

RAMAKRISHNA MISSION VIDYAMANDIRA

(Residential Autonomous College affiliated to University of Calcutta)

SECOND YEAR [2015-18]

B.A./B.Sc. THIRD SEMESTER (July – December) 2016

Mid-Semester Examination, September 2016

Date : 17/09/2016

STATISTICS (General)

Time : 12 noon – 1 pm

Paper : III

Full Marks : 25

[Use a separate answer book for each group]

Group – A

(Answer the following questions)

[2×5]

1. What do you mean by tests of index numbers. Explain Time Reversal Test and Factor Reversal Test.

Or,

What is real wage? In 2015 the price of a commodity increased by 50% over that in 2000 while the production of the quantity decreased by 30%. By what percentage did the total rupee value of the commodity in 2015 increase or decrease with respect to the 2000 value?

2. Define Trend. State advantages of moving average method to obtain trend value. Also state disadvantages of that method.

Or,

What are the major uses of seasonal indices in time series analysis. Name four methods by which one can compute a seasonal index from time series data. Explain any one of them.

Group – B

(Answer any three questions)

[3×5]

3. A random sample X_1, X_2, \dots, X_n of size n is selected from a normal distribution with mean μ & variance σ^2 . (both are unknown) Let S^2 be the unbiased estimator of σ^2 & T be the maximum likelihood estimator of σ^2 . If $20T - 19S^2 = 0$, then what is the sample size? Explain your answer.

4. Suppose X & Y are independent random variables each with density function of the form :

$$f(x) = \begin{cases} 2x\theta^2 & \text{for } 0 < x < \frac{1}{\theta} \\ 0 & \text{otherwise} \end{cases} \quad \text{i.e.} \quad f(y) = \begin{cases} 2y\theta^2 & \text{for } 0 < y < \frac{1}{\theta} \\ 0 & \text{otherwise} \end{cases}$$

If $K(X+2Y)$ is an unbiased estimates of θ^{-1} , then what's the value of K ?

5. A random sample X_1, X_2, \dots, X_n of size n is selected from a normal population with mean μ & s.d. 1. Later an additional observation X_{n+1} is obtained from the same population. What is the distribution of the statistic $(X_{n+1} - \mu)^2 + \sum_{i=1}^n (X_i - \bar{X})^2$, where \bar{X} denotes the sample mean of the first n observations?

6. Let $T = \frac{K(X+Y)}{\sqrt{Z^2 + W^2}}$ where X, Y, Z and W are independent Normal random variables with mean zero & variance $\sigma^2 (> 0)$. For exactly one value of K , T has a t-distribution, If r denotes the degrees of freedom of that distribution, then what's the value of the pair (K, r) ?