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Odd Semester Examination-2024(Backlog)

Paper Name: Mathematics-III

Paper Code: BTCSE-311

Time: 3 Hours

Maximum Marks: 75

NOTE: Programmable calculator is not allowed.

PART – A

(All questions are compulsory)

(7 X 5 = 35)

S. No	Questions	Marks	Course Outcomes	Blooms Taxonomy Level								
Q.1	From a city population, the probability of selecting (i) a male or a smoker is $7/10$ (ii) a male smoker is $2/5$ (iii) and, a male, if a smoker is already selected is $2/3$. Find the probability of selecting (a) a non-smoker (b) a male (c) a smoker, if a male is first selected	5	CO1	L2								
Q.2	An appliance dealer sells three different models of upright freezers having 13.5, 15.9, and 19.1 cubic feet of storage space, respectively. Let X = the amount of storage space purchased by the next customer to by a freezer. Suppose that X has probability mass function <table border="1"><tr><td>x</td><td>13.5</td><td>15.9</td><td>19.1</td></tr><tr><td>$f(x)$</td><td>0.2</td><td>0.5</td><td>0.3</td></tr></table> Compute $E(X)$, $E(X^2)$, and $V(X)$.	x	13.5	15.9	19.1	$f(x)$	0.2	0.5	0.3	5	CO2	L3
x	13.5	15.9	19.1									
$f(x)$	0.2	0.5	0.3									
Q.3	Two cards are drawn successively with replacement from a well-shuffled pack of 52 cards. Find the probability distribution of the no. of aces.	5	CO2	L3								
Q.4	A continuous random variable X has a probability density function $f(x) = 3x^2$, $0 \leq x \leq 1$. Find a and b such that (i) $P(X \leq a) = P(X > a)$ (ii) $P(X > b) = 0.05$	5	CO2	L4								
Q.5	If X and Y are two random variables having joint probability function $f(x, y) = \frac{1}{27}(2x + y)$, where x and y can only assume only the integer values 0, 1 and 2. Find (i) Joint Probability Function (ii) Marginal probability function of X and Y .	5	CO3	L3								
Q.6	If X and Y are two random variables having joint probability function $f(x, y) = cxy$, where X and Y can only assume only the integer values 1, 2 and 3. Find (i) $P(X = 1 Y = 1)$ (ii) $P(Y = 1 X = 3)$ (iii) $P(X = 2 Y = 1)$ (iv) $P(X = 3 Y = 2)$	5	CO3	L4								
Q.7	A random sample of size 100 is taken from a population whose mean is 60 and variance is 400. Using Central limit theorem with what probability can we assert that the mean of sample will not differ $\mu=60$ by more than 4.	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	An insurance company insured 2000 scooter drivers, 4000 car drivers and 6000 truck drivers. The probability of any accident involving a scooter, car and a truck is 0.01, 0.03 and 0.15 respectively. One of the insured persons meets with an accident. What is the probability that (a) he is a scooty driver? (b) he is a car driver? (c) he is a truck driver?	10	CO1	L4

Q.2	Define Random variable with a real life example. A bag contains 2 white and 2 red ball. One ball is drawn at random and then put back in the bag after noting its color. The process is repeated again. If X denote the no. of red balls recorded in two draws, then describe X and find its probability distribution. Also, find its Distribution function.	10	CO2	L3
Q.3	A bombing plane carrying three bombs flies directly above a railroad track. If a bomb falls within 40 feet of track, the track will be sufficiently damaged to disrupt the traffic. With a certain bomb sight, the point of impact of a bomb have the probability density function $f(x) = \begin{cases} \frac{100+x}{10^4}, & -100 \leq x < 0 \\ \frac{100-x}{10^4}, & 0 \leq x \leq 100 \\ 0, & \text{otherwise} \end{cases}$ where x represents the vertical deviation(in feet) from the aiming point, which is the track in this case. Then (1) find the distribution function (2) If all the three bombs are used, what is the probability that the track will be damaged?	10	CO2	L3
Q.4	The Joint probability density function of two continuous random variable $f(x,y) = \begin{cases} cxy, & 0 < x < 4 \text{ and } 1 < y < 5 \\ 0 & \text{otherwise} \end{cases}$ Then find (i) the value of c (ii) $P(1 \leq X \leq 2, 2 \leq Y \leq 3)$ (iii) $P(X + Y > 3)$.	10	CO3	L4
Q.5	Let X and Y be random variables having joint density function $f(x,y) = \begin{cases} x+y, & 0 \leq x \leq 1, 0 \leq y \leq 1 \\ 0 & \text{otherwise} \end{cases}$ Find (a) $Var(X)$ (b) $Var(Y)$ (c) σ_X (d) σ_Y	10	CO3	L4
Q.6	Suppose that new brand of biscuits were introduced in the market by three companies at the same time. When they were introduced, companies had 0.7, 0.2 and 0.1 shares of the market, but during the first year the following changes took place: (i) Company A retained 50% of its customers, loss 30% to B and 20% to C. (ii) Company B retained 70% of its customers, loss 10% to A and 20% to C. (iii) Company C retained 50% of its customers, loss 10% to A and 40% to B. Assuming no changes in the buying habits of the consumer occur. (i) What are the market shares of the three companies at the end first, second and third year? (ii) What are long run market shares of the three companies?	10	CO4	L3

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

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