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School of Engineering Sciences & Technology
Supplementary/Improvement Examination-2024
(For Even Semester Examination-2024)

Paper Name: Probability & Statistics for AI
Time: 2.5 Hours

Paper Code: BTCSEAI-202
Maximum Marks: 60

NOTE: Programmable calculator is not allowed.

Part-A

(All Questions are compulsory)

(4 X 5 = 20)

S. No	Questions	Marks	Course Outcomes	Blooms Taxonomy Level
Q.1	The probability density function of a random variable X is $f(x) = \begin{cases} e^{-x} & \text{if } x > 0 \\ 0 & \text{otherwise} \end{cases}$ Find (i) Expectation of X (ii) Variance of X .	5	CO3	L4
Q.2	It is known that 30% of a certain company's washing machines require service while under warranty, whereas only 10% of its dryers need such service. If someone purchases both a washer and dryer made by this company, what is the probability that both machines will need a warranty service?	5	CO1	L3
Q.3	With equal probability the observations 5, 10, 8, 2 and 7 show the number of defective units found during five inspections in a laboratory. Find mean and variance?	5	CO2	L4
Q.4	The marks obtained in Mathematics by 1000 students are normally distributed with mean 78% and standard deviation 11%. How many students got marks above 90%? ($P < 1.09$) = 0.8621.	5	CO4	L3

Part-B

(Attempt any Four Questions out of Six)

(4 X 10 = 40)

S. No	Questions	Marks	Course Outcomes	Blooms Taxonomy Level														
Q.1	Obtain a regression line of Y on X for the following data: <table border="1"><tr><td>X</td><td>10</td><td>12</td><td>18</td><td>22</td><td>23</td><td>27</td></tr><tr><td>Y</td><td>13</td><td>18</td><td>12</td><td>25</td><td>30</td><td>10</td></tr></table>	X	10	12	18	22	23	27	Y	13	18	12	25	30	10	10	CO5	L4
X	10	12	18	22	23	27												
Y	13	18	12	25	30	10												
Q.2	If a sample of 900 units has mean of width of 3.5cm and standard deviation 2.61cm then test whether this sample has come from a large population mean width 3.25cm and standard deviation 2.61cm.	10	CO5	L4														
Q.3	Let X and Y be random variables having joint density function $f(x,y) = \begin{cases} 2, & 0 < y < x < 1, \\ 0 & \text{otherwise} \end{cases}$ Obtain the marginal and conditional probability density functions.	10	CO3	L3														
Q.4	For the following data: <table border="1"><tr><td>Marks</td><td>0-5</td><td>5-10</td><td>10-15</td><td>15-20</td><td>25-30</td></tr><tr><td>No. of students</td><td>5</td><td>10</td><td>20</td><td>15</td><td>10</td></tr></table> Find first four moments about origin.	Marks	0-5	5-10	10-15	15-20	25-30	No. of students	5	10	20	15	10	10	CO4	L3		
Marks	0-5	5-10	10-15	15-20	25-30													
No. of students	5	10	20	15	10													
Q.5	A random variable X has the following probability distribution function <table border="1"><tr><td>X</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td></tr><tr><td>$P(X)$</td><td>0.01</td><td>0.25</td><td>0.40</td><td>k</td><td>0.04</td></tr></table> Determine: (i) k (ii) $E(X)$ (iii) $E(X^2)$ (iv) $var(X)$ (v) $P(3 \leq X \leq 6)$.	X	2	3	4	5	6	$P(X)$	0.01	0.25	0.40	k	0.04	10	CO2	L5		
X	2	3	4	5	6													
$P(X)$	0.01	0.25	0.40	k	0.04													
Q.6	Let $np = 12$ and $npq = 6$ then find $P(X > 21)$ and $P(X < 7)$, where X is a binomial random variable, n is a number of trials, p is a probability of success and q is a probability of failure.	10	CO1	L3														

BL – Bloom's Taxonomy Levels (1- Remembering, 2- Understanding, 3- Applying, 4- Analyzing, 5- Evaluating, 6- Creating)

*****End of Paper*****