

RAMAKRISHNA MISSION VIDYAMANDIRA

(Residential Autonomous College under University of Calcutta)

SECOND YEAR

B.A./B.SC. THIRD SEMESTER (July – December), 2011

Mid-Semester Examination, September, 2011

Date : 14/09/2011

STATISTICS (General)

Time : 2 pm – 3 pm

Paper : III

Full Marks : 25

Answer any five questions :

[5×5= 25]

1. Define the minimum variance property of an estimator. Suppose a variable x follows normal distribution with mean μ and variance σ^2 . A random sample of size 5 is drawn from the observation, viz., x_1, x_2, x_3, x_4, x_5 . Consider the following estimators—

$$t_1 = \frac{x_1 + x_2 + x_3 + x_4 + x_5}{5}$$

$$t_2 = \frac{2x_1 + x_2}{3}$$

$$t_3 = \frac{x_1 + 2x_2 + x_3 + x_4 + x_5}{5}$$

Which of the following estimators will you choose and why?

[1+4 = 5]

2. Define consistency. What are the necessary and sufficient conditions for an estimate to be consistent? [5]
3. When an estimator is known as ‘sufficient’ estimator? Show that, for a Bernouli population with parameter p ($0 < p < 1$), the sum of the sample values can be considered as a sufficient estimate for p .

[1+4]

4. If $x_1, x_2, \dots, x_n$ are independent Normal distributions with mean μ and variance σ^2 find the distribution of $\sum_{i=1}^n a_i x_i$ where a_i s are constants and atleast one a_i is non zero. Hence find the distribution of $\bar{x} = \frac{1}{n} \sum_{i=1}^n x_i$

[4+1]

5. Define an F variable. Write down it's p.d.f and obtain it's expectation. [1+1+3]
6. Write a shortnote on order statistics and their distributions. [5]
7. Differentiate between statistic and parameter. Why the standard deviation of a statistic is called standard error? What do you mean by sampling distribution? [2+2+1]
8. What is an Alternative hypothesis? Explain with an example. What is size of a test? What are the two types of error associated with hypothesis testing? Which is more severe type of error? In that case what do we do? [1+1+1+1+1 = 5]
9. Let p be the probability of obtaining head in a single toss in order to test $H_0 : P = \frac{1}{2}$ against $H_1 : P = \frac{4}{5}$. The coin is tossed for 6 times. H_0 is rejected if more that 4 heads are obtained. Calculate— (a) Size of the test; (b) Power of the test [2·5×2 = 5]