

Time allowed: 3 Hours

NOTE: Attempt five questions in all, including Question No. 1 which is compulsory and selecting two questions from each Section. Log tables and statistical tables may be provided on demand.

x-x-x

1. (i) Define sufficiency of an estimator.
- (ii) Give an example of an estimator which is neither unbiased nor consistence.
- (iii) Distinguish between Estimate and Estimator.
- (iv) Define F- distribution.
- (v) Explain the concept of level of significance and power of the test.
- (vi) Difference between simple hypothesis and alternative hypothesis. (6x2)
- (vii) Are maximum likelihood estimators always Unbiased? (1)

Section-I

2. (a) Explain two methods of estimation by giving all the properties of these methods.
- (b) Let X_1, \dots, X_n be a random sample of size n from discrete Binomial distribution with parameter n and p . Find the estimates of n and p by using both the methods. (7.6)
3. (a) Define the concept of efficiency. Explain it with the help of an example.
- (b) Let X be a random sample from normal distribution $N(\mu, \sigma^2)$, find unbiased estimator of μ^2 and σ^2 . (6.7)
4. (a) Define t-square distribution. List its applications also drive its probability density function.
- (b) Develop a relationship between chi-square, t and F distributions. (7.6)
5. (a) Independence of sample mean and variance in random sampling from a normal distribution.
- (b) Drive the sampling distribution of sum of two independent binomial random variables. (7.6)

Section-II

6. (a) Distinguish the following and illustrate with the help of an example
 - (i) Acception region and Rejection Region
 - (ii) Probability of Type I and Type-II errors
 - (iii) Attribute and Variable
- (b) Two horses A and B were tested according to time (in seconds) to run a particular track with the following results:

Horse A:	28	30	32	33	33	29	34
Horse B:	29	30	30	24	27	29	

 Test whether the two horses have the same running capacity. (6.7)

7. (a) Describe the test for equality of the proportions of two normal population. Obtain $100(1-\alpha)\%$ confidence interval for the same.
- (b) In a random sample of 500 men from a particular district of U.P., 300 are found to be smokers. In one of 1,000 men from another district, 550 are smokers. Do the data indicate that the two districts are significantly different with respect to the prevalence of smoking among men? Also calculate confidence interval at 5% level of significance. (7.6)
8. (a) How does one test the significance of sample correlation coefficient? Also state the necessary assumption required in the testing procedure. Explain Fisher Z transformation.
- (b) The correlation coefficient between sitting height and stature was found to be 0.7854 for a group of 70 adult Europeans. For a group of 39 adult Indians, on the other hand, the coefficient was 0.5209. Do the two coefficients differ significantly? (8.5)
9. (a) Explain testing procedure for Paired t – test. Obtain $100(1-\alpha)\%$ confidence interval for it.
- (b) Explain Chi-square test for Goodness of Fit. (7.6)

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