(i) Printed Pages: 7]

(ii) Questions : 9]

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B.A./B.Sc. (General) 2nd Semester Examination

1047

STATISTICS

Paper : 103 (Probability Theory and Descriptive Statistics-II)

Time : 3 Hours]   [Max. Marks : 65

Note :– Attempt *five* questions in all, including compulsory first question and *two* questions from each Section.

(Compulsory Question)

1. (i) Write down the probability mass function of discrete uniform distribution.   2

    (ii) What is the relationship between mean and variance of binomial distribution ?   2

(iii) If Karl Pearson's coefficient between X and Y is equal to zero, then X and Y are independent or not ?   2

(iv) State the central limit theorem.   2

(v) What is the range of multiple correlation coefficient and Spearman correlation coefficient ?   2

(vi) What is the difference between association and independence ?   2

(vii) What is the shape of Poisson distribution ?   1

Section–I

2. (a) Define the Binomial distribution with parameters p and n. Give a real life situation where the distribution is likely to be realized. Obtain the moment generating function of the binomial distribution and also find its mean and variance.

(b) A Poisson distribution has a double mode at $x = 2$, $x = 3$. What is the probability that x will have one or the other of the two values ?   8,5

N–24   (2)

3. (a) A Pascal distribution is defined by $f(x)$

$$= \frac{1}{1+\mu}\left(\frac{\mu}{1+\mu}\right)^x , \quad x = 0, 1, 2, \ldots, \text{ where}$$

$\mu > 0$. Find the mean and variance of the distribution.

(b) Show that random variable X distributed in exponential form has lack of memory property :

$P (X > s + t \mid X > t) = P (X > s)$, for s, $t > 0$,

This means that under the condition that an item survives to time t, the probability of surviving a further time s is the same as the probability. 7,6

4. (a) Show that for a symmetrical probability distribution (either discrete or continuous), all odd-order central moments are equal to zero.

(b) Define bivariate Normal distribution. If (X, Y) has a bivariate normal distribution, find the marginals and conditional probability distributions. 5,8

5. (a) State and prove the Chebyshev's inequality.

(b) The life time of a certain brand of an electric bulb may be considered a random variable with mean 1,200 hours and standard deviation 250 hours. Find the probability, using central limit theorem, that the average life time of 60 bulbs exceed, 1,400 hours. 7,6

Section–II

6. Define the term regression with suitable example. State and prove its important properties. What are its limitations ? 13

N–24 (4)

7. (a) Show that the coefficient of correlation r is independent of a change of scale and origin of the variables.

(b) For 20 army personnel, the regression of weight of kidneys (y) on weight of heart (x), both measured in oz., is $Y = 0\cdot399x + 6\cdot934$ and the regression of weight of heart on weight of kidney is $X = 1\cdot212y-2\cdot461$. Find the correlation between the two variables and also their means. 5,8

8. (a) What is a rank correlation coefficient ? Deduce Spearman's formula for rank correlation coefficient. How should the formula be modified for tied ranks ?

(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 coefficient were obtained.

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

Find the partial correlation coefficient $r_{12.3}$ and

multiple correlation coefficient $R_{1.23}$.   8,5

9. (a) For the case of two attributes, define independence and association (positive and negative). What are the different measures of association and what are their properties ?

(b) Given that (A) = 490, (α) = 570, (AB) = 294,

(αB) = 380. Check whether A and B are

independent, positively associated and negatively

associated.

9,4