

Shiv Nadar University Chennai

Mid Semester Examinations 2023-2024 Even

Question Paper

Name of the Program: B.Tech. AI & DS	Semester: II
Course Code & Name: MA1004 STATISTICAL FOUNDATIONS OF DATA SCIENCE	
Regulation 2021	
Time: 2 Hours	Maximum: 50 Marks
Answer All Questions	

Q.No.		Questions	Marks	CO	KL																
1	a	The independent probabilities that the three sections of a costing department will encounter a computer error are 0.2, 0.3 and 0.1 per week respectively. What is the probability that there would be one and only one computer error per week?	2	CO1	KL3																
2	a	Box A contains 8 items of which 3 are defective and box B contains 5 items of which 2 are defective. An item is taken at random from each box. What is the probability that both are not defective?	2	CO1	KL3																
3	a	A shipment of 6 television sets contains 2 defective sets. A hotel makes a random purchase of 3 sets. If X denotes the random variable and is the number of defective sets purchased by the hotel, find the probability distribution of X .	2	CO1	KL3																
4	a	Find the expected value of X , if the probability density function of a coded measurement of pitch diameter X of threads of a fitting is given by $f(x) = \begin{cases} \frac{4}{\pi(1+x^2)}, & \text{if } 0 < x < 1 \\ 0, & \text{otherwise} \end{cases}$	2	CO2	KL3																
5	a	Find the moment generating function of the random variable whose moments are given by $\mu'_r = (r + 1)! 2^r$.	2	CO2	KL3																
6	a	<p>The contents of Boxes I, II, and III are as follows:</p> <table><tr><th>Balls Boxes</th><th>White</th><th>Black</th><th>Red</th></tr><tr><td>I</td><td>1</td><td>2</td><td>3</td></tr><tr><td>II</td><td>2</td><td>1</td><td>1</td></tr><tr><td>III</td><td>4</td><td>5</td><td>3</td></tr></table> <p>One box is chosen at random, and two balls are drawn. They happen to be white and red. What is the probability that they come from boxes I, II and III, respectively?</p>	Balls Boxes	White	Black	Red	I	1	2	3	II	2	1	1	III	4	5	3	10	CO1	KL3
Balls Boxes	White	Black	Red																		
I	1	2	3																		
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7	a	<p>A random variable X has the following probability density function $f(x) = \begin{cases} kx, & \text{if } 0 < x < 1 \\ 0, & \text{otherwise} \end{cases}$</p> <p>Find (i) the value of k; (ii) $P\left(X < \frac{1}{2}\right)$; (iii) $P\left(\frac{1}{4} < X < \frac{1}{2}\right)$; (iv) $P\left[\left(X > \frac{3}{4}\right) \mid \left(X > \frac{1}{2}\right)\right]$; (v) $P\left[\left(X < \frac{3}{4}\right) \mid \left(X > \frac{1}{2}\right)\right]$.</p>	10	CO1	KL3																

8	a	A perfect coin is tossed three times. If X denotes the number of heads that appear, find the moment generating function of X and hence find the mean, standard deviation.	10	CO2	KL3
9	a	Show that if a random variable X has the probability density function $f(x) = \frac{1}{2}e^{- x }$ for $-\infty < x < \infty$, the moment generating function is given by $M_x(t) = \frac{1}{1-t^2}$. Also, show that all odd moments about the mean vanish and even moments are given by $(2r)!$. Also discuss the nature of the curve?	10	CO2	KL3

KL - Bloom's Taxonomy Levels

(KL1: Remembering, KL2: Understanding, KL3: Applying, KL4: Analyzing, KL5: Evaluating, KL6: Creating)

CO - Course Outcomes
