(T) Roll No. .....

PAPER ID—10707

B. Tech. EXAMINATION, 2026

(Second Semester)

COMPUTER SCIENCE AND ENGINEERING

(CYBER SECURITY)

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.

1. (i) Define conditional probability.

(ii) Define a bivariate probability distribution.

(iii) Define Skewness.

(iv) Define the exponential distribution.

(v) What is meant by goodness of fit ?

(vi) Define alternative hypothesis.

(vii) What is meant by a Gamma distribution ?

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Unit I

2. (a) Calculate the coefficient of correlation between X and Y using Karl Pearson's method : **7**

X	Y
1	2
2	4
3	5
4	4
5	5

(b) Calculate Spearman's Rank Correlation Coefficient for the following ranks : 7

Student	A	B	C	D	E	F
Rank in Mathematics	1	2	3	4	5	6
Rank in Physics	2	1	4	3	6	5

3. (a) State and prove Chebyshev's inequality for a random variable having finite mean and variance. **7**

(b) A discrete random variable X has the following probability mass function :

x	$P(X = x)$
0	0.2
1	0.3
2	0.1
3	0.25
4	0.15

Find E(X) and Var(X). **7**

Unit II

4. (a) A continuous random variable X has probability density function :

$f(x) = k(3 - x)$, $0 < x < 3$; find (i) value of k (ii) $P(1 < X < 2)$. 7

(b) If the joint density function is $f(x, y) = 6xy$, $0 < x < 1$, $0 < y < 1$, find : 7

(i) $P(X < 0.5, Y < 0.5)$

(ii) Conditional density $f_{X/Y}(X/Y)$.

5. (a) Give a note on Gamma Distribution and if a random variable X follows Gamma Distribution with parameters $\alpha = 4$ and $\beta = 5$, then find the mean, variance and standard deviation of the distribution. 7

(b) Define bivariate probability distribution. Explain marginal and joint probability density functions. 7

Unit III

6. (a) Find the mean and variance of Binomial distribution. 7

(b) Describe the procedure for fitting a straight line using least squares method. 7

7. (a) Compute the coefficient of skewness and coefficient of kurtosis based on moments for the following data : 7

Age	Frequency
25–30	2
30–35	8
35–40	18
40–45	27
45–50	25
50–55	16
55–60	7
60–65	2

(b) Fit a second-degree parabola $y = a + bx + cx^2$ to the data :

x : 1, 2, 3, 4, 5; y : 2.2, 4.8, 8.5, 14.2, 22.8. 7

Unit IV

8. (a) A sample of 400 students has mean height 168 cm. The population mean is 170 cm with standard deviation 6 cm. Test the significance at 5% level. 7

(b) Explain the Chi-square distribution and its properties. 7

9. (a) Test whether gender and preference for sports are independent : 7

	Cricket	Football	Total
Boys	40	30	70
Girls	20	30	50
Total	60	60	120

(b) Two small samples have the following statistics :

Sample 1 : $n_1 = 7$, $\overline{x_1} = 25$, $s_1 = 4$;

Sample 2: $n_2 = 9$, $\overline{x_2} = 22$, $s_2 = 3$.

Test whether the difference in means is significant. 7

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