Hall Ticket Number :										

R-20

Code: 20AC41T

II B.Tech. II Semester Regular & Supplementary Examinations May/June 2024

Probability and Statistics

(Common to CE, ME, CSE, AI&DS, CSE(DS), CSE(AI) 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) A sample of five university students responded to the question "How much time, in minutes, did you spend on the social network site yesterday?" 100, 45, 60, 130, 30. Find the mean and the median. CO1 L1

b) What is the probability that a leap year selected at random will contain 53 Sundays? CO2 L1

c) Define Normal distribution. CO3 L2

d) Explain Type I error and Type II error. CO4 L3

e) Write χ^2 statistic for analysis of r × c table. 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. Calculate the mean and median for the following table giving the age distribution of 542 members. 12M CO1 L3

Age (in years)	20-30	30-40	40-50	50-60	60-70	70-80	80-90
No. of members	3	61	132	153	140	51	2

OR

3. The ranks of same 16 students in Mathematics and Physics are as follows. Two numbers within brackets denote the ranks of the students in Mathematics and Physics: (1,1) (2,10) (3,3) (4,4) (5,5) (6,7) (7,2) (8,6) (9,8) (10,11) (11,15) (12,9) (13,14) (14,12) (15,16) (16,13). Calculate the rank correlation coefficient for proficiencies of this group in Mathematics and Physics. 12M CO1 L4

UNIT–II

4. In a bolt factory machines A,B and C manufacture respectively 25%.35% and 40% of the total. Of their output 5, 4, 2 percent are defective bolts. A bolt is drawn at random from the product and is found to be defective. What are the probabilities that it was manufactured by machines A, B and C? 12M CO2 L2

OR

5. Let X be a continuous random variable with distribution :

$$f(x)=\begin{cases} k\,x^2 & if\ 0\le x\le 1 \\ 0 & elsewhere \end{cases}$$

(i) Evaluate k (ii) Find $p(1/4\le X\le 3/4)$. (iii) Find $p(X>2/3)$. 12M CO2 L5

UNIT–III

6. a) The probability that a patient recovers from a rare blood disease is 0.4. If 15 people are known to have contracted this disease, what is the probability that (i) at least 10 survive, (ii) from 3 to 8 survive, and (iii) exactly 5 survive? 6M CO3 L1

b) A car hires firm has two cars which it fires out day by day. Tile number of demands for a car on each day is distributed as Poisson variate with mean 1· 5. Calculate the proportion of days on which (i) neither car is used, and (ii) some demand is refused. 6M CO3 L3

OR

7. a) Out of 800 families with 5 children each, how many would you except to have (i) 3 boys (ii) either 2 or 3 boys? (iii) 5 girls. Assume equal probabilities for boys and girls. 6M CO3 L2

b) In a normal distribution, 7% of the items are under 35 and 89% are under 63. What are the mean and standard deviation of the distribution? 6M CO3 L1

UNIT–IV

8. a) The average zinc concentration recovered from a sample of measurements taken in 36 different locations in a river is found to be 2.6 grams per milliliter. Find the 95% and 99% confidence intervals for the mean zinc concentration in the river. Assume that the population standard deviation is 0.3gram per milliliter. 6M CO4 L2

b) A study showed that 64 of 180 persons who saw a photocopying machine advertised during the telecast of a baseball game and 75 of 180 other persons who saw it advertised on a variety show remembered the brand name 2 hours later. Use the Z- statistic to test at the 0.05 level of significance whether the difference between the corresponding sample proportions is significant. 6M CO4 L3

OR

9. a) If x = 36 of n = 100 persons interviewed are familiar with the tax incentives for installing certain energy-saving devices, construct a 95% confidence interval for the corresponding true proportion. 6M CO4 L3

b) In 64 randomly selected hours of production, the mean and the standard deviation of the number of acceptable pieces produced by a automatic stamping machine are $x = 1,038$ and $s = 146$. At the 0.05 level of significance, does this enable us to reject the null hypothesis $\mu = 1,000$ against the alternative hypothesis $\mu > 1,000$? 6M CO4 L5

UNIT–V

10. It is desired to determine whether there is less variability in the silver plating done by Company 1 than in that done by Company 2. If independent random samples of size 12 of the two companies' work yield $s_1 = 0.035$ mil and $s_2 = 0.062$ mil, test the null hypothesis $\sigma^2_1 = \sigma^2_2$ against the alternative hypothesis $\sigma^2_1 < \sigma^2_2$ at the 0.05 level of significance. 12M CO5 L5

OR

11. The following is the distribution of the hourly number of trucks arriving at a company's warehouse:

Trucks arriving per hour	Frequency
0	52
1	151
2	130
3	102
4	45
5	12
6	5
7	1
8	2

Find the mean of this distribution, and using it (rounded to one decimal place) as the parameter λ, fit a Poisson distribution. Test for goodness of fit at the 0.05 level of significance. 12M CO5 L6

*** End ***

Hall Ticket Number :										

R-20

Code: 20A541T

II B.Tech. II Semester Regular & Supplementary Examinations May / June 2024

Design and Analysis of Algorithms

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

		CO	BL
1.	**Answer ALL the following short answer questions** (5 X 2 = 10M)		
a)	Show that 2n+3 = Ω(n).	CO1	L3
b)	What is the advantage of binary search over linear search?	CO2	L2
c)	Define 0-1 knapsack problem.	CO3	L1
d)	Give two examples for optimization problems which have a branch and bound solution.	CO4	L1
e)	What is halting problem of Turing machine?	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)	Define an algorithm. What are the criteria an algorithm must satisfy? Explain briefly.	6M	CO1	L1

b)	Define theta notation and give an example. Let T(*n*) be the number of times "*Procrastination makes easy things hard and hard things harder*." is printed in the following algorithm segment. Determine T(*n*) and represent it using theta notation.
	for (i =1; i ≤ n; i= i++) do
	for (j=i+1; j ≤ n; j= j++) do
	print " Procrastination makes easy things hard and hard things harder.";
		6M	CO1	L4

	OR			
3. a)	Explain with pseudo code and a suitable example weighted union operation.	6M	CO1	L2
b)	Define big-oh notation and give an example. Let $f(n) = a_m n^m + a_{m-1}n^{m-1} + a_{m-2} n^{m-2} + \ldots + a_1 n + a_0$, be a degree *m* polynomial in *n* and $a_m > 0$. Show that $f(n) = O(n^m)$.	6M	CO1	L3
	UNIT–II			
4. a)	With pseudo code explain merger sort algorithm. Sort the array 10, 50, 20, 80, 60, 30, 70, 40 using merge sort. Give a recurrence for the running time of merge sort and represent its running time using theta notation.	9M	CO2	L2
b)	What is a greedy-choice property?	3M	CO2	L1
	OR			
5. a)	State job sequencing with deadlines problem. Solve the instance, n=7, $(p_1,p_2,\ldots,p_7)$ = (3, 5, 20, 18, 1, 6, 30} and $(d_1,d_2,\ldots,d_7)$={1, 3, 4, 3, 2, 1, 2) of job scheduling problem by applying a greedy algorithm.	8M	CO2	L3

b) Which of the following arrays is efficiently sorted using quick sort? Justify your answer.
A: (1000, 150, 8200, 4300, 5200)
B: (600, 1000, 1200, 1500, 1800) 4M CO2 L2

UNIT–III

6. a) Define matrix chain multiplication problem. Design a dynamic programming algorithm to solve matrix chain multiplication problem. Apply your algorithm and find an optimal way of multiplying the chain of four matrices A_1 A_2 A_3 A_4 , where, A_1 , A_2 , A_3 , A_4 have dimensions 5X10, 10X15, 15X20 and 20X25 respectively. Also analyze the running time of your algorithm. 10M CO3 L3

b) What are two ingredients an optimization problem must have to apply dynamic programming? 2M CO3 L2

OR

7. a) Solve the instance n=4, (a_1,a_2,a_3,a_4)=(do, if, int, while), P(1:4)=(3,3,1,1) and q(0:4)=(2,3,1,1,1) of optimal binary search tree problem by applying a dynamic programming algorithm. 10M CO3 L3

b) Define all-pairs shortest paths problem. 2M CO3

UNIT–IV

8. a) Define *sum of subsets* problem. Explain steps in a backtracking solution to solve the sum of subsets problem. 6M CO4 L3

b) Define the following terms.
i. Chromatic number of a graph ii. Planar graph
iii. m-colorability decision problem, where m is a positive integer 6M CO4 L2

OR

9. a) Explain the general method of branch-and-bound. 4M CO4 L2

b) Define Traveling Salesperson Problem (TSP). Explain briefly the main steps in a branch-and-bound solution to the TSP problem. 8M CO4 L3

UNIT–V

10. a) Does there exists a problem which is NP-hard but not NP-complete? Justify. 2M CO5 L2

b) Define the complexity classes and give an example for each: P, NP, NP-hard and NP-complete. Draw a Venn diagram of the complexity classes P, NP, NP-hard and NP-complete set of problems under the assumption that P ≠ NP. 10M CO5 L2

OR

11. a) Differentiate between deterministic and non-deterministic algorithms. 6M CO5 L2

b) Explain COOK's Theorem. 6M CO5 L2

*** End ***

Hall Ticket Number :										

R-20

Code: 20A3041T

II B.Tech. II Semester Regular & Supplementary Examinations May / June 2024

Foundations of Artificial Intelligence and Data Science

(Artificial Intelligence and Data Science)

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)

		CO	Blooms Level
1.	**Answer ALL the following short answer questions** (5 X 2 = 10M)		
a)	Foundations of AI	CO1	L1
b)	Define the heuristic search	CO2	L1
c)	Explain the roles of Data Science.	CO3	L3
d)	How is data exploration done?	CO4	L1
e)	Write any two advantages of Data visualization	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)	Explain the various benefits of AI	6M	CO1	L2
	b)	Explain about the problem solving agent.	6M	CO1	L2
		OR			
3.	a)	Explain the types of Agent and its environment	6M	CO1	L2
	b)	Give an example of a problem for which breadth first search would work better than depth first search.	6M	CO1	L3
		UNIT–II			
4.	a)	Explain the algorithm for steepest hill climbing with the help of an example.	6M	CO2	L3
	b)	Discuss Simulated Annealing in detail	6M	CO2	L3
		OR			
5.		Write the constraint satisfaction procedure. Trace the execution of the constraint satisfaction procedure in solving crypto-arithmetic problem:	12M	CO2	L4

UNIT–III

6.	a)	Explain in detail about the working with relational databases	6M	CO3	L4
	b)	Explain how populations and samples differ	6M	CO3	L4

OR

7.	a)	Write about probability distributions	6M	CO3	L4
	b)	Explain Linear Regression models with example.	6M	CO3	L4

UNIT–IV

8.	a)	Explain the k-Means Algorithm with an example.	6M	CO4	L4
	b)	Illustrate with an example K-nearest neighbors	6M	CO4	L2

OR

9.	a)	Describe the significance of feature selection algorithms.	6M	CO4	L2
	b)	Explain Naïve Bayes Classifier with an Example	6M	CO4	L4

UNIT–V

10.	a)	Write about basic principles of data Presentation	6M	CO5	L2
	b)	Give examples of inspiring (industry) projects.	6M	CO5	L2

OR

11.		Explain the applications of data science in Health care and Biotechnology	12M	CO5	L4

*** End ***

Hall Ticket Number :										

R-20

Code: 20A445T

II B.Tech. II Semester Regular & Supplementary Examinations May/June 2024

Microprocessor and Interfacing

(Common to CSE, AI&DS, CSE(DS), CSE(AI) 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)	What is the maximum memory size that can be addressed by 8086?	CO1	L1
b)	Differences between minimum & maximum mode of operation of 8086.	CO2	L2
c)	List the modes of operation supported by 8255?	CO3	L1
d)	What is the necessity of USART (8251)	CO4	L2
e)	Features of 80386 than 80286 processors.	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.	What do you mean by addressing modes? What are the different addressing modes supported by 8086 with suitable examples.	12M	CO1	L2
	OR			
3.	With a neat architectural diagram of 8086 and explain the functions of BIU and EU.	12M	CO1	L1
	UNIT–II			
4.	Briefly explain the maximum and minimum mode configuration of 8086.What is the purpose and function of MN/Mx pin? Explain.	12M	CO2	L3
	OR			
5.	What is need of DMA controller and discuss the architecture of 8257 & interfacing with 8086.	12M	CO2	L3
	UNIT–III			
6.	How many interrupts are available in 8086? List the predefined software interrupts available in 8086 along with function of each in 8086 execution.	12M	CO3	L2
	OR			
7.	Describe that how D/A interfacing is done with 8086 and write a program to generate 50% duty cycle sinusoidal wave.	12M	CO3	L2
	UNIT–IV			
8.	With the help of neat diagram explain how 8251 is interfaced with 8086 and used for serial Communication.	12M	CO4	L3
	OR			
9.	Describe the various modes of operation in 8253 programmable internal timers.	12M	CO4	L3
	UNIT–V			
10.	Give introduction, main features and applications of Pentium processor in detail.	12M	CO5	L2
	OR			
11.	Write a brief summary on concepts of segmentation & paging mechanisms in Microprocessors with appropriate examples.	12M	CO5	L3

*** End ***

Hall Ticket Number :										

R-20

Code: 20A543T

II B.Tech. II Semester Regular & Supplementary Examinations May/June 2024

Operating Systems

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

			CO	BL
1.	**Answer ALL the following short answer questions** (5 X 2 = 10M)			
	a)	Define System call.	CO1	L1
	b)	Define Thread scheduling.	CO2	L1
	c)	Describe Deadlock.	CO3	L2
	d)	Define RAID.	CO4	L1
	e)	List out the Goals of Protection.	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)	What are the services of Operating system? Explain.	6M	CO1	L2
	b)	List and explain various types of System calls.	6M	CO1	L2
		OR			
3.		What is processes scheduling? Explain operations on process.	12M	CO1	L2
		UNIT–II			
4.		Explain thread libraries in detail.	12M	CO2	L2
		OR			
5.	a)	Explain Multiprocessor scheduling in detail.	6M	CO2	L2
	b)	Describe Peterson‘s Solution in detail.	6M	CO2	L2
		UNIT–III			
6.		Explain the following. a) Principles of Deadlock b) Deadlock characterization c) Deadlock detection and avoidance	12M	CO3	L2
		OR			
7.	a)	Define paging. Illustrate the structure of the page table in detail.	6M	CO3	L4
	b)	Write short notes on contiguous memory allocation.	6M	CO3	L1

UNIT–IV

8.		Define Mass-storage structure. Illustrate Disk scheduling in detail.	12M	CO4	L4

OR

9.	a)	Explain stable-storage implementation.	6M	CO4	L2
	b)	List out the objectives of file management systems? Illustrate the file system architecture.	6M	CO4	L4

UNIT–V

10.	a)	Write short notes on Implementation of Access Matrix.	6M	CO5	L1
	b)	Explain computer –security classifications.	6M	CO5	L2

OR

11.	a)	Explain firewalls used to protect systems and networks.	8M	CO5	L2
	b)	Describe user authentication.	4M	CO5	L2

*** End ***