table. 3M CO2 L-3

b) For the continuous probability function $f(x) = kx^{-e^{-x}}$ n x≥0,find (i) k (ii) Mean (iii) Variance 9M CO2 L-2

### UNIT–III

6. a) Out of 800 families with 5 children each, how many would you expect to have (i) 3 boys (ii) either 2 or 3 boys (iii) atleast one boy? Assume equal probabilities for boys and girls 6M CO3 L-3

b) In a Normal distribution 7% of the items are under 35 and 89% are under 63. Determine the mean and variance of the distribution — 6M CO3 L-3

**OR**

7. a) Average number of accidents on one day on a national highway is 1.6. Determine the probability that the number of accidents are (i) at least one (ii) Atmost one — 6M CO3 L-3

b) In a sample of 1000 cases the mean of a certain test is 14 and standard deviation is 2.5.Assuming the distribution to be normal, find (i) how many score between 12 and 15? (ii) how many score above 18? (iii) how many score below 18? — 6M CO3 L-3

**UNIT–IV**

8. a) The mean life of a sample of 10 electric bulbs was found to be 1456 hours with standard deviation of 423 hours. The second sample of 17 bulbs chosen from a different batch shoed a mean life of 1280 hours with standard deviation of 398 hours. Is there a significant difference between the means of two batches at 5% level of significance? — 8M CO4 L-4

b) A random sample of 400 items is found to have mean 82 and Standard deviation of 18. Determine maximum error of estimation at 95% confidence interval. Also construct 95% confidence interval. — 4M CO4 L-4

**OR**

9. a) An oceanographer wants to whether the depth of the ocean in a certain region is 57.4 fathoms, as had previously been recorded. What can he conclude at the 0.05 level of significance, if readings taken at 40 random locations in the given region yielded a mean of 59.1 fathoms with standard deviation of 5.2 fathoms? — 4M CO4

b) In a random sample of 1000 persons from town A, 400 are found to be consumers of wheat. In a sample of 800 from town B, 400 are found to be consumers of wheat. Do these data reveal a significant difference between town A and town B, so far as the proportion of wheat consumers is concerned? Consider level of significance as 1%. — 8M CO4 L-4

**UNIT–V**

10. To compare two kinds of bumper guards, 6 of each kind were mounted on a car and then the car was run into a concrete wall. The following are the costs of repairs.

| | | | | | | |
|---|---|---|---|---|---|---|
| Guard I | 107 | 148 | 123 | 165 | 102 | 119 |
| Guard II | 134 | 115 | 112 | 151 | 133 | 129 |

Use 0.01 level of significance to test whether the difference between two sample means is significant. — 12M CO5 L-4

**OR**

11. Mechanical engineers, testing a new welding technique, classified welds both with respect to appearance and an X-ray inspection. Test for performance with respect to appearance and X ray inspection are independent (consider level of significance as 5%)

Quality

| X-Ray | Bad | Normal | Good |
|---|---|---|---|
| Bad | 20 | 7 | 3 |
| Normal | 13 | 51 | 16 |
| Good | 7 | 12 | 21 |

12M CO5 L-4

*** End ***

| Hall Ticket Number : | | | | | | | | | | |
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**R-20**

**Code: 20A541T**

II B.Tech. II Semester Regular & Supplementary Examinations July 2023

# Design and Analysis of Algorithms

(Common to CSE, AI&DS and AI&ML)

Max. Marks: 70 Time: 3 Hours

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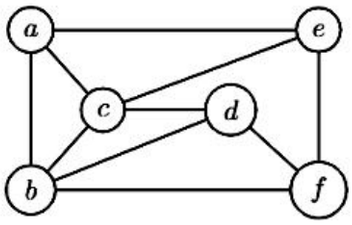
Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**
2. In Part-A, each question carries **Two marks.**
3. Answer **ALL** the questions in **Part-A** and **Part-B**

## PART-A

**(Compulsory question)**

| | | | | |
|---|---|---|---|---|
| 1. | **Answer ALL the following short answer questions** ( 5 X 2 = 10M ) | | CO | BL |
| a) | Show that 5n+6 = O(n). | | CO1 | L3 |
| b) | Give a recurrence for running time of merge sort. | | CO2 | L2 |
| c) | What is the principle of optimality? | | CO3 | L1 |
| d) | Determine the minimum number of colors required to properly color the vertices of the following graph. | | CO4 | L2 |



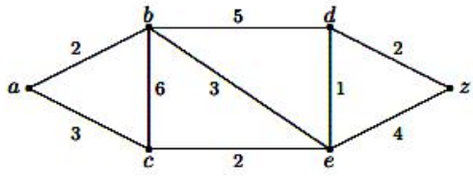

| | | | | |
|---|---|---|---|---|
| e) | State the Cook's theorem. | | CO5 | L1 |

## PART-B

**Answer *five* questions by choosing one question from each unit ( 5 x 12 = 60 Marks )**

| | | | Marks | CO | BL |
|---|---|---|---|---|---|
| | | **UNIT–I** | | | |
| 2. | a) | Formally define the asymptotic notations big-oh, big-omega and theta. Give an example for each of the notations. | 9M | CO1 | L2 |
| | b) | Let T(n) be the number of times "AITS Rajampet" is printed in the following algorithm segment. Determine T(n) and represent it using theta notation.<br>for (i =1; i ≤ n; i= i++) do<br>for (j=1; j ≤ n; j= j+2) do<br>print" AITS Rajampet "; | 3M | CO1 | L4 |
| | | **OR** | | | |
| 3. | a) | How would you find connected components of a graph using disjoint set data structure? Explain with an example. | 4M | CO1 | L3 |
| | b) | Explain with pseudo code and a suitable example disjoint set *union* and *find* operations. What is weighting rule for union operation? | 8M | CO1 | L2 |
| | | **UNIT–II** | | | |
| 4. | a) | Sort the keys 50, 50, 80, 30, 40, 30, 20 in non-decreasing order by applying quick sort. Give a recurrence for the worst-case running time of quick sort and represent its running time using theta notation. | 7M | CO2 | L3 |
| | b) | Explain binary search algorithm with an example. | 5M | CO2 | L2 |
| | | **OR** | | | |
| 5. | a) | State fractional knapsack problem. Find an optimal solution to the fractional knapsack instance n=7, m=15, (p1, p2, …,p7) = (1, 3, 5, 4, 1, 3 ,2) and (w1, w2, …, w7) = (5,10,15,7,8,9,4) by applying greedy algorithm. | 7M | CO2 | L3 |

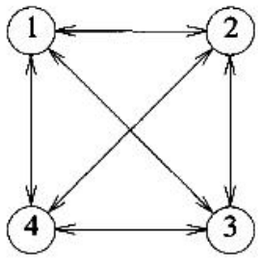
b) Define Minimum Spanning Tree (MST). Find a MST of the following graph by applying Prim's algorithm. CO2 L3




5M

**UNIT–III**

6. a) Define travelling salesperson problem. Consider the directed graph and the edge cost matrices given below. Solve the given instance of travelling salesperson problem by applying a dynamic programming algorithm. Assume vertex 1 as the source. CO3 L3




(a)

$$\begin{bmatrix} 0 & 10 & 15 & 20 \\ 5 & 0 & 9 & 10 \\ 6 & 13 & 0 & 12 \\ 8 & 8 & 9 & 0 \end{bmatrix}$$

(b)

9M

b) Define matrix chain multiplication problem. 3M CO3 L1

**OR**

7. a) Give a dynamic programming-based algorithm to solve 0/1 knapsack problem and analyze its running time. Solve the following instance of 0/1 knapsack problem by applying your algorithm. CO3 L3

| Item No | Weight (Kg) | Profit (Rs) |
|---|---|---|
| 1 | 2 | 3 |
| 2 | 3 | 4 |
| 3 | 4 | 5 |
| 4 | 5 | 6 |

Knapsack capacity (W) = 5 Kg 9M

b) Define binary search tree. Draw all different binary search trees possible with keys 25, 15 and 35. CO3 L2 3M

**UNIT–IV**

8. a) Explain the general method of backtracking. 4M CO4 L2

b) Give a backtracking solution to 8-queens problem. 8M CO4 L3

**OR**

9. a) Differentiate between FIFO and LC branch and bound techniques. 4M CO4 L2

b) Explain briefly the main steps in an LC branch-and-bound solution to 0/1 knapsack problem. CO4 L3 8M

**UNIT–V**

10. a) Define complexity classes NP-hard and NP-complete. How to show that a problem is NP-hard? CO5 L2 7M

b) What is halting problem of the Turing machine? Determine the complexity class of halting problem. CO5 L1 5M

**OR**

11. a) Define decision problem. Give three examples for decision problems which are in class NP but not in class P. CO5 L2 4M

b) Define satisfiability problem. Design a nondeterministic algorithm to solve satisfiability problem. CO5 L2 8M

*** End ***

| Hall Ticket Number : | | | | | | | | | | |
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**R-20**

**Code: 20A3041T**

II B.Tech. II Semester Regular & Supplementary Examinations July 2023

# Foundations of Artificial Intelligence and Data Science

(Artificial Intelligence & Data Science)

Max. Marks: 70 Time: 3 Hours

*********

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**
2. In Part-A, each question carries **Two marks.**
3. Answer **ALL** the questions in **Part-A** and **Part-B**

## PART-A

**(Compulsory question)**

| | | CO | BL |
|---|---|---|---|
| **1.** | **Answer ALL the following short answer questions** ( 5 X 2 = 10M ) | | |
| a) | Define AI. Specify any one application | CO1 | L1 |
| b) | What is meant by search agents? | CO1 | L1 |
| c) | Define big data and discuss its impact on businesses and decision-making processes. | CO3 | L2 |
| d) | What is the goal of feature selection in machine learning? | CO3 | L1 |
| e) | Name two commonly used data visualization tools. | CO5 | L1 |

## PART-B

**Answer *five* questions by choosing one question from each unit ( 5 x 12 = 60 Marks )**

| | | Marks | CO | BL |
|---|---|---|---|---|
| | **UNIT–I** | | | |
| 2. a) | Discuss about various kinds of agents and their properties with neat diagram. | 6M | CO1 | L2 |
| b) | Discuss the characteristics of AI problem. Can Towers of Hanoi problem be considered as AI problem? Justify your answer with suitable discussions | 6M | CO1 | L3 |
| | **OR** | | | |
| 3. a) | What is meant by Search strategy? List and explain various parameters to evaluate search strategies. | 6M | CO1 | L3 |
| b) | How to avoid repeated search? | 6M | CO1 | L2 |
| | **UNIT–II** | | | |
| 4. a) | Explain the heuristic search techniques. | 6M | CO2 | L2 |
| b) | Explain difference between simple Hill climbing and Steepest Ascent Hill Climbing. | 6M | CO2 | L3 |
| | **OR** | | | |
| 5. a) | Prove that A* search technique is complete and optimal. | 6M | CO2 | L3 |
| b) | Describe back tracking search for the Constraint satisfaction problem? | 6M | CO2 | L3 |

## UNIT–III

| | | | | | |
|---|---|---|---|---|---|
| 6. | a) | Explain about the different sampling modeling techniques. | 6M | CO3 | L4 |
| | b) | Discuss the importance of fitting a model to data and the role of maximum likelihood estimation in determining the parameters of probability distributions. | 6M | CO3 | L3 |

**OR**

| | | | | | |
|---|---|---|---|---|---|
| 7. | a) | Define data science and discuss its importance in the era of big data. | 6M | CO3 | L2 |
| | b) | Discuss the steps involved in constructing and evaluating statistical models for data analysis. | 6M | CO3 | L4 |

## UNIT–IV

| | | | | | |
|---|---|---|---|---|---|
| 8. | a) | Discuss the concept of Exploratory Data Analysis (EDA) and its significance in the data science process. | 6M | CO4 | L2 |
| | b) | Explain the concepts of Support Vector Machines (SVM), Naïve Bayes, and Logistic Regression. | 6M | CO4 | L3 |

**OR**

| | | | | | |
|---|---|---|---|---|---|
| 9. | | Explain about Data K-Means Algorithm with example. | 12M | CO4 | L3 |

## UNIT–V

| | | | | | |
|---|---|---|---|---|---|
| 10. | a) | Explore the role of interactivity in data visualization. | 6M | CO5 | L3 |
| | b) | Explain the concepts of visual encoding, perception, and design aesthetics, and provide examples to illustrate their application in data visualization. | 6M | CO5 | L4 |

**OR**

| | | | | | |
|---|---|---|---|---|---|
| 11. | | Explain the ideas and tools used for data visualization. | 12M | CO5 | L4 |

*** End ***