This question paper contains 8 printed pages]

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

S. No. of Question Paper : 6711

Unique Paper Code : 323271101 HC

Name of the Paper : **Descriptive Statistics**

Name of the Course : **B.Sc. (H) Statistics**

Semester : **I**

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

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

Attempt 6 questions in all.

Question No. 1 is compulsory.

Attempt 5 more questions selecting 3 questions from Section A

and 2 questions from Section B.

Use of simple calculator is allowed.

P.T.O.

Section A

1. (*a*) Fill in the blanks :

(*i*) For a symmetric distribution, β_1 = ...

(*ii*) If the attributes of A and B are independent, then $\frac{(AB)}{N}$ = ...

(*iii*) The algebraic sum of the deviations of 20 observations measured from 30 is 2. Therefore, mean of these observations is ....

(*iv*) Correlation coefficient is the .... of the regression coefficients.

(*v*) Total number of ultimate class frequency for *n* attributes is ....

(*vi*) If A and B are mutually disjoint events, then $P(A \cup B)$ = ...

(*vii*) A, B and C are three mutually exclusive and exhaustive events associated with a random experiment. Given that :

$P(B) = \frac{3}{2}P(A)$ and $P(C) = \frac{1}{2}P(B)$, then

$P(B)$ = ...

(*viii*) The limits for rank correlation coefficient are ....

(*ix*) Two uncorrelated variables .... be independent.

(*b*) (*i*) If the two regression lines are $3x + 12y = 19$, $3y + 9x = 46$, then find correlation coefficient between x and y.

(*ii*) If $P(A \cup B) = \frac{5}{6}$, $P(A \cap B) = \frac{1}{3}$ and $P(\overline{A}) = \frac{1}{2}$, then find P(A) and P(B). Hence show that A and B are independent.

(*iii*) If the lines of regression of Y on X and X on Y are respectively $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$, then prove that $a_1b_2 \leq a_2b_1$. 9×1, 3×2

2. (*a*) Show that the sum of the squares of the deviations of a set of values is minimum when taken about mean.

(*b*) In a frequency table, the upper boundary of each class interval has a constant ratio to the lower boundary. Show that the geometric mean G may be expressed by the formula :

$$\log G = x_0 + \frac{C}{N}\sum_i f_i(i-1),$$

Where x_0 is the logarithm of the mid-value of the first interval and C is the logarithm of the ratio between upper and lower boundaries. 6, 6

3. (*a*) What do you mean by skewness and kurtosis of a distribution ? Explain the methods of measuring skewness and kurtosis of a frequency distribution.

(*b*) Let X_i/f_i, $i = 1, 2, 3, \ldots\ldots\ldots, n$ be a discrete series. If the deviations $x_i = X_i - M$ are small compared with mean M, so that $\left(\frac{x}{M}\right)^3$ and high powers of $\left(\frac{x}{M}\right)$ are neglected, then :

(*i*) $G = M\left(1 - \frac{\sigma^2}{2M^2}\right)$,

(*ii*) $\text{Mean}\left(\sqrt{x}\right) = \sqrt{M\left(1 - \frac{\sigma^2}{8M^2}\right)}$,

where G is the geometric mean, M is the arithmetic mean and σ is the standard deviation. 6, 6

4. (*a*) Explain the principle of least squares. Obtain the equation of the line of regression of Y on X.

(*b*) If d_i be the difference in the ranks of the ith individual in two different characteristics, then show that the maximum value of :

$$\sum_{i=1}^{n} d_i^2 \text{ is } \frac{1}{3}\left(n^3 - n\right).$$

6, 6

5. (*a*) If X and Y are independent random variables with zero means and standard deviations 3 and 4 respectively, then find K so that X + 2Y and KX – Y are uncorrelated.

(*b*) If X and Y are two independent variables, show that :

$$r(X + Y, X - Y) = r^2(X, X + Y) - r^2(Y, X + Y)$$

where $r(X + Y, X - Y)$ denotes the coefficient of correlation between X + Y and X – Y.

6, 6

Section B

6. (*a*) State and prove Boole's inequality.

(*b*) In a random arrangement of the letters of the word COMMERCE, find the probability that all the vowels come together.

6, 6

7. (*a*) Show that in a population with three attributes A, B and C if :

(*i*) (AB) = (A) and (BC) = (B), then (AC) = (A);

(*ii*) If (AB) = (A) and (BC) = 0, then (AC) = 0.

(*b*) One bag contains 5 white and 4 black balls. Another bag contains 7 white and 9 black balls. A ball is transferred from the first bag to the second bag and then a ball is drawn from the second. Find the probability that the ball is white.

6, 6

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

(*b*) State Baye's theorem. A and B are two weak students of statistics and their chances of solving a problem in statistics correctly are $\frac{1}{6}$ and $\frac{1}{8}$ respectively. If the probability of their making a common error is $\frac{1}{525}$ and they obtain the same answer, find the probability that their answer is correct. 6, 6