KNT/KW/16/5185

Bachelor of Science (B.Sc.) Semester—V (C.B.S.) Examination

STATISTICS

Compulsory Paper—2

(Survey Sampling Techniques)

Time : Three Hours] [Maximum Marks : 50

N.B. :— ALL questions are compulsory and carry equal marks.

1. (A) Distinguish between sample survey and complete enumeration. Explain the types of sampling giving an example of each. Explain the concept of sampling errors stating their causes. What precaution is taken to control sampling errors ? 10

OR

(E) Explain the purpose, functions and divisions of CSO.

(F) Explain various steps in the planning stage of a large scale sample survey. 5+5

2. (A) Explain SRSWR. Show that sample mean and sample mean square are unbiased estimators of the population mean and population variance respectively. Obtain the variance of the sample mean and its estimate.

(B) Explain SRSWR applied to qualitative characteristic. Show that the sample proportion is an unbiased estimator of the population proportion. Also obtain an expression for the variance of the sample proportion under SRSWR. 5+5

OR

(E) Under SRSWOR, derive an expression for the sample size required for estimating the population mean with a specified precision and margin of error permissible in the estimate.

(F) Distinguish between SRSWOR and SRSWR. Obtain 100 $(1 - \alpha)$% confidence interval for the population mean on the basis of the sample mean and its standard error in case of SRSWOR. 5+5

3. (A) Explain the procedure of stratified random sampling stating the need for stratification. Explain the advantages of stratified sampling. Explain various allocations and find the expressions for variance of the sample mean under these allocations. Show that stratified sampling is more efficient under Neyman allocation as compared to proportional allocation. 10

OR

(E) Under stratified sampling, discuss briefly the following two principles :—

(i) Fixing the cost of the survey minimizing the variance of sample mean.

(ii) Fixing the variance of sample mean minimizing the cost of the sample survey.

Obtain the expressions for strata sample sizes under these two principles. 10

4. (A) Explain how systematic sampling is carried out. State its advantages. Explain its resemblance with stratified and cluster sampling. Show that sample mean is an unbiased estimator of population mean. 10

OR

(B) For a population with linear trend $Y_i = \mu + \theta \cdot i$, i = 1, 2, ..., N, find the expressions for variance of the estimate of population mean under systematic sampling and SRSWOR. Compare the efficiencies of the two sampling procedures. 10

5. Solve any **TEN** questions out of the following :—

(A) Name the divisions of N.S.S.O.

(B) Define sampling unit and frame.

(C) Name the type of error occurred in the following examples of surveys :—

(i) Faulty data collection in a population census.

(ii) Wrong choice of the estimator for estimating the population parameter.

(D) State the formula for the sample mean under stratified sampling and show that it is the weighted arithmetic mean of strata means.

(E) Give one example where stratified sampling may be used.

(F) What is meant by allocation in stratified sampling ?

(G) State one example where cluster sampling may be appropriate.

(H) State the disadvantages of systematic sampling.

(I) Name the sampling procedures where :—

(i) Groups of elements are used as the sampling unit.

(ii) Selected sampling units are evenly spaced.

(J) Name two methods for drawing a simple random sample.

(K) State the expressions for $V(p_n)_{SRSWOR}$ and est $V(p_n)_{SRSWOR}$ where p_n is the sample proportion.

(L) Between SRSWOR and SRSWR which method provides a better estimate of population mean ? Why ? 1×10=10