Roll No.

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S. No. of Question Paper : **7962**

Unique Paper Code : **62371101**   **HC**

Name of the Paper : **Basic Statistics and Probability**

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

Semester : **I**

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

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

Question No. **1** is compulsory.

Attempt *six* questions in all.

Simple calculator can be used.

1. (*a*) Fill in the blanks :   5

     (*i*) In a symmetric distribution, the upper and lower

     quartiles are equi-distant from ....

(ii)   If the kurtosis of a distribution is 3, it is called

       .... distribution.

(iii)   Median = ... Quartile.

(iv)   Limits of correlation coefficient are ....

(v)   If A and B are independent events, then

       $P(A \cap B) =$ ....

(b)   Prove that, if A, B, C are mutually independent events

then $A \cup B$ and C are also independent.   5

(c)   Out of the two lines of regression given by

$X + 2Y = 8$ and $2X + 3Y = 8$. Which one is the line

of regression of X on Y ? Also find $\overline{X}$, $\overline{Y}$, r, σ_Y^2

when $\sigma_X^2 = 12$.   5

2.   (a)   A cyclist pedals from his house to his college at a

speed of 20 km.p.h. and back from the college to his

house at 25 km.p.h. Find the average speed.   6

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

7.   (a)   State and prove Bayes' Theorem.   6

(b)   The probability of X, Y and Z becoming managers are $\dfrac{4}{9}$,

$\dfrac{2}{9}$ and $\dfrac{1}{3}$ respectively. The probability that the Bonus

Scheme will be introduced if X, Y and Z become

managers are $\dfrac{3}{10}$, $\dfrac{1}{2}$ and $\dfrac{4}{5}$ respectively.   6

(i)   What is the probability that Bonus Scheme will be

introduced ?

(ii)   If the Bonus Scheme has been introduced, what

is the probability that the manager appointed

was X ?

Regression equation of X on Y : $20X - 9Y - 65 = 0$

The standard deviation of the prices of $X = 3$.

You are required to calculate :

(i) Average prices of X and Y.

(ii) Standard deviation of the prices of Y.

(iii) Coefficient of correlation between the prices of

X and Y. 6

6. (a) State and prove multiplication theorem of probability. 6

(b) A piece of equipment will function only when the three

components A, B and C are working. The probability of

A failing during one year is 0.05, that of B failing is 0.15

and that of C failing is 0.10. What is the probability that

equipment will fail before the end of the year ? 6

3. (a) Show that, if n_1, n_2 are the sizes, $\overline{x_1}$, $\overline{x_2}$ the means,

and σ_1, σ_2 the standard deviations of two series, then

the standard deviation σ of the combined series of size

$n_1 + n_2$ is :

$$\sigma^2 = \frac{1}{n_1 + n_2}\left[n_1\left(\sigma_1^2 + d_1^2\right) + n_2\left(\sigma_2^2 + d_2^2\right)\right]$$

where

$$d_1 = \left(\overline{x_1} - \overline{x}\right),\ d_2 = \left(\overline{x_2} - \overline{x}\right)\ \text{and}\ \overline{x} = \frac{n_1\overline{x_1} + n_2\overline{x_2}}{n_1 + n_2}$$

is the mean of the combined series. 6

(b) For a distribution, the mean is 10, variance is 25,

γ_1 is +1 and β_2 is 4. Obtain the first four moments about

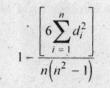the origin, i.e. zero. Comment upon the nature of the

distribution. 6

4. (a) Prove that Spearman's rank correlation coefficient is given by : 6

$$1 - \frac{\left[6\sum_{i=1}^{n} d_i^2\right]}{n\left(n^2 - 1\right)}$$

where d_i denotes the difference between the ranks of the ith individual.

(b) From the data relating to the yield of dry bark (X_1), height (X_2) and girth (X_3) for 18 cinchona plants, the following correlation coefficients were obtained :

$r_{12} = 0.77$, $r_{13} = 0.72$ and $r_{23} = 0.52$.

Find the partial correlation coefficient $r_{12.3}$ and multiple correlation coefficient $R_{1.23}$. 6

5. (a) Obtain the equation of two lines of regression for the following data. Also obtain the estimate of X for Y = 70 : 6

X	Y
65	67
66	68
67	65
67	68
68	72
69	72
70	69
72	71

(b) In a statistical study relating to the prices of two commodities X and Y, the following two regression lines were found, where the prices were expressed in rupees :

Regression equation of Y on X : $8X - 10Y + 70 = 0$