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

S. No. of Question Paper : **5001**

Unique Paper Code : **237162** **D**

Name of the Paper : **Descriptive Statistics and Probability (STP-101)**

Name of the Course : **B.Sc. (Mathematical Sciences)—Statistics**

Semester : **I**

Duration : **3 Hours** Maximum Marks : **75**

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

Attempt any *Six* questions.

All questions carry equal marks.

1. (*a*) Describe the following with the help of suitable diagram :

(*i*) Histogram;

(*ii*) Frequency polygon;

(*iii*) Ogive.

(*b*) Show that in finding the arithmetic mean of a set of readings on a thermometer it does not matter whether we measure temperature in Centigrade or Fahrenheit, but that in finding the geometric mean it does matter which scale we use. 2×3,6½

P.T.O.

2. (*a*) Define Kurtosis. Explain it with the help of figure. Show that for a discrete distribution $\beta_2 > 1$.

(*b*) The mean weight of 150 students in a certain class is 60 kg. The mean weight of boys in the class is 70 kg and that of the girls is 55 kg. Find the number of boys and number of girls in the class. 6,6½

3. (*a*) Define Skewness. Find the limits for Bowley's Coefficient of Skewness.

(*b*) State and prove addition theorem of probability for two events A and B. Also, for any three events A, B and C defined on a sample space S such that $B \subset C$ and $P(A) > 0$, show that $P(B|A) \leq P(C|A)$. 6,6½

4. (*a*) An urn contains four tickets market with numbers 112, 121, 211, 222 and one ticket is drawn at random. Let A_i, (i = 1, 2, 3) be the event that ith digit of the number of the ticket drawn is 1. Discuss the independence of the events A_1, A_2 and A_3.

(*b*) Explain mutual independence of three events A, B and C. Prove that if A, B and C are random events in a sample space and if A, B and C are pairwise independent and A is independent of $(B \cup C)$, then A, B and C are mutually independent.

6,6½

5. (*a*) Define Karl Pearson's coefficient of correlation between two random variables X and Y. Also find its limits.

(*b*) What is the effect of change of origin and scale on correlation coefficient. Given $r(X, Y) = 0.2$, find

(*i*) $r(2X + 3, -3Y - 3)$ and

(*ii*) $r(5X, 4Y)$. 6,6½

6. (*a*) Explain principle of Least Squares to fit exponential curve $Y = ab^X$.

(*b*) (*i*) In a partially destroyed laboratory record of an analysis of correlations data, the following results only are legible :

Variance of X = 9, Regression equations :

$$8X - 10Y + 66 = 0, \quad 40X - 18Y = 214.$$

What are :

(1) The mean values X and Y

(2) The correlation coefficient between X and Y ?

(*ii*) Can $Y = 5 + 2.8X$ and $X = 3 - 0.5Y$ be the estimated regression equation of Y on X and X on Y respectively ? Explain your answer with suitable theoretical arguments. 6,4,2½

7. (*a*) Explain the symbols $R_{1.23}$, $r_{13.2}$ and r_{12}.

(*b*) From a vessel containing 3 white and 5 black balls, 4 balls are transferred into an empty vessel. From this vessel a ball is drawn and is found to be white. What is the probability that out of 4 balls transferred 3 are white and 1 is black ? 6,6½

8. (*a*) The odds that person X speaks the truth are 3 : 2 and the odds that person Y speaks the truth are 5 : 3. In what percentage of cases are they likely to contradict each other on an identical point ?

(*b*) Define the terms Standard Deviation and Mean Deviation about Mean. Also show that Standard deviation $\geq$ Mean Deviation about Mean. 6,6½