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5 SEM TDC STS M 3 (N/O)

2 0 1 7

(November)

STATISTICS

(Major)

Course : 503

(**Sample Survey**)

*The figures in the margin indicate full marks
for the questions*

(**New Course**)

Full Marks : 80

Pass Marks : 24

Time : 3 hours

1. Select the correct alternative out of the given ones : 1×8=8

(a) The difference between the value of a statistic obtained from a random sample and the corresponding population parameter value is called

(i) non-sampling error

(ii) sampling error

(iii) standard error

(iv) None of the above

(b) If the values of a sample of size 5 are 1, 2, 3, 4, 5, then the sample variance is

(i) 2

(ii) $\sqrt{2}$

(iii) 4

(iv) 10

(c) In probability sampling, an increase in the sample size

(i) increases the precision of estimates

(ii) decreases the precision of estimates

(iii) does not affect the precision of estimates

(iv) increases the sampling error

(d) In simple random sampling, the probability that a specified unit is included in the sample of size n from a population of size N is

(i) $\frac{1}{n}$

(ii) $\frac{n}{N}$

(iii) $\frac{1}{N}$

(iv) None of the above

- (e) Stratified random sample is a type of
- (i) unrestricted sample
 - (ii) subjective sample
 - (iii) purposive sample
 - (iv) restricted sample
- (f) Under proportional allocation, the size of the sample from each stratum depends on
- (i) total sample size
 - (ii) size of the stratum
 - (iii) population size
 - (iv) All of the above
- (g) A systematic sample is selected by including
- (i) every n th unit from the population
 - (ii) n largest units
 - (iii) first n units
 - (iv) None of the above
- (h) In cluster sampling, it is desirable to have
- (i) as great a heterogeneity as possible within clusters
 - (ii) as small a difference as possible between clusters
 - (iii) Both (i) and (ii)
 - (iv) None of the above

2. Answer the following questions in brief :

2×8=16

- (a) Define population and sample.
- (b) In what situations is sampling inevitable?
- (c) What do you mean by probability sampling?
- (d) How would you select a simple random sample using 'random number tables'?
- (e) What are the advantages of simple random sampling?
- (f) What is proportional allocation in stratified random sampling?
- (g) What are the advantages of systematic sampling?
- (h) What are the drawbacks of cluster sampling?

3. Distinguish between sample survey and complete enumeration. Describe briefly the advantages of carrying out a sample survey in preference to a complete enumeration. Under what circumstances can complete enumeration be recommended in preference to a sample survey?

2+6+3=11

4. (a) (i) What do you mean by simple random sampling with replacement and without replacement from a finite population?

- (ii) Show that in simple random sampling without replacement the probability of selecting a specified unit of the population at any given draw is equal to the probability of selecting at the first draw.
- (iii) Discuss briefly the determination of sample size for a simple random sample without replacement for a specified precision. $4+4+3=11$

Or

- (b) (i) Define simple random sampling with replacement and without replacement from a finite population.
- (ii) Prove that in simple random sampling without replacement the sample mean is an unbiased estimator of the population mean and the sample mean square is an unbiased estimator of the population mean square. $4+3+4=11$

5. Describe the procedure of stratified random sampling. Mention two commonly used stratifying factors. Under what conditions is stratified random sampling preferred to simple random sampling? Prove that for stratified random sampling

$$\bar{y}_{st} = \frac{1}{N} \sum_{i=1}^k N_i \bar{y}_{ni}$$

is an unbiased estimator of the population mean \bar{y}_N . $3+1+4+3=11$

6. (a) A population consists of $N = nk$ units. Explain how you would obtain a systematic sample from this population. How would you proceed to analyze the data from this sample so as to estimate the population total? Obtain the variance of the estimated mean.

$$5 + 2\frac{1}{2} + 3\frac{1}{2} = 11$$

Or

- (b) Describe cluster sampling. A simple random sample of n clusters is drawn without replacement from a population of N clusters, each containing M elements. Give an unbiased estimator of the mean square between elements of the population.

$$5 + 6 = 11$$

7. Write short notes on any *two* of the following :

$$6 \times 2 = 12$$

- (a) NSSO and CSO
 (b) Ratio and regression estimates in SRS
 (c) Optimum allocation in stratified random sampling
 (d) Systematic sampling vs. stratified random sampling

(Old Course)

Full Marks : 80

Pass Marks : 32

Time : 3 hours

1. Select the correct alternative out of the given ones : 1×8=8

(a) Which one of the following statements is true?

(i) Population mean increases with the increase of the sample size.

(ii) Population mean decreases with the increase of the sample size.

(iii) Population mean decreases with the decrease of the sample size.

(iv) Population mean is a constant.

(b) If the values of a sample of size 5 are 1, 2, 3, 4, 5, then the sample variance is

(i) 2

(ii) $\sqrt{2}$

(iii) 4

(iv) 10

- (c) In probability sampling, an increase in the sample size
- (i) increases the precision of estimates
 - (ii) decreases the precision of estimates
 - (iii) does not affect the precision of estimates
 - (iv) increases the sampling error
- (d) In simple random sampling, the probability that a specified unit is included in the sample of size n from a population of size N is
- (i) $\frac{1}{n}$
 - (ii) $\frac{n}{N}$
 - (iii) $\frac{1}{N}$
 - (iv) None of the above
- (e) Stratified random sample is a type of
- (i) unrestricted sample
 - (ii) subjective sample
 - (iii) purposive sample
 - (iv) restricted sample

- (f) Under proportional allocation, the size of the sample from each stratum depends on
- (i) total sample size
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 - (iv) All of the above
- (g) A systematic sample is selected by including
- (i) every n th unit from the population
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 - (iv) None of the above
- (h) In cluster sampling, it is desirable to have
- (i) as great a heterogeneity as possible within clusters
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2. Answer the following questions in brief :

$2 \times 8 = 16$

- (a) Define population and sample.
- (b) In what situations is sampling inevitable?

- (c) What do you mean by probability sampling?
 - (d) How would you select a simple random sample using 'random number tables'?
 - (e) What are the advantages of simple random sampling?
 - (f) What is proportional allocation in stratified random sampling?
 - (g) What are the advantages of systematic sampling?
 - (h) What are the drawbacks of cluster sampling?
3. Discuss briefly the main steps involved in a sample survey. Enumerate the advantages of a sample survey over complete enumeration.

6+5=11

4. (a) (i) What do you mean by simple random sampling with replacement and without replacement from a finite population?
- (ii) Show that in simple random sampling without replacement the probability of selecting a specified unit of the population at any given draw is equal to the probability of selecting at the first draw.

- (iii) Discuss briefly determination of sample size for a simple random sample without replacement for a specified precision. 4+4+3=11

Or

- (b) (i) Define simple random sampling with replacement and without replacement from a finite population.
- (ii) Prove that in simple random sampling without replacement the sample mean is an unbiased estimator of the population mean and the sample mean square is an unbiased estimator of the population mean square. 4+3+4=11

5. Describe the procedure of stratified random sampling. Mention two commonly used stratifying factors. Under what conditions is stratified random sampling preferred to simple random sampling? Prove that for stratified random sampling

$$\bar{y}_{st} = \frac{1}{N} \sum_{i=1}^k N_i \bar{y}_{n_i}$$

is an unbiased estimator of the population mean \bar{y}_N . 3+1+4+3=11

6. (a) Explain the method of systematic sampling. Obtain an unbiased estimator of the population mean. Discuss the disadvantages of systematic sampling.

5+3+3=11

Or

- (b) Describe cluster sampling. A simple random sample of n clusters is drawn without replacement from a population of N clusters, each containing M elements. Give an unbiased estimator of the mean square between elements of the population.

5+6=11

7. Write short notes on any two of the following :

6×2=12

- (a) Sampling and non-sampling error
- (b) Sampling for proportions
- (c) Optimum allocation in stratified random sampling
- (d) Systematic sampling vs. stratified random sampling
