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Total No. of Pages : 03

Total No. of Questions : 09

B.Tech. (Sem.-2)
MATHEMATICS-II
Subject Code : BTAM-204-18
M.Code : 91960
Date of Examination : 23-01-2023

Time : 3 Hrs.

Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :

1. SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.
2. SECTION - B & C. have FOUR questions each.
3. Attempt any FIVE questions from SECTION B & C carrying EIGHT marks each.
4. Select atleast TWO questions from SECTION - B & C.

SECTION-A

I. Write short notes on :

- a) Prove that $(x_1 - \bar{x}) + (x_2 - \bar{x}) + \dots + (x_n - \bar{x}) = 0$.
- b) What is Kurtosis? How does it differ from skewness?
- c) Two unbiased dice are thrown. Find the expected values of the sum of numbers of points on them.
- d) If a leap year is selected at random, what is the chance that it will contain 53 Mondays?
- e) The number of emergency admissions each day to hospital is found to have Poisson distribution with mean 4. Find the probability that on a particular day there will be no emergency admission.
- f) If $n = 8$ and $\sum D^2 = 240$, what is the coefficient of Rank Correlation?
- g) Calculate the regression equation Y on X from the following data:
 $\sum X = 61, \sum Y = 139, \sum XY = 1817, \sum X^2 = 777, \sum Y^2 = 4315, N = 5$.
- h) Fit a linear curve to the data $\sum X = 15, \sum Y = 42, \sum XY = 141, \sum X^2 = 55, N = 5$.

- i) Find the constant c so that $f(x)$ satisfies the conditions of being a probability density function of one random variable x :

$$f(x) = \begin{cases} cxe^{-x}, & 0, x, \infty \\ 0, & \text{elsewhere} \end{cases}$$

- j) A normal population has a mean of 6.8 and standard deviation of 1.5. A sample of 400 members gave a mean 6.75. Is the difference significant?

SECTION-B

2. a) The first three moments of a distribution about the value 5 of the variable are 2, 20, and 40. Find the mean, the variance and the third moment about mean.
- b) If X denotes the profit that a man can make in business. He may earn Rs. 2,800 with probability $\frac{1}{2}$, he may lose Rs. 5,000 with probability $\frac{3}{10}$ and he may neither lose nor gain with probability $\frac{1}{5}$. Find his expected gain or loss.

3. a) Calculate Karl Pearson's coefficient of skewness from the following data:

Profit (Rs. lakhs) below :	20	40	60	80	100
No. of companies :	8	20	50	64	70

- b) Five defective bulbs are accidentally mixed with twenty good ones. It is not possible to just look at a bulb and tell whether or not a bulb is defective. Four bulbs are drawn at random from this lot. Find the mean number of defective bulbs drawn.
4. a) Box I contains 3 red and 2 blue marbles while Box II contains 2 red and 8 blue marbles. A fair coin is tossed. If the coin turns up heads, a marble is chosen from Box I.; if it turns up tails, a marble is chosen from Box II. Find the probability that a red marble is chosen.
- b) Find the binomial distribution whose mean is 10 and standard deviation $2\sqrt{2}$.
5. a) Suppose that X has Poisson distribution. If $P(X = 2) = \frac{2}{3}P(X = 1)$ then find $P(X = 0)$.

- b) Calculate the correlation coefficient from the following data:

$$N=10, \sum X=350, \sum Y=310, \sum (X - 35)^2 = 162, \sum (Y - 31)^2 = 222, \sum (X - 35)(Y - 31) = 92.$$

SECTION-C

6. a) Suppose that the probability density function of a random variable X is as follows:

$$f(x) = \begin{cases} cx & \text{for } 0 < x < 4 \\ 0 & \text{elsewhere} \end{cases}$$

where c is a given constant. Determine the value of c and the values of $P(1 \leq X \leq 2)$.

- b) A coin is tossed 400 times and it turns up head 216 times. Test the hypothesis that coin is unbiased.
7. Find the parabola of the form $y = a + bx + cx^2$ which fits most closely with the observations

x	-3	-2	-1	0	1	2	3
y	4.63	2.11	0.67	0.09	0.63	2.15	4.58

8. Fit a straight line trend to the given data

x	1	2	3	4	5
y	14	27	40	55	68

9. In two large populations, there are 30% and 25% respectively of fair people. Is this difference likely to be hidden in samples of 1200 and 900 respectively from the two proportions.

NOTE : Disclosure of Identity by writing Mobile No. or Marking of passing request on any paper of Answer Sheet will lead to UMC against the Student.