SRM Institute of Science and Technology

College of Engineering and Technology

DEPARTMENT OF MATHEMATICS

SRM Nagar, Kattankulathur – 603203, Chengalpattu District, Tamilnadu

Academic Year: 2021-2022

Slot-A1 (ODD)

Test: CLAT-1
Course Code & Title: 18MAB204T / Probability ang Queueing Theory
Year & Sem: II & IV

Date: 07/04/2022
Duration: 50 min
Max. Marks: 25

Course Articulation Matrix:

At the end of this course, learners will be able to:			Program Outcomes (PO)											
Course Outcomes (CO)		Learning Bloom's Level	1	2	3	4	5	6	7	8	9	10	11	12
CO1	Apply the concepts of probability and random variables in engineering problems.	4	3	3										
CO2	Identify random variables and model them using various distributions.	4	3	3										
CO3	Infer results by using hypothesis testing on large and small samples	4	3	3										
CO4	Examine F test, Chi Square test in sampling techniques and analyse the performance measures of queuing models.	4	3	3										
CO5	Determine the transition probabilities and classify the states of Markov chain.	4	3	3										
CO6	Apply probability techniques and implement them in the study on sampling distributions, queueing models and Markov chain	4	3	3										

Part – A (3 x 4 = 12 Marks)
Answer all the questions

Q. No.	Question	Marks	BL	CO	PO	PI Code
1	Let X be a continuous RV with pdf $f(x) = \begin{cases} k(x-x^2), & 0 \le x \le 1,\ k>0 \\ 0, & otherwise \end{cases}$. Find (i) k (ii) μ_r' and hence find the mean.	4	1	1	1	1.2.2
2	If the RV takes the values $-1, 0, 1$ with equal probabilities $\frac{1}{3}$, find the MGF of X and hence find the mean and variance.	4	3	1	1	1.2.2
3	A RV X has an exponential distribution defined by the pdf $f(x) = \begin{cases} e^{-x}, & 0 < x < \infty \\ 0, & otherwise \end{cases}$. Find the density function of $Y = 3X + 5$	4	2	1	1	1.2.2

Part-B (1 x 13= 13 Marks)
Answer all the questions

Q. No.	Question	Marks	BL	CO	PO	PI Code
4 (a)	The distribution function of a discrete RV is given below. x: 1, 2, 3, 4 $p(x)$: $15k$, $10k$, $30k$, $6k$ Find (i) k (ii) $E(X)$ (iii) $P(X > 2/X < 4)$ (iv) $F(x)$	7	3	1	1	1.2.2
(b)	A fair die is tossed 300 times. Use Tchebycheff's inequality to find a lower bound for the probability of getting 40 to 60 fours.	6	3	1	2	2.5.1

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CO1	Apply the concepts of probability and random variables in engineering problems.	4	3	3										
CO2	Identify random variables and model them using various distributions.	4	3	3										
CO3	Infer results by using hypothesis testing on large and small samples	4	3	3										
CO4	Examine F test, Chi Square test in sampling techniques and analyse the performance measures of queuing models.	4	3	3										
CO5	Determine the transition probabilities and classify the states of Markov chain.	4	3	3										
CO6	Apply probability techniques and implement them in the study on sampling distributions, queueing models and Markov chain	4	3	3										

Q.No	Question	Marks	BL	CO	PO	PI Code
	Part – A (3 x 4 = 12 Marks) **Answer all the questions**					
1	A random variable X has the pdf $f(x) = \begin{cases} Kx^2, & 1 \le x \le 2 \\ 0, & otherwise \end{cases}$. Find (i) K (ii) $\mu_r{}'$ and hence find the mean.	4	1	1	1	1.2.2
2	If a random variable X has the MGF $M_X(t) = \frac{3}{3-t}$, obtain the mean, variance and μ_3.	4	3	1	1	1.2.2
3	The pdf of a random variable X is given by $f(x) = \begin{cases} 2x, & 0 < x < 1 \\ 0, & elsewhere \end{cases}$. Find the pdf of $Y = 2X^3$	4	2	1	1	1.2.2
	Part-B (1 x 13= 13 Marks) **Answer all the questions**					
4 (a)	If the CDF of a random variable X is given by $F(x) = \begin{cases} 0, & x < 0 \\ \frac{x^2}{16}, & 0 < x < 4 \\ 1, & x \ge 4 \end{cases}$. Find (i) the density function $f(x)$ (ii) $E(X)$ (iii) $P(X > 1/ X < 3)$ iv) $P(X \le 2)$	7	3	1	1	1.2.2
(b)	If X is the number obtained in a throw of a fair die, find $P\{\lvert X-\mu\rvert > 2.5\}$ using Tchebycheff's inequality.	6	3	1	2	2.5.1

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Slot-A2 (ODD)

Academic Year: 2021-2022

Test: CLAT-1
Course Code & Title: 18MAB204T / Probability ang Queueing Theory
Year & Sem: II & IV

Date: 07/04/2022
Duration: 50 min
Max. Marks: 25

Course Articulation Matrix:

At the end of this course, learners will be able to:			Program Outcomes (PO)											
Course Outcomes (CO)		Learning Bloom's Level	1	2	3	4	5	6	7	8	9	10	11	12
CO1	Apply the concepts of probability and random variables in engineering problems.	4	3	3										
CO2	Identify random variables and model them using various distributions.	4	3	3										
CO3	Infer results by using hypothesis testing on large and small samples	4	3	3										
CO4	Examine F test, Chi Square test in sampling techniques and analyse the performance measures of queuing models.	4	3	3										
CO5	Determine the transition probabilities and classify the states of Markov chain.	4	3	3										
CO6	Apply probability techniques and implement them in the study on sampling distributions, queueing models and Markov chain	4	3	3										

Part – A (3 x 4 = 12 Marks)
Answer all the questions

Q. No.	Question	Marks	BL	CO	PO	PI Code
1	A continuous random variable X has the density function $f(x) = \begin{cases} K(1+x), & 0 < x < 2 \\ 0, & otherwise \end{cases}$. Find (i) K (ii) $\mu_r{}'$ and hence find the mean.	4	1	1	1	1.2.2
2	X is a discrete random variable having the following probability distribution. x: 1, 2, 3 $p(x)$: 1/4, 2/4, 1/4 Find the MGF of X and hence find mean and variance.	4	3	1	1	1.2.2
3	Let X be a random variable with density function $f_X(x) = \begin{cases} \frac{x}{12}, & 1 < x < 5 \\ 0, & otherwise \end{cases}$. Let $Y = 2X^3$. Find the pdf of Y.	4	2	1	1	1.2.2

Part-B (1 x 13= 13 Marks)
Answer all the questions

Q. No.	Question	Marks	BL	CO	PO	PI Code
4(i)	If the probability distribution of X is given as x: 1, 2, 3, 4 $p(x)$: $4k$, $3k$, $2k$, k Find (i) k (ii) $E(X)$ (iii) $P(X > 1 / X < 4)$ (iv) $F(x)$	7	3	1	1	1.2.2
(ii)	A fair die is tossed 720 times. Use Tchebycheff's inequality to find a lower bound for the probability of getting 90 to 150 fives.	6	3	1	2	2.5.1

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Q.No	Question	Marks	BL	CO	PO	PI Code
	Part – A (3 x 4 = 12 Marks) **Answer all the questions**					
1	A random variable X has the pdf $f(x) = \begin{cases} Cx^2(1-x), & 0 \le x \le 1 \\ 0, & otherwise \end{cases}$. Find (i) C (ii) $\mu_r{}'$ and hence find the mean.	4	1	1	1	1.2.2
2	If the MGF of a random variable X is $M_X(t) = \frac{2}{2-t}$, obtain the mean, variance and μ_3.	4	3	1	1	1.2.2
3	The pdf of a random variable X is given by $f(x) = \begin{cases} 3x^2, & 0 < x < 1 \\ 0, & elsewhere \end{cases}$. Find the pdf of $Y = 3X + 1$.	4	2	1	1	1.2.2
	Part-B (1 x 13= 13 Marks) **Answer all the questions**					
4 (a)	The CDF of a random variable X is given by $F(x) = \begin{cases} 0, & x < 0 \\ x^2, & 0 \le x \le 1 \\ 1, & x > 1 \end{cases}$. Find (i) $f(x)$ (ii) $E(X)$ (iii) $P(X > \frac{1}{4} / X < \frac{3}{4})$ (iv) $P(X \le \frac{1}{2})$	7	3	1	1	1.2.2
(b)	A discrete random variable X takes the values 1, 2, 3 with probabilities $1/18, 16/18, 1/18$. Evaluate $P\{\lvert X-\mu\rvert \ge 2\sigma\}$ using Tchebycheff's inequality.	6	3	1	2	2.5.1