

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 ½ 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: <table><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> Find $E(X)$ and $E(X^2)$ and using the law of expectations, evaluate $E(2X + 1)^2$.	X	-3	6	9	P(X)	$\frac{1}{6}$	$\frac{1}{2}$	$\frac{1}{3}$		CO2						
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><tr><td>Monthly Wages in Rs.</td><td>No. of Workers</td></tr><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></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																
70-90	44																
90-110	38																
110-130	28																
130-150	6																
150-170	8																

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	$2k^2$	$7k^2 + k$

- Find k,
- $P(3 < X \leq 6)$
- Minimum value of x for which $P(X \leq x) \geq 1/2$.

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.