Roll No. | | | | | | | | | | | | | **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

l. Write short notes on :

a) Prove that $(x_1 - \bar{x}) + (x_2 - \bar{x}) + ... + (x_n - \bar{x}) = 0$.

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 of 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 accidently 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:

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

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 ($1 \le X \le 2$).

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.