

Mid-West University
Examinations Management Office
End Semester Examinations 2081

Bachelor level/ B.Sc / 5th Semester

Time: 3 hours

Subject: Sampling theory (STAT453/STA453)

Full Marks: 60

Pass Marks: 30

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

Attempt all the questions

[4x6=24]

1. What is questionnaire? What are the requisites of good questionnaire? [1+5]
2. For simple random sampling, prove that sample mean square is unbiased estimator of population mean square. [6]
3. What is stratified random sampling? In SRSWOR prove that the variance of \bar{y}_{st} is given by
$$Var(\bar{y}_{st}) = \frac{1}{N^2} \sum N_i(N_i - n_i) \frac{s_i^2}{n_i} \quad w \quad [1+5]$$
4. Describe the procedure of drawing PPS sampling? [6]

OR

In systematic sampling, prove that:

$Var(\bar{y}_{sys}) = \frac{N-1}{N} \frac{s^2}{n} [1 + (n-1)\rho_w]$. Where, $\rho_w = \frac{E(y_{ij}-\bar{y})(y_{iu}-\bar{y})}{E(y_{ij}-\bar{y})^2}$ is the correlation coefficient between pair of units. [6]

Group-B

Attempt all the questions

[6x4=24]

5. Discuss on different steps used in conducting sample survey. [4]
6. Write down sampling and non-sampling error in occurred in sample survey? [2+2]
7. What are the factors affecting size of sample? A survey company wants to conduct a survey on customer satisfaction for a company with 500,000 customers. The company wants the survey to have a margin of error of 3% with a 99% confidence level. How large of a sample size should the survey company select? [1+4]
8. Prove that: $Var(\bar{y})_{SRS} \geq Var(\bar{y}_{st})_{Prop} \geq Var(\bar{y}_{st})_{Opt}$. [4]
9. How can you draw sample by using systematic sampling method? Also solve the problem in systematic sampling if $N \neq nk$. [2+2]
10. Discuss on necessity of ratio and regression estimation under simple and stratified random sampling. [2+2]

OR

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: $Var(\hat{Y}_R) = \frac{N^2(1-f)}{n} \frac{\sum_{l=1}^N (y_l - R x_l)^2}{N-1}$ [4]

Group-C

Attempt all questions

[6x2=12]

11. Define the concept of statistical population and sample.
12. How can you draw sample by using simple random sampling?
13. Write down different non-probability sampling technique.
14. Write in brief principle of sample survey.
15. Enumerate all possible sample of size 2 taken from the population whose elements are 2, 4, 5, and 8 by using SRSWOR.
16. What is regression estimator?

The End