

Mid-West University
Examinations Management Office
Surkhet, Nepal
End Semester Examinations -2078

Bachelor level/ B.Sc / 5th Semester
Time: 3 hrs

Full Marks : 100
Pass Marks : 50

Subject : Sampling Theory (STAT 453)

Candidates are required to give their answer in their own words as far as practicable. The figures in the margin indicate full marks

GROUP-A

1. **Attempt all the questions**

[2x7=14]

- a) What is sampling frame?
- b) What are the factors that affecting sample size?
- c) List out the different techniques of drawing random.
- d) Mention advantage and disadvantage of simple random sampling.
- e) Write down the purpose of stratification.
- f) What is regression estimator?
- g) Give the situation that the systematic sampling is useful.

GROUP-B

2. **Attempt all the questions**

[3x10=30]

- i) Differentiate between sampling and non-sampling error?
- ii) Discuss on probability and non-probability sampling.
- iii) Write in brief principle of sample survey.
- iv) How you can determine sample size for studying population proportion?
- v) Explain the procedure of selecting sample by using simple random sampling with or without replacement.
- vi) Prove that in simple random sampling with replacement sample mean is unbiased estimate of population mean.
- vii) Enumerate all possible sample of size 2 taken from the population whose elements are 1, 2, 3, 4 and 5 by using SRSWOR.
- viii) Write down the procedure of drawing sample by using circular systematic sampling method.
- ix) Differentiate between simple random sampling and PPS sampling methods.
- x) Discuss on ratio method of estimation.

GROUP-C

Attempt any 'EIGHT' questions

[7x8=56]

3. Explain how can you plan and execution of sample survey.
4. What is questionnaire? What are requisites of good question?
5. Prove that in simple random sampling without replacement,
$$V(\bar{y}) = \frac{N-n}{Nn} S^2 = \frac{S^2}{n} (1 - f)$$
 where the notation have their usual meaning.
6. Describe the stratified random sampling method.
Show that $Var(\bar{y}_{st})_{prop} = \left(\frac{1}{n} - \frac{1}{N}\right) \sum_{i=1}^k w_i S_i^2$
7. Prove that: $Var(\bar{y})_{SRS} \geq Var(\bar{y}_{st})_{Prop} \geq Var(\bar{y}_{st})_{Opt}$.

8. Describe the procedure of drawing sample by using probability proportion to size sampling.
9. Write down merits and demerits of systematic sampling, Show that variance of mean of systematic sampling is;

$$Var(\bar{y}_{sys}) = \frac{N-1}{N} S^2 - \frac{(n-1)k}{N} S_{Wsy}^2$$

Where S_{Wsy}^2 is mean square within systematic sample.

10. The ratio estimate of population total Y, the population mean \bar{Y} and population ratio R are $\hat{Y}_R = \frac{\bar{y}}{\bar{x}} X$, $\hat{Y}_R = \frac{\bar{y}}{\bar{x}} \bar{X}$ and $\hat{R} = \frac{\bar{y}}{\bar{x}}$ respectively, then show that:

$$Var(\hat{Y}_R) = \frac{N^2(1-f) \sum_{i=1}^N (y_i - Rx_i)^2}{n(N-1)}$$

$$Var(\hat{Y}_R) = \frac{1-f}{n} \frac{\sum_{i=1}^N (y_i - Rx_i)^2}{N-1}$$

$$Var(\hat{R}) = \frac{(1-f) \sum_{i=1}^N (y_i - Rx_i)^2}{n\bar{X}^2(N-1)} \quad \text{where } f = \frac{n}{N}$$

11. Prove that variance of regression estimate is given by; $Var(\bar{y}_{lr}) = \frac{1-f}{n} [S_Y^2 - 2b_0^2 S_{XY} + b_0^2 S_X^2]$. Where b_0 is the pre-assigned constant value for the regression coefficient.

THE END