(T) Roll No. .....

PAPER ID—10707

B.Tech. Computer Science and Engineering (Internet of things and Cyber Technology including block chain technology), Bachelor of Technology (Computer Science and Engineering), Bachelor of Technology in Computer Science and Engineering (Artificial Intelligence), Bachelor of Technology in Computer Science and Engineering (Internet of things), Bachelor of Technology (Computer Science and Engineering (Artificial Intelligence and date science)), etc. (Common for All)

EXAMINATION, 2025

(Second Semester)

MATHEMATICS-II

Time : 3 *Hours* *Maximum Marks* : 70

Before answering the question-paper candidates should ensure that they have been supplied to correct and complete question-paper. No complaint, in this regard, will be entertained after the examination.

Note : Attempt *Five* questions in all, selecting *one* question from each Unit. Q. No. 1 is compulsory. All questions carry equal marks.

(Compulsory Question)

1. (a) Define random variable and state its types. 2

   (b) Define Moments. 2

   (c) Name a discrete distribution with equal mean and variance. Also state the mean and variance. 2

   (d) State the 'lack memory' property of exponential distribution. 2

   (e) Write the relation between central and non-central moments. 2

(f) Write a short note on skewness. 2

(g) Define level of significance. 2

Unit I

2. (a) State and prove Chebyshev's inequality. 7

(b) Derive Poisson approximation as a limiting case of binomial distribution. 7

3. For a discrete random variable, prove the following : 14

(a) $E(aX_1 + bX_2) = aE(X_1) + bE(X_2)$

(b) $V(a_1X_1 + a_2X_2) = a_1^2V(X_1) + a_2^2V(X_2) + 2a_1a_2Cov(X_1, X_2)$

(c) $E(aX + b) = aE(X) + b$

Unit II

4. The amount of bread (in hundreds of pounds) X that a certain bakery is able to sell in a day is found to be a numerical valued random phenomenon, with a probability density function $f(x)$, given by :

$$f(x)=\begin{cases} A.x & \text{for} \quad 0 \le x \le 5 \\ A(10-x) & \text{for} \quad 5 \le x \le 10 \\ 0, & \text{otherwise} \end{cases}$$

(a) Find the value of A such that $f(x)$ is a probability density function. 2

(b) What is the probability that the number of pounds of bread that will be sold tomorrow is : 6

(i) D = more than 500 pounds,

(ii) E = less than 500 pounds,

(iii) F = between 250 and 750 pounds ?

(c) For D, E, F defined above : 6

(i) Find P(D | E), P(D | F).

(ii) Are D and E independent events ?

(iii) Are D and F independent events ?

5. If the distribution of two independent random variables X and Y is given by $f_X(x) = 1$; $0 \leq x \leq 1$ and $f_Y(y) = 1$; $0 \leq y \leq 1$, then find the pdf of X + Y. 14

Unit III

6. (a) Derive the angle between two lines of regression. 7

(b) Write a note on Normal Distribution. Write its properties. 7

7. Fit an exponential curve of the form $Y = ab^X$ to the following data : 14

X	Y
1	1.0
2	1.2
3	1.8
4	2.5
5	3.6
6	4.7
7	6.6
8	9.1

Unit IV

8. (a) A random sample of 900 members has a mean 3.2 cm. Can it be reasonably regarded as a sample from a large population of mean 3.2 cm and standard deviation 2.3 cm ? Also find 95% confidence interval. Consider tabulated value 1.96 at 5% level of significance. 7

(b) Random samples of 400 men and 600 women were asked whether they would like to have a school near their residence. 200 men and 325 women were in favour of proposal. Test the hypothesis that the proportion of men and women in favour of the proposal are same at 1% level of significance. Consider tabulated value 2.58 at 1% level of significance. 7

9. The following table gives for a sample of married women, the level of education and marriage adjustment score :

		Marriage Adjustment Score			
		Very Low	Low	High	Very High
Level of Education	College	24	97	62	58
	High School	22	28	30	41
	Middle School	32	10	11	20

Can you conclude from the above, 'the higher the level of education, the greater is the degree of adjustment in marriage' ? Consider tabulated value 12.592 at 5% level of significance. **14**

