RAMAKRISHNA MISSION VIDYAMANDIRA

(A Residential Autonomous College under University of Calcutta)

First Year

First-Semester Examination, December 2010

Date : 21-12-2010   **STATISTICS (General)**   Full Marks : 50

Time : 11am – 1pm   **Paper - I**

(Use separate answer script for each group)

Group – A

1. Answer <u>any three</u> questions :

   a)   What do you mean by a questionnaire? What are the characteristics of a good questionnaire?

                                                   [(1+4) =5]

   b)   Briefly describe the different parts of a table.   [5]

   c)   Show that the arithmetic mean of the two groups lies between the two group means.   [5]

   d)   There are two sets of values of a variable x. The first one has n_1 values with geometric mean G_1 and the second set has n_2 values with geometric mean G_2. If G be the geometric mean of the combined group then show that—   [5]

$$\log G = \frac{n_1 \log G_1 + n_2 \log G_2}{n_1 + n_2}$$

   e)   What is skewness? Mention a measure of skewness based on quartiles. Show that this measure lies between −1 to +1.   [2+1+2 = 5]

   f)   Show that $b_2 \geq b_1 + 1$, where b_1 and b_2 are measures of skewness and kurtosis respectively.   [5]

2. Answer <u>any one</u> question :

   a)   i) Define Arithmetic Mean. State the properties of Arithmetic Mean.

        ii) Give some examples where the geometric mean and harmonic mean would be the appropriate type of average.

        iii) If y = a + bx and M_0 is the mode of x, then show that the mode of y must be a + bM_0

                                           [(1+4)+2+3]

   b)   What are the advantages of using relative measures of dispersion? Identify two situations where they are applicable. For a set of n values of a variable with S and R as the standard deviation and range respectively, show that, $\frac{R^2}{2n} \leq S^2 \leq \frac{R^2}{4}$ [2+2+6 = 10]

Group – B

3. Answer <u>any three</u> questions :

   a)   Give classical definition of probability. What are its limitations?   [2+3 = 5]

   b)   i) Show that if two events are independent they cannot be exclusive, the events having non-zero probabilities.

        ii) If A and B are independent then show that $\overline{A}$ and $\overline{B}$ are also independent.   [2+3]

c) Arrange the quantities 1, P(A) + P(B) − 1, P(A∪B) and P(A∩B) in decreasing order, with reasons. [5]

d) From a well shuffled deck of 52 playing cards (13 each of clubs, spades, hearts and diamonds and all distinct), cards are picked up at random one by one. What is the probability that the 7th one picked up is the 5th spade? [5]

e) For the following probability mass function find– (i) P (|x| < 1) and (ii) the distribution function F(x).

$$f(x) = \begin{cases} \frac{1}{4} & \text{for } x = -2 \\ \frac{1}{4} & \text{for } x = 3 \\ \frac{1}{2} & \text{for } x = 6 \\ 0 & \text{elsewhere} \end{cases}$$

[2+3]

f) What do you mean by Bernoullian trials? Write down the p.m.f. of a Bernoullian distribution.

[3+2 = 5]

4. Answer _any one_ question :

a) Show that for the Binomial distribution with parameters n and p

$$\mu_{K+1} = p(1-p)\left[nK\mu_{K-1} + \frac{d\mu_K}{dp} \right]$$

where μ_K is the Kth order central moment.

Hence show that the distribution is symmetric and platykurtic when $p = \frac{1}{2}$. [6+2+2 = 10]

b) i) Find the expectation and variance of a geometric distribution with parameter p.

ii) Define a Negative Binomial distribution and show that geometric distribution is a special case of it. Using the expectation and variance of geometric distribution find expectation and variance of a Negative Binomial distribution. [4+6]