

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -2 EXAMINATION- 2025

B.Tech-III Semester (BT/BI)

COURSE CODE (CREDITS): 25B11MA313(4)

MAX. MARKS: 25

COURSE NAME: PROBABILITY AND STATISTICAL TECHNIQUES

COURSE INSTRUCTORS: MDS

MAX. TIME: 1 Hour 30 Min

Note: (a) All questions are compulsory.

(b) The candidate is allowed to make suitable numeric assumptions wherever required for solving problems.

(c) Scientific calculator is allowed.

Q.No	Question	CO	Marks														
Q1	For the following data: <table><tr><td>Age (in yrs.)</td><td>0 - 2</td><td>2 - 4</td><td>4 - 6</td><td>6 - 8</td><td>8 - 10</td><td>10 -12</td></tr><tr><td>No. of Children</td><td>15</td><td>19</td><td>25</td><td>29</td><td>21</td><td>12</td></tr></table> Calculate: a) Mean b) Mode c) Standard deviation. d) Karl Pearson's coefficient and also comment on your result.	Age (in yrs.)	0 - 2	2 - 4	4 - 6	6 - 8	8 - 10	10 -12	No. of Children	15	19	25	29	21	12	CO-1	1.5+1.5 +2+1
Age (in yrs.)	0 - 2	2 - 4	4 - 6	6 - 8	8 - 10	10 -12											
No. of Children	15	19	25	29	21	12											
Q2	Two machines, M_1 and M_2 operate independently. The probability that machine M_1 is functioning properly is 0.6, and the probability that machine M_2 is functioning properly is 0.5. Find a) the probability that exactly one machine is functioning. b) the probability that at least one machine is functioning. c) the probability that both machines are not functioning.	CO-2	3														
Q3	In DNA sequencing, a read may originate from one of three genes. The probability that a read comes from Gene A is 0.2, from Gene B is 0.3, and from Gene C is 0.5. The probability of a sequencing error is 0.01 if the read is from Gene A, 0.02 if it is from Gene B, and 0.03 if it is from Gene C. Calculate the overall probability that a sequencing error occurs in a randomly selected read.	CO-2	4														
Q4	A defect in a plant sample may be caused by one of three possible mutations: Mutation A, Mutation B, or Mutation C. The chances before testing are: 10% for Mutation A, 30% for Mutation B, and 60% for Mutation C. A laboratory test gives a reading "R". The test shows reading R with probability 0.8 if Mutation A is present, with probability 0.4 if Mutation B is present, and with probability 0.1 if Mutation C is present. If the reading R is observed, what are the updated probabilities that the defect is due to Mutation A, Mutation B, or Mutation C?	CO-2	4														

Q5	Suppose that the error in the reaction temperature, in $^{\circ}\text{C}$, for a controlled laboratory experiment is a continuous random variable X having the following probability density function: $f(x) = \begin{cases} k(x+1)^2, & \text{if } -1 \leq x \leq 2 \\ 0, & \text{otherwise} \end{cases}$ Find: - The value of k. $p(0 \leq X \leq 1)$. - Cumulative distribution function (CDF).	CO-2	4
Q6	In single-cell gene expression studies, the number of mRNA copies X is given by: $P(X = x) = \begin{cases} k, & \text{if } x = 0 \\ 2k, & \text{if } x = 1 \\ 4k, & \text{if } x = 2 \\ 3k, & \text{if } x = 3 \\ 0, & \text{otherwise} \end{cases}$ Find : - the constant k. $E[X]$ and $\text{Var}(X)$.	CO-2	4