

Seat No. : _____

XB-126

March-2013

T.Y. B.Sc.

Statistics

Paper – VIII

Time : 3 Hours]

[Max. Marks : 70

- Instructions :** (1) Attempt **all** questions.
(2) **All** questions carry equal marks.

1. (a) For stratified random sampling prove that

(i) $E(\bar{y}_{st}) = \bar{Y}$

(ii) $V(\bar{y}_{st}) = \sum_{h=1}^L W_h^2 V(\bar{y}_h)$

OR

Discuss the applications of stratified sampling.

- (b) In case of stratified random sampling, how will you estimate the sample size with continuous data.

OR

If terms in $\frac{1}{N_h}$ are ignored relative to unity and the optimum allocation is with

$n_h \propto N_h S_h$ then prove that

$$V_{prop} \in [V_{opt}, V_{ran}]$$

Where [a, b] denotes a closed interval.

- (c) (i) Define f.p.c. factors.
(ii) State the condition for proportional allocation in stratified random sampling.

2. (a) Explain the procedure of systematic sampling and state its merits and demerits.

OR

If the population consists of linear trend show that $V(\bar{y}_{sy}) = \frac{K^2 - 1}{12}$ and

$$V(\bar{y}_{ran}) = \frac{(K - 1)(N + 1)}{12}.$$

- (b) For two stage sampling with units of equal sizes prove that

$$V(\bar{y}) = \left(\frac{N - n}{N}\right) \frac{S_1^2}{n} + \left(\frac{M - m}{M}\right) \frac{S_2^2}{mn}$$

OR

Explain the procedure for finding mean and variance in two stage sampling. Also derive

$$V(\hat{\theta}) = V_1[E_2(\hat{\theta})] + E_1[V_2(\hat{\theta})]$$

- (c) (i) Define a cost function used in two stage sampling.
(ii) In systematic sampling, what happens when $N \neq nK$.

3. (a) Introduce S.Q.C., and give its historic background.

OR

Explain the concept of 3σ -limits in detail.

- (b) Derive control limits of \bar{X} and R charts.

OR

Explain and derive O.C. function of \bar{X} -chart.

- (c) (i) Give two examples of 'Assignable causes'.
(ii) What is the probability that seven consecutive points fall on upper side of central line ?

4. (a) Write a detailed note on 'Subgrouping'.

OR

Derive control limits for c and u chart and state applicants of c-chart.

- (b) Explain Rejection limits and modified limits for \bar{X} -chart.

OR

Compare the control charts for variables and attributes with illustrations.

- (c) (i) What is np chart preferred to p-chart ?
(ii) What is the interpretation of a sample point that falls below the LCL on p-chart ?

5. (a) Explain the procedure of 'Acceptance Sampling' and state its uses and types of plans used in it.

OR

Explain following terms for single sampling plan for attributes :

- (i) AQL and LTPD
(ii) AOQ and AOQL

- (b) Explain the procedure of Double Sampling Plan for attributes and derive its O.C. function.

OR

Derive sampling inspection plan for variables when lower specification limit and lot s.d. are both known.

- (c) (i) For SSP with attributes, define ASN.
(ii) Give two merits of sampling inspection plan for variables.