[This question paper contains 4 printed pages.]

Sr. No. of Question Paper : 5152   F   Your Roll No...............

Unique Paper Code   : 237151

Name of the Paper   : ST : Basic Statistics and Probability

Name of the Course   : **B.A. (Programme) Statistics**

Semester   : I

Duration : 3 Hours   Maximum Marks : 75

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.

2. Q. No. 1 is compulsory.

3. Attempt **six** questions in all.

4. Simple calculator can be used

1. (a) Fill in the Blanks :

   (i) In a symmetric distribution the mean and mode are _____ .

   (ii) If A and B are independent events, then A and $\bar{B}$ are _____ .

   (iii) A distribution with two modes is called _____ and with more than two modes is called _____ .

   (iv) If $\beta_2 > 3$ the distribution is said to be _____ .

   (v) If A and B are independent events then $P(A \cup B) = $ _____ .

   (5)

(b) If A, B and C are mutually exclusive events such that $p_1 = P(A)$, $p_2 = P(B)$, $p_3 = P(A \cap B)$, find in terms of p_1, p_2 and p_3

    (i) $P\left(\overline{A} \cup B\right)$

    (ii) $P(A \mid B)$ (5)

(c) The line of regression in a bivariate distribution are $X + 9Y = 7$ and

$Y + 4X = \dfrac{49}{3}$. Find (i) Coefficient of correlation and (ii) the ratio $\sigma_x^2 : \sigma_y^2$.

                                                              (5)

2. (a) Calculate the mean and standard deviation (s.d.) for the following frequency distribution.

Class-interval	0-8	8-16	16-24	24-32	32-40	40-48
Frequency	8	7	16	24	15	7

                                                             (6)

(b) Show that for any discrete frequency distribution $\beta_2 > 1$.   (6)

3. (a) From the following table showing the wage distribution in a certain factory, calculate the mode of wages and median wage.

Weekly wages	20-40	40-60	60-80	80-100	100-120	120-140	140-160	160-180	180-200
No. of Employees	8	12	20	30	40	35	18	7	5

                                                               (6)

(b) Prove that the sum of the squares of the deviations of a set of values is minimum when taken about mean.   (6)

4. (a) Let A and B be two events such that $P(A) = \dfrac{3}{4}$ and $P(B) = \dfrac{5}{8}$. Show that

      (i) $P(A \cup B) \geq \dfrac{3}{4}$

      (ii) $\dfrac{3}{8} \leq P(A \cap B) \leq \dfrac{5}{8}$ (6)

    (b) State and prove addition theorem of probability for any two events A and B.   (6)

5. (a) The odds that a book will be favourably reviewed by 3 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 favourable ?   (6)

    (b) State Bayes Theorem. In a bolt factory machines A, B and C manufacture respectively 25%, 35% and 40% bolts. Of their output 5, 4, 2 percentage are defective respectively. A bolt is drawn at random from the product and is found to be defective. What are the probabilities that it was manufactured by Machines A, B and C ?   (6)

6. (a) Define Karl Pearson correlation coefficient and obtain the limits for correlation coefficient.   (6)

    (b) The variables X and Y are connected by the equation $aX + bY + c = 0$. Show that the correlation between them is −1 if the signs of a and b are alike and +1 if they are different.   (6)

7.   (a)   In a bivariate distribution, it is given that

$$\bar{x} = 65, \quad \bar{y} = 67, \quad \sigma_x = 2.5, \quad \sigma_y = 3.5, \quad r = .8$$

Find the line of regression of Y on X and also obtain the value of Y corresponding to X = 70.   (6)

    (b)   If $r_{12} = 0.80$, $r_{13} = -0.40$, and $r_{23} = -0.56$. Find the values of $r_{12.3}$ and $R_{1.23}$.   (6)