F – 54941

Register No. | | | | | | | | |

BE/BTech Degree Examination December 2022

Fourth Semester

Computer Science and Engineering & Information Technology

20MAT42 – PROBABILITY AND STATISTICS

(Regulations 2020)

Time: Three hours | Maximum: 100 marks

Answer all Questions

Part – A (10 × 2 = 20 marks)

1. Find the distribution function of x, for the following probability distribution. [CO1,K2]

x:	0	1	2
P(x):	1/4	2/4	1/4

2. Define moment generating function of a discrete and continuous random variable x. [CO1,K1]

3. The probability of a bomb hitting a target is 1/5. Two bombs are enough to destroy a bridge. If six bombs are aimed at the bridge, find the probability that the bridge is destroyed? [CO2,K2]

4. State memoryless property of exponential distribution. [CO2,K1]

5. Find the covariance of the two random variables whose probability distribution function is given by [CO3,K2]

$$f(x,y) = \begin{cases} 2, & x > 0, y > 0, x + y < 1 \\ 0, & \text{otherwise} \end{cases}$$

6. State the equations of the two regression lines. [CO3,K1]

7. What are the parameters and statistics in sampling? [CO4,K1]

8. What are the expected frequencies of 2 x 2 contingency table [CO4,K1]

a	b
c	d

9. Define ANOVA. [CO5,K1]

10. Why a 2 x 2 Latin Square is not possible? [CO5,K1]

Part – B (5 × 16 = 80 marks)

11. a. i) A random variable x has the following probability distribution. (10) [CO1,K3]

x	-2	-1	0	1	2	3
P(x)	0.1	k	0.2	2k	0.3	3k

1) Find k 2) Evaluate P (x<2) and P (-2<x<2) 3) Find the distribution function of x.

ii) The cumulative distribution function of a random variable x is $F(x) = 1 - (1+x)e^{-x}, x > 0$. Find the probability density function of x and Mean. (6) [CO1,K3]

(OR)

b. Find the probability distribution of the total number of heads obtained in four tosses of a balanced coin. Hence obtain the MGF of X, mean of x and variance of x. (16) [CO1,K3]

12. a. i) Derive M.G.F, Mean and Variance of Binomial distribution. (10) [CO2,K2]

ii) A car hire firm has 2 cars which it hires out day by day. The number of demands of a car on each day follows a poisson distribution with mean 1.5. Calculate the proportion of days on which (i) Neither car is used and ii) Some demand is not fulfilled. (6) [CO2,K2]

(OR)

b. i) Electric trains on a certain line run every half an hour between mid-night and six in the morning. What is the probability that a man entering the station at a random time during this period will have no wait atleast twenty minutes? (6) [CO2,K2]

ii) In normal distribution, 7 % of the items are under 35 can 89 % of the items are under 63. What are the mean and the standard deviation of the distribution? (10) [CO2,K2]

13. a. i) The joint probability mass function of x and y is. (8) [CO3,K3]

P(x,y) x	0	1	2
0	0.1	0.4	0.2
1	0.8	0.20	0.06
2	0.06	0.14	0.30

1) Compute the marginal distributions of x and y
2) Compute $P[X \leq 1, Y \leq 1]$

ii) Obtain the correlation co-efficient from the following data (8) [CO3,K3]

x	1	2	3	4	5	6	7
y	4	3	1	2	6	5	7

(OR)

b. i) The joint density function of the R.v's x and y is given by (8) [CO3,K3]

$$f(x,y) = \begin{cases} 2-x-y, & 0 \leq x \leq 1, 0 \leq y \leq 1 \\ 0, & \text{otherwise} \end{cases}$$

1) Find the marginal probability functions.
2) Find the conditional probability functions.

ii) Compute the regression lines for the following data. (8) [CO3,K3]

x	42	44	58	55	89	98	66
y	56	49	53	58	64	76	58

14. a. i) A simple sample of heights of 6,400 Englishmen has a mass of 67.85 inches and a standard deviation of 2.56 inches, while a simple sample of heights of 1600 Australians has a mean of 68.55 inches and a standard deviation of 2.52 inches. Do the data indicate that Australians are on the average taller than Englishmen? (8) [CO4,K3]

ii) The table given below shows the data obtained during an epidemic of cholera. Test the effectives of inoculation in preventing the attack of cholera by using χ^2 test. (8) [CO4,K3]

	Attacked	Not attacked	Total
Inoculated	31	469	500
Not Inoculated	185	1315	1500
Total	216	1784	2000

(OR)

b. The marks obtained by a group of 9 regular course students and another group of 11 part-time course students in a test are given below. (16) [CO4,K3]

Regular:	56	62	63	54	60	51	67	69	58	-	-
Part time:	62	70	71	62	60	56	75	64	72	68	66

Examine whether the marks obtained by regular students and part-time students differ significantly at 5 % level of significance.

15. a. A tea company appoints four salesmen A,B,C and D and observes their sales in three seasons – summer, winter and monsoon. The figures (in lakhs) are given in the following table. (16) [CO5,K3]

Seasons	Salesmen				Season's Total
	A	B	C	D	
Summer	36	36	21	35	128
Winter	28	29	31	32	120
Monsoon	26	28	29	29	112
Salesmen Total	90	93	81	96	360

1) Do the salesman significantly differ in performance?

2) Is there significant difference between the seasons?

(OR)

b. A variable trial was conducted on wheat with 4 varieties in a Latin Square Design. The plans of the experiment and plot yield are given below. (16) [CO5,K3]

C(25)	B(23)	A(20)	D(20)
A(19)	D(19)	C(21)	B(18)
B(19)	A(14)	D(17)	C(20)
D(17)	C(20)	B(21)	A(15)

Analyse data and interpret the result.

Bloom's Taxonomy Level	Remembering (K1)	Understanding (K2)	Applying (K3)	Analysing (K4)	Evaluating (K5)	Creating (K6)
Percentage	8	21	71	-	-	-