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T.Y.B.Sc.

STATISTICS (Principal)

ST- 333 : Sampling Methods

(2013 Pattern) (Semester - III) (Paper - III)

Time : 2 Hours] ***[Max. Marks : 40***

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***
3) ***Use of scientific calculator and statistical tables is allowed.***
4) ***Symbols and abbreviations have their usual meaning.***

Q1) Attempt each of the following:

a) Choose correct alternatives in each of the following: **[1 each]**

i) In simple random sampling without replacement (SRSWOR), variance of sample mean is

A) $\left(\frac{N-n}{Nn}\right)S^2$ B) $\left(\frac{n-N}{Nn}\right)S^2$

C) $\left(\frac{N-1}{Nn}\right)S^2$ D) $\left(\frac{N-n}{N}\right)S^2$

ii) In case of stratified random sampling with proportional allocation, the sample size from i^{th} stratum is

A) nW_i B) $n\frac{W_iS_i}{\Sigma_{i=1}^{k}W_iS_i}$

C) nW_iS_i D) $\frac{W_iS_i}{\Sigma_{i=1}^{k}W_iS_i}$

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iii) The ratio estimator of the population mean ($\bar{Y}$)is

A) $\bar{y}$ B) $\frac{\bar{x}}{\bar{y}}\bar{X}$

C) $\frac{\bar{y}}{\bar{x}}\bar{X}$ D) $\frac{\bar{x}\cdot\bar{y}}{\bar{x}}$

iv) In case of SRSWOR, probability that specified unit is included in the sample is

A) $\frac{n}{N}$ B) $\frac{1}{n}$

C) $\frac{1}{\binom{N}{n}}$ D) $\frac{1}{N^n}$

b) State whether each of the following statements is true or false: **[1 each]**

i) For proportional allocation variance of an estimator $(\bar{Y}_{st})_{prop}$ of population mean is smaller than that $(\bar{Y}_{st})_{Ney}$ in case of Neyman's allocation.

ii) Regression estimator is biased estimator of population mean.

c) Define the following terms: **[1 each]**

i) Sampling unit.

ii) Stratification.

d) i) State an unbiased estimator of population mean in systematic sampling. **[1]**

ii) State one real life situation where ratio method of estimation can be used. **[1]**

Q2) Attempt any two of the following: **[5 each]**

a) In SRSWOR, show that sample mean sum of square is an unbiased estimator of population mean sum of square.

b) Describe the proportional allocation method and derive an expression for standard error of unbiased estimator of population mean.

c) A population consists of 550 units. By total count, it was found that population mean is 49 and population mean square is 46 under SRSWOR, how many sampling units should be chosen to estimate $\bar{X}_N$ with permissible margin of error 10% of population mean and 95% confidence coefficient?

Q3) Attempt any two of the following: **[5 each]**

a) With usual notation prove that systematic sampling is more efficient than SRSWOR if $\rho \leq -\frac{1}{N-1}$ where ρ is intra class correlation coefficient.

b) Given the following data, determine the sample size n_1, n_2, n_3 by using Neyman's allocation if total sample size is n=12

Sr.No	Ni	Si
1	4000	3
2	2000	5
3	3000	2

Also find variance of an estimator of population mean in case of Neyman's allocation.

c) For SRSWOR method for attribute, derive an expression for an unbiased estimator of variance of sample proportion.

Q4) Attempt any one of the following:

a) i) Explain reliability and validity test of questionnaire by using internal consistency method with the help of Kuder Rechardson coefficient. **[5]**

ii) Define ratio estimator of population mean and compare its efficiency with SRSWOR estimator. **[5]**

b) i) Prove that in SRSWR, sample mean is an unbiased estimator of population mean and also derive an expression for variance of sample mean. **[5]**

ii) Explain in brief characteristics of good questionnaire. **[5]**

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