CENTRAL INSTITUTE OF TECHNOLOGY KOKRAJHAR
(Deemed to be University)
KOKRAJHAR :: BTR :: ASSAM :: 783370

END – SEMESTER EXAMINATION
UG

Session: **Janu-June, 2024** Semester: **IV** Time: **3Hrs.** Full Marks: **100**
Course Code: **UCSE402** Course Title: **Probability and Random Process**

Answer any *five* questions

1. (a) State and prove the Bayes theorem.
(b) In your class, 60% participate in campus interviews while the remaining opt for off-campus interviews. Among the campus interview candidates, 5% secured a job. on the other hand, 4% of the off-campus candidates got a job. The topper of your class got the job. What is the probability that topper got the job from an off-campus job interview?

10 + 10

2. (a) Describe the singular value decomposition (matrix diagonalization). Decompose the following matrix in the specified form

$$A = \begin{pmatrix} 0 & 1 \\ -2 & -3 \end{pmatrix}$$

(b) In Kokrajhar there are two departmental stores, Vishal and Bazar Kolkata. Each year 30% of Vishal's customers switch to Bazar Kolkata. On the other hand, 20% of Bazar Kolkata's customers switch to Vishal. Write the transition diagram and transition matrix. What will be their market share in the long run?

10 + 10

3. (a) Describe an algorithm for the best-fit line for a linear regression model.
(b) Determine the regression line for the given dataset.

x	2	4	6	8
y	3	7	5	7

10 + 10

4. Let X and Y are two jointly continuous random variables with joint probability density function

$$f_{XY}(x,y) = \begin{cases} x + cy^2, & \text{if } 0 \le x \le 1, 0 \le y \le 1 \\ 0, & \text{otherwise} \end{cases}$$

(a) Find the value of c.
(b) Find $P(\frac{1}{2} \le X \le 0, \frac{1}{2} \le Y \le 0)$.
(c) Find the marginal distribution.

$5 + 5 + 10$

5. (a) Define Moment Generating Function. Find the mean and variance of Poisson distribution using Moment Generating Function.
(b) Define the Central Limit Theorem.

$15 + 5$

6. (a) Describe the significance of $\rho = 0.9$ and $\rho = 0.1$ [ρ implies the correlation coefficient value]
(b) Is the following experiments are independent? Justify your answer
(i) Drawing a card from a deck one by one with replacement
(ii) Drawing a card from a deck one by one without replacement
(c) State and prove Chebyshev Inequalities

$6 + 8 + 6$

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