M. Sc. (Sem. II) (CBCS) Examination

May / June – 2017

MS-204 : Sampling Techniques
Faculty Code : 003
Subject Code : 1172004

Time : $2\frac{1}{2}$ Hours]   [Total Marks : 70

Instructions : (i) Attempt all questions.

(ii) Each question carries equal marks.

1 Answer any seven of the following :   **14**

(1) What is meant by sampling frame ?

(2) Probability of any one sample of size n being drawn out of N unit is _____.

(3) A finite subset of statistical individuals in a population is called _____.

(4) Write the names of non-probability sampling methods.

(5) A statistical measure computed from the sample observation alone is called _____.

(6) Define sample size.

(7) If the number of units in a population is limited, it is known as _____ population.

(8) Errors other than sampling error in a survey are called _____ errors.

(9) Define population.

(10) What is objective of sampling ?

2 Answer the following questions : (any **two**)   **14**

    (a) Prove that systematic sample mean is unbiased estimator of population mean.

    (b) For studying a characteristic the observation of a population are 10, 12, 20, 22, 26. How many random samples of size 2 without replacement can be taken from it ? Making a list of all samples verify the following results ?

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

        (ii) $V(\bar{y}) = \left(\dfrac{N-n}{N}\right)\dfrac{S^2}{n}$

        (iii) $E\left(s^2\right) = S^2$

    (c) Prove that $Var\left(\bar{y}_n\right)_{Ran} > Var\left(\bar{y}_{sys}\right)$ if and only if $S^2_{sys} > S^2$.

3 Answer the following questions :   **14**

    (a) Prove that

$$Var\left(\bar{y}_{sys}\right) = \frac{nk-1}{nk}\frac{S^2}{n}\{1+(n-1)\rho\} = \frac{S^2}{n}\{1+(n-1)\rho\}.$$

    (b) Write the difference between population study and sample study.

OR

3 Answer the following questions :   **14**

    (a) Which factors are responsible for the size of a sample ?

    (b) Explain cumulative total method in PPS sampling.

4 Answer the following questions : (any **two**)   **14**

    (a)   In what situations sampling is inevitable ?

    (b)   If the population consists of a linear trend, then prove that,

$$Var\left(\bar{y}_{st}\right) \le Var\left(\bar{y}_{sys}\right) \le Var\left(\bar{y}_{n}\right)_{Ran}.$$

    (c)   Write comparison of systematic sampling with stratified sampling.

5 Answer the following questions : (any **two**)   **14**

    (a)   Discuss the bias of ratio estimator.

    (b)   Explain Lahiri's method in PPS sampling.

    (c)   Explain the meaning of simple random sampling with replacement and without replacement.

    (d)   If a sample of n units drawn with probabilities p_i and with replacement then show that $\hat{Y}_{pps} = \frac{1}{n}\sum_{i \in s}\frac{y_i}{p_i}$ is unbiased estimator for Y. Also find variance of $\hat{Y}_{pps}$.

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