

MID-TERM EXAMINATION

(Course Name: B. Tech. ECE/AI-ML/CSE-AI/ECE-AI) (Semester: I)

(October 2024) OFF LINE mode

Subject Code: BAS 103	Subject: Probability and Statistics
Time : 1 $\frac{1}{2}$ Hours	Maximum Marks :30

Note: Q1 is compulsory. Attempt any two parts of Q2 and Q3

Q1		(2.5*4=10)															
	a) The odds that a book will be favorably reviewed by three independent critics are 5 to 2, 4 to 3 and 3 to 4 respectively. What is the probability that, of the three reviews, a majority will be favorable?		CO1														
	b) Three bags A,B and C contains 4 red, 3 black, 2 white; 3 red ,4 black, 4 white; and 5 red , 2 black, 6 white balls respectively. If a bag is selected at random and a ball is drawn from it, find the probability that the ball drawn is red.		CO1														
	c) Prove that the moment generating function of the sum of a number of independent random variables is equal to the product of their respective moment generating functions.		CO2														
	d) Let X be the random variable with the following probability distribution:		CO2														
	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td>X</td> <td>-3</td> <td>6</td> <td>9</td> </tr> <tr> <td>P(X)</td> <td>$\frac{1}{6}$</td> <td>$\frac{1}{2}$</td> <td>$\frac{1}{3}$</td> </tr> </table> <p>Find $E(X)$ and $E(X^2)$and using the law of expectations, evaluate $E(2X + 1)^2$.</p>	X	-3	6	9	P(X)	$\frac{1}{6}$	$\frac{1}{2}$	$\frac{1}{3}$								
X	-3	6	9														
P(X)	$\frac{1}{6}$	$\frac{1}{2}$	$\frac{1}{3}$														
	UNIT I		CO2														
Q2	Attempt any two parts	(5*2=10)															
	a) Calculate the mean, median and mode for the following distribution:																
	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Monthly Wages in Rs.</th> <th>No. of Workers</th> </tr> </thead> <tbody> <tr> <td>50-70</td> <td>4</td> </tr> <tr> <td>70-90</td> <td>44</td> </tr> <tr> <td>90-110</td> <td>38</td> </tr> <tr> <td>110-130</td> <td>28</td> </tr> <tr> <td>130-150</td> <td>6</td> </tr> <tr> <td>150-170</td> <td>8</td> </tr> </tbody> </table>	Monthly Wages in Rs.	No. of Workers	50-70	4	70-90	44	90-110	38	110-130	28	130-150	6	150-170	8		
Monthly Wages in Rs.	No. of Workers																
50-70	4																
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	170-190	12	
	190-210	2	
	210-230	2	

b) Calculate the first four moments of the following distributions about the mean and hence find β_1 and β_2 .

x	0	1	2	3	4	5	6	7	8
f	1	8	28	56	70	56	28	8	1

c) A random variable X has the following probability function:

X	0	1	2	3	4	5	6	7
P(X)	0	k	2k	2k	3k	k^2	$2k^2$	$7k^2 + k$

(i) Find k,

(ii) $P(3 < X \leq 6)$

(iii) Minimum value of x for which $P(X \leq x) \geq \frac{1}{2}$.

UNIT II

CO2

Q3 Attempt any two parts

(5*2=10)

a) If X and Y are two random variables having joint density function:

$$f(x, y) = \begin{cases} \frac{1}{8}(6 - x - y), & 0 \leq x < 2, 2 \leq y < 4 \\ 0, & \text{Otherwise} \end{cases}$$

Find (i) $P(X < 1 \cap Y < 3)$ (ii) $P(X + Y < 3)$ (iii) $P(X < 1 | Y < 3)$

b) Two ideal dice are thrown. Let X_1 be the score on the first die and X_2 be the score on second die. Let Y denote the maximum of X_1 and X_2 . Write the joint distribution of Y and X_1 . Find the mean and variance of Y and $Cov(Y, X_1)$.

c) The first of the two samples has 100 items with mean 15 and standard deviation 3. If the whole group has 250 items with mean 15.6 and standard deviation $\sqrt{13.44}$. Find the standard deviation of the second group.