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5 SEM TDC STS M 3 (N/O)

2016

(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) Sampling is inevitable in which of the following situation(s)?

(i) When the population is infinite

(ii) Blood test of a person

(iii) Testing the life of battery cells

(iv) All of the above

(b) The number of all possible samples of size 2 from a population of size 6 without replacement is

(i) 12

(ii) 15

(iii) 30

(iv) None of the above

(c) Which of the following statements does not hold good?

(i) An increase in sample size reduces the standard error

(ii) An increase in sample size decreases the sampling error

(iii) Decrease in sample size results in the reduction of population standard deviation

(iv) The precision of an estimate depends on sample size

(d) The selection procedure of a sample having no involvement of probability is known as

(i) purposive sampling

(ii) subjective sampling

(iii) judgement sampling

(iv) All of the above

(Continued)

(e) In SRSWR, the variance of the sample mean is given by

(i) $\frac{\sigma^2}{n}\frac{N-n}{N}$

(ii) $\frac{S^2}{n}\frac{N-n}{N}$

(iii) $\frac{\sigma^2}{n}$

(iv) None of the above

(f) Regarding the number of strata, which statement is true?

(i) Lesser the number of strata, better it is

(ii) More the number of strata, worse it is

(iii) More the number of strata, better it is

(iv) Not more than twenty items should be there in a stratum

(g) Systematic sampling may yield highly biased estimates, if

(i) there are periodic features associated with the sampling involved

(ii) the frame is arranged wholly at random

(iii) N is a multiple of n

(iv) None of the above

(Turn Over)

(h) A population was divided into clusters and it was found that within clusters variation was less than the variation between clusters. If a sample of units was selected from each cluster, the sampling procedure used was

(i) multistage sampling

(ii) stratified sampling

(iii) cluster sampling

(iv) systematic sampling

2. Answer the following questions in brief : 2×8=16

(a) What is a sample survey?

(b) What is meant by sampling frame?

(c) What is meant by sampling error?

(d) What is lottery system for selecting a simple random sample?

(e) What is proportional allocation in stratified random sampling?

(f) What are the main differences between cluster sampling and stratified random sampling?

(g) State the circumstances when systematic sampling is optimum.

(h) What are NSSO and SRS?

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 SRSWOR the sample mean is an unbiased estimator of the population mean.

(iii) How would you determine the sample size for a simple random sample without replacement for specified precision? 4+3+4=11

Or

(b) *(i)* What do you mean by simple random sampling of attributes?

(ii) In a population of N units the number of units possessing a certain characteristic is A and in a simple random sample of size n from it, the number of units possessing that characteristic is a. If $P=\frac{A}{N}$, $p=\frac{a}{n}$, $Q=1-P$ and $q=1-p$, then show that p is an

unbiased estimator of population proportion P and

$$\text{var}(p) = \frac{N-n}{N-1}\frac{PQ}{n}$$ 4+(3+4)=11

5. What is stratified random sampling? How do you estimate the population mean from a stratified random sample? What are the advantages of stratified random sampling over simple random sampling? 3+4+4=11

6. *(a)* Explain the method of systematic sampling. Obtain an unbiased estimator of the population mean. What are the advantages and disadvantages of systematic sampling? 4+3+4=11

Or

(b) Describe cluster sampling. In what situation the cluster sampling be preferred? What sampling design is used to select clusters from a population? 6+3+2=11

7. Write short notes on the following : 6×2=12

(a) Optimum allocation in stratified random sampling

(b) Populations with linear trend

(Continued)

(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) The number of all possible samples (WOR) of size 2 from a population of size 10 is

(i) 45

(ii) 20

(iii) 5

(iv) None of the above

(b) If all the observations in a sample are of same value, the variance of the sample is

(i) 1

(ii) ∞

(iii) 0

(iv) None of the above

(c) Which 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 constant

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

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

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

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

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

(e) Variance of $\bar{y}_{st}$ under random sampling, proportional allocation and optimum allocation hold the inequality as

(i) $V_{ran}(\bar{y}_{st}) \leq V_{prop}(\bar{y}_{st}) \leq V_{opt}(\bar{y}_{st})$

(ii) $V_{ran}(\bar{y}_{st}) \geq V_{prop}(\bar{y}_{st}) \geq V_{opt}(\bar{y}_{st})$

(iii) $V_{ran}(\bar{y}_{st}) \geq V_{opt}(\bar{y}_{st}) \geq V_{prop}(\bar{y}_{st})$

(iv) None of the above

(f) Systematic sampling means

(i) selection of n middle units in a sequence

(ii) selection of n largest units

(iii) selection of n units situated at equal distances

(iv) None of the above

(g) Non-response in surveys means

(i) non-availability of respondents

(ii) non-return of questionnaires by the respondents

(iii) refusal to give information by the respondents

(iv) All of the above

(h) Circular systematic sampling is used when

(i) N (population size) is a multiple of n (sample size)

(ii) N is a whole number

(iii) N is not a multiple of n

(iv) None of the above

2. Answer the following questions in brief : 2×8=16

(a) Define population and sample.

(b) What do you mean by sampling frame?

(c) What is meant by sampling error?

(d) What is meant by probability sampling?

(e) What is lottery system for selecting a random sample?

(f) What is proportional allocation in stratified random sampling?

(g) What are the main differences between cluster sampling and stratified random sampling?

(h) How would you know that a population is in linear trend?

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 SRSWOR, the sample mean is an unbiased estimator of the population mean, i.e.,

$$E(\bar{y}_n) = \bar{Y}_N$$

(iii) Show that in SRSWOR, the variance of the sample mean is given by

$$\text{var}(\bar{y}_n) = \frac{S^2}{n}\frac{N-n}{N}$$ 4+3+4=11

Or

(b) *(i)* What do you mean by simple random sampling of attributes?

(ii) In a population of N units, the number of units possessing a certain characteristic is A, and in a simple random sample of size n from it, the number of units possessing that characteristic is a. If $P = \frac{A}{N}$, $p = \frac{a}{n}$, $Q = 1 - P$ and $q = 1 - p$, show that p is an

unbiased estimator of population proportion P, and

$$\text{var}(p) = \frac{N-n}{N-1}\frac{PQ}{n}$$ 4+(3+4)=11

5. What is stratified random sampling? How do you estimate the population mean from a stratified random sample? What are the advantages of stratified random sampling over simple random sampling? 3+4+4=11

6. *(a)* What is systematic sampling? Obtain an unbiased estimator of population mean. Discuss its advantages and disadvantages. 4+3+4=11

Or

(b) 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+2½+3½=11

7. Write short notes on the following : 6×2=12

(a) Optimum allocation in stratified random sampling

(b) Cluster sampling

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