Name of the Student:

Register No.:

R	A														

SRM

SRM Institute of Science and Technology
College of Engineering and Technology
SRM Nagar, Kattankulathur – 603203, Chengalpattu District, Tamilnadu
Academic Year: 2023-2024 (EVEN)

C2-Slot
SET-A
MCQ

Test: FT3 | Date: 19/03/2024
Course Code & Title: 21MAB203T-Probability and Stochastic Processes | Duration: 1 hr 40 Minutes.
Year / Sem: II/IV | Max. Marks: 50

At the end of this course, learners will be able to:		Learning Bloom's Level	Program Outcomes (PO)											
Course Outcomes (CO)			1	2	3	4	5	6	7	8	9	10	11	12
CO1	Evaluate the characteristics of discrete and continuous random variables	4	3	3										
CO2	Explain the model and analyze systems using two-dimensional random variables	4	3	3										
CO3	Classify limit theorems and evaluate upper bounds using various inequalities	4	3	3										
CO4	Analyze the characteristics of random processes	4	3	3										
CO5	Examine problems in spectral density functions and linear time-invariant systems	4	3	3										

Note:

(i) Only A/B/C/D have to be mentioned as an answer for MCQ in the space provided in the Question paper.

(ii) Any striking (or) overwriting (or) using whitener in the answer (A/B/C/D) under Part-A will not be accepted. No marks will be awarded for that question.

(iii) Part - B and Part – C should be answered in the answer booklet.

Part-A (1 x 4 = 4 Marks)
Answer ALL the Questions

Q. No	Question	Answer	Marks	BL	CO	PO
1.	Let $X \in \{0,1\}$ and $Y \in \{0,1\}$ be two independent binary random variables. If $P(X=0)=p$ and $P(Y=0)=q$, then $P(X+Y) \geq 1$ is equal to (A) pq (B) $pq+(1-p)(1-q)$ (C) $p(1-q)$ (D) $1-pq$		1	2	2	1,2
2.	If the joint pdf of the RV (X,Y) is given by $f(x,y)=kx$ in the region $0 \leq x \leq 1$ and $0 \leq y \leq 1$, then $k=$ (A) $k=1$ (B) $k=2$ (C) $k=1/2$ (D) $k=4$		1	2	2	1,2
3.	Cauchy-Schwartz inequality for two random variables X and Y is given by (A) $E[XY]^2 \leq E[X^2]E[Y^2]$ (B) $E[XY]^2 \leq E[X]^2E[Y]^2$ (C) $E[X^2Y^2] \leq E[X^2]E[Y^2]$ (D) $E[XY]^2 \leq E[X]E[Y]$		1	1	3	1,2
4.	Let X is a RV with $E(X)=\mu$ and $Var(X)=\sigma^2$, then for some $a>0$, which of the following equation denotes Markov inequality? (A) $P(x \geq a) \leq \frac{\mu}{a}$ (B) $P(x \leq a) \leq \frac{\mu}{a}$ (C) $P(x \geq a) \leq \frac{\sigma^2}{a}$ (D) $P(x \leq a) \leq \frac{\sigma^2}{a}$		1	1	3	1,2

SRM Institute of Science and Technology
College of Engineering and Technology
SRM Nagar, Kattankulathur – 603203, Chengalpattu District, Tamilnadu

C2-Slot
SET-A
Part-B&C

Academic Year: 2023-2024 (EVEN)

Test: FT3 | **Date: 19/03/2024**
Course Code & Title: 21MAB203T-Probability and Stochastic Processes | **Duration: 1 hr 40 Minutes.**
Year / Sem: II/IV | **Max. Marks: 50**

Part – B (8 x 2 = 16 Marks) **Answer any two questions**					
5.	The joint probability mass function of X and Y is given by $p(x,y) = k(x+2y)$, where $x = 1,2,3,4$; $y = 0,1,2,3$. Find the value of k, marginal distributions and P(X+Y>4)	**8**	**4**	**2**	**1,2**
6.	If X denotes the sum of the numbers obtained when two dice are thrown. Obtain an upper bound for $P\{\lvert X-7\rvert \geq 4$ using Tchebycheff's inequality.	**8**	**4**	**3**	**1,2**
7(i).	Two random variables X and Y are distributed according to $f_{X,Y}(x,y) = \begin{cases} x+y & 0 \leq x \leq 1 \quad 0 \leq y \leq 1 \\ 0 & otherwise \end{cases}$ Find the marginal distributions.	**4**	**3**	**2**	**1,2**
7(ii).	Let X and Y are two random variables with mean and variance of X as 4 and 2, respectively and mean and variance of Y as 2 and 1 respectively, Find the maximum possible value of $E[XY]$.	**4**	**3**	**3**	**1,2**

Part – C (15 x 2 = 30 Marks) **Answer any two question**					
8.	The joint pdf of (X,Y) is given by $f(x,y) = 6y; x > 0, y > 0, x+y \leq 1$ and $f(x,y) = 0$, elsewhere. Find the covariance of X and Y.	**15**	**4**	**2**	**1,2**
9.	If $X_1, X_2, \ldots, X_n$ are Poisson variates with parameters $\lambda = 1$, use the central limit theorem to estimate $P(120 \leq S_n \leq 160)$ and $P(150 \leq S_n \leq 180)$ where $S_n = X_1, X_2, \ldots, X_n$ and $n = 150$.	**15**	**4**	**3**	**1,2**
10(i).	If the joint pdf of (X,Y) is given by $f_{XY}(x,y) = x+y$; where $0 \leq x \leq 1$ and $0 \leq y \leq 1$, find the pdf of $U = XY$.	**8**	**3**	**2**	**1,2**
10(ii).	Let X be a positive random variable with $E(X) = 10$. Prove that $f(x) = \frac{1}{x+1}$ is a convex function in $(0,\infty)$. And then estimate the value of $E\left(\frac{1}{X+1}\right)$.	**7**	**3**	**3**	**1,2**

Name of the Student :														
Register No. :	R	A												

SRM Institute of Science and Technology
College of Engineering and Technology
DEPARTMENT OF MATHEMATICS
SRM Nagar, Kattankulathur – 603203, Chengalpattu District, Tamilnadu
Academic Year: 2023-2024 (EVEN)

SLOT-C2 (SET-B) MCQ

Test: FT-3
Course Code & Title: 21MAB203T-Probability and Stochastic Processes
Year & Sem: II & IV

Date: 19/03/2024
Duration: 1 hr 40 min
Max. Marks: 50

Note:
- Part A should be answered in the Question paper itself within the first 5 minutes and the same should be handed over to the hall invigilator at the end of the 5th minute
- Only A/B/C/D have to be mentioned as an answer for MCQ in the space provided in the Question paper.
- Any striking (or) overwriting (or) using whitener in the answer (A/B/C/D) under Part-A will not be accepted. No marks will be awarded for that question.
- Part - B and Part - C should be answered in the answer booklet.

Course Articulation Matrix:

At the end of the course, student will be able to Course Outcomes (CO)		Program Outcomes (PO) 1	2	3	4	5	6	7	8	9	10	11	12
CO1	Evaluate the characteristics of discrete and continuous random variables	3	3										
CO2	Explain the model and analyze systems using two-dimensional random variables Engineering	3	3										
CO3	Classify limit theorems and evaluate upper bounds using various inequalities	3	3										
CO4	Analyze the characteristics of random processes	3	3										
CO5	Examine problems in spectral density functions and linear time-invariant systems	3	3										

Part-A ($4 \times 1 = 4$ Marks)
Answer ALL the questions

Q.No.	Question	Answer A/B/C/D	Marks	BL	CO	PO
1.	For two random variables X and Y, $E(X) = 5$, $E(Y) = 15$, $E(XY) = 75$, $E(X^2) = 4$ and $E(Y^2) = 149$, $COV(XY)$ is (A) 0 (B) 25 (C) 15 (D) 10		1	1	4	1,2
2.	The joint probability distribution of two continuous random variables X and Y is given by $f_{XY}(x,y) = e^{-3(x+y)}$, $0 \leq x, y < \infty$ The marginal probability distribution of Y is given by (A) e^{-2y} (B) e^{-3y} (C) e^{-x} (D) e^{-2x}		1	2	4	1,2
3.	If X is a random variable with $E(X) = 4$ and $E(X^2) = 20$, then the lower bound for $P\{\|X-4\| < 8\}$ is (A) $\frac{10}{16}$ (B) $\frac{1}{16}$ (C) $\frac{15}{16}$ (D) $\frac{11}{16}$		1	1	4	1,2
4.	MGF is used to find the bound of a distribution in ------- inequality. (A) Jensen's (B) Cauchy-Schwartz (C) Tchebycheff's (D) Chernoff		1	2	4	1,2

Name of the Student :	
Register No. :	R A

SRM Institute of Science and Technology
College of Engineering and Technology
DEPARTMENT OF MATHEMATICS
SRM Nagar, Kattankulathur – 603203, Chengalpattu District, Tamilnadu
Academic Year: 2023-2024 (EVEN)

SLOT-C2
(SET-B)
Part – B & C

Test: FT-3
Course Code & Title: 21MAB203T-Probability and Stochastic Processes
Year & Sem: II & IV

Date: 19/03/2024
Duration: 1 hr 40 min
Max. Marks: 50

Part-B ($2 \times 8 = 16$ Marks)

Answer any TWO questions

Q.No.	Question	Marks	BL	CO	PO
5.	The joint probability mass function of X and Y is given by $p(x,y) = k(3x+y)$, where $x = 1,2,3,4; y = 0,1,2,3$. Find the value of k, marginal distributions, $P(X+Y>4)$	8	3	2	1,2
6.	A random variable is exponentially distributed with parameter 3. Use Tchebycheff's inequality to find the lower bound for $P(-1/3 \leq X \leq 1)$. Also find the actual probability.	8	3	3	1,2
7 a.	Two random variables X and Y have joint distribution $f_{XY}(x,y) = \frac{1}{8}(6-x-y), 0 < x < 2,\ 2 < x < 4$. Find the marginal distributions.	4	2	2	1,2
7 b.	Suppose that the average grade in a certain subject is 57%. Find an upper bound on the proportion of students who score at least 75%	4	2	3	1,2

Part-C ($2 \times 15 = 30$ Marks)

Answer any TWO questions

Q.No.	Question	Marks	BL	CO	PO
8.	Given the joint pdf of (X,Y) as $f(x,y) = k(x^2+y^2), 0 < x,y < 1$. Find k and covariance.	15	4	4	1,2
9.	The life time of a certain brand of battery may be considered as a random variable with mean 3500 hours and S.D. 750 hours. Using CLT, find the probability that the average life time of 100 batteries (i) exceeds 3650 hours (ii) between 3350 and 3650 hours (iii) less than 3350 hours	15	4	4	1,2
10 a.	If X and Y each follow an exponential distribution with parameter 5 and are independent, find the joint pdf $g_{UV}(u,v)$ where $U = X/Y$.	8	4	4	1,2
10 b.	Let X follows a binomial distribution with n=100 and p=$\frac{1}{2}$. Find $P(X \geq 75)$ using Markov inequality and Chebychev's inequality.	7	4	4	1,2