

SEPTEMBER 2006

[KP 252]

Sub. Code : 2852

M.Sc. (Biostatistics) DEGREE EXAMINATION.

First Year

Paper II — RESEARCH DESIGNS AND
BIostatistical INFERENCE — I

Time : Three hours Maximum : 100 marks

Descriptive : Two hours and Descriptive : 80 marks
forty minutes

Objective : Twenty minutes Objective : 20 marks

Answer ALL questions.

1. Define a consistent estimator. If the estimator t_n based on a random sample of size n is such that $E(t_n) \rightarrow \theta$ and $\text{var}(t_n) \rightarrow 0$ as $n \rightarrow \infty$ then show that t_n is a consistent estimator for θ . Hence prove that the sample mean is always a consistent estimator for population mean. (20)

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2. What is the principle of replication and what are the local controls? What is their role in experimental designs. (15)

3. A random sample X_1, X_2 of size 2 with replacement is taken from the following population :

Value of $X(k)$: 0 1 2 3

Probability $P(X=k)$: 1/8 3/8 3/8 1/8

Find the distribution of $X_1 + X_2$, its mean and variance. Also find the distribution of the sample mean \bar{X} , its mean and variance. (15)

4. Write short notes on : (6 × 5 = 30)

(a) Give the mathematical model assumed in L.S.D and explain the analysis of variance table used for analysing the results of an experiment.

(b) Describe the advantages of sampling over complete enumeration.

(c) Compare the efficiencies of Neyman and proportional allocations with that of an unstratified random sample of the same size.

(d) Define MVU estimator. If T_1 and T_2 are two unbiased estimators of a parameter θ , with variances σ_1^2 and σ_2^2 and correlation coefficient ρ , obtain the best unbiased linear combination of T_1 and T_2 . Also obtain its variance.

(e) Describe UJMP test and likelihood ratio test.

(f) Describe the test procedure to test the equality of two population variances taking small samples. Also write down the 95% confidence interval for the ratio of population variances.