Reg. No. : | | | | | | | |

SNS COLLEGE OF TECHNOLOGY

(An Autonomous Institution, Affiliated to Anna University)
Coimbatore – 641 035.

Internal Assessment Examination -I
Academic Year 2022-2023(Even)
Third Semester
19MAT203 – PROBABILITY AND RANDOM PROCESSES
(REGULATION 2019)

A

TIME: 1 1/2 HOURS **MAXIMUM MARKS: 50**

ANSWER ALL QUESTIONS

PART A — (5 x 2 = 10 Marks)

		CO	BL	
1.	A.R.V. X has the probability function X: -2, -1, 0, 1 P(X): 0.4, k, 0.2, 0.3 Find k and the mean value of X	CO1	Rem	2
2.	A Continuous R.V X that can assume any value between x=2 and x=5 had the p.d.f f(x) = k(1+x). Find P(x<4).	CO1	App	2
3.	If a R.V X has the MGF $M_X(t) = \frac{3}{3-t}$, Obtain the mean and variance of X.	CO1	Und	2
4.	The time (in hours) required to repair a machine is exponentially distributed with parameter $\lambda = \frac{1}{3}$. What is the probability that the repair time exceeds 3 hours ?	CO1	Rem	2
5.	The joint p.d.f of a bivariate random variable (X,Y) is given by $f(x,y)=\begin{cases} kxy, 0<x<1, 0<y<1 \\ 0, \quad otherwise \end{cases}$, find K.	CO2	App	2

PART B — (13+13+14=40 Marks)

6.	(a)	(i)	A random variable X has the following probability distribution. X: 0, 1, 2, 3, 4, 5, 6, 7 $P(X)$: 0, k, $2k$, $2k$, $3k$, k^2, $2k^2$, $7k^2+k$ Find (1) The value of k (2) Evaluate P(X<6), P(0<X<5) (3) The smallest value of a for which $P(X \leq a) > \frac{1}{2}$. (4) The Cumulative distribution function.	CO1	App	7
		(ii)	A manufacturer of pins knows that 2% of his products are defective. If he sells pins in boxes of 100 and guarantees that not more than 4 pins will be defective what is the probability that a box will fail to meet the guaranteed quality? $(e^{-2} = 0.13534)$	CO1	Ana	6
(OR)						

	(b)	(i)	A continuous random variable $f(x) = \begin{cases} 2x, & 0 < x < 1 \\ 0, & Otherwise \end{cases}$ is a pdf and find i)$P\left(X < \frac{1}{2}\right)$ ii) $P(\frac{1}{4} < X < \frac{1}{2})$ iii) $P(X > \frac{3}{4} / X > \frac{1}{2})$.	CO1	App	6
		(ii)	Derive the MGF of Poisson distribution and hence find its mean and variance.	CO1	Und	7
7.	(a)	(i)	A random variable has the p.d.f given by $$f(x) = \begin{cases} 2e^{-2x} & x \geq 0 \\ 0 & x < 0 \end{cases}$$ Find a) The moment generating function b) First two moments about the origin.	CO1	App	7
		(ii)	The weekly wages of 1000 workmen are normally distributed around a mean of Rs.70 with a S.D. of Rs.5. Estimate the number of workers whose weekly wages will be (i) between Rs.69 and Rs.72 (ii) less than Rs.69 (iii) more than Rs.72.	CO1	Ana	6
(OR)						
	(b)	(i)	The two dimentional random variable (X,Y) has joint probability mass function $f(x,y) = \frac{x+2y}{27}, x = 0,1,2; y = 0,1,2$. Find the conditional distribution of Y for X = x. Also find conditional distribution of Y given X = x.	CO2	App	6
		(ii)	The joint probability function (X,Y) is given by $$P(x,y) = k(2x+3y), x = 0,1,2;\ \ y = 1,2,3$$ i) Find the marginal distributions. ii) Find the probability distributions of (X+Y) iii) Find all conditional probability distributions.	CO2	App	7
8.	(a)		Derive the MGF of Exponential distribution and hence find its mean and variance	CO1	App	14
			(OR)			
	(b)		From the following table for bivariate distribution of (X,Y). Find i) $P(X \leq 1)$ ii) $P(Y \leq 3)$ iii) $P(X \leq 1, Y \leq 3)$ iv)$P(X \leq 1/Y \leq 3)$ v) $P(Y \leq 3/X \leq 1)$ vi) $P(X + Y \leq 4)$ vii) Marginal distribution function of X & Y viii) Conditional distribution of X given Y=2 ix) Estimate X & Y are independent.	CO2	Ana	14

X \ Y	1	2	3	4	5	6
0	0	0	$\frac{1}{32}$	$\frac{2}{32}$	$\frac{2}{32}$	$\frac{3}{32}$
1	$\frac{1}{16}$	$\frac{1}{16}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$
2	$\frac{1}{32}$	$\frac{1}{32}$	$\frac{1}{64}$	$\frac{1}{64}$	0	$\frac{2}{64}$

Rem/und: Remember/Understand App:Apply Ana:Analyze Eva: Evaluate

Prepared by Verified by Dean(S&H)