

**SAMPLE SURVEYS**

CSM- 355

(Semester-V<sup>th</sup>)

Time Allowed: 2 Hours

Maximum Marks: 30

Note: The candidates are required to attempt any four questions from all. Each question carry equal marks.

1. (a) What do you understand by sampling? Describe the principle steps of sampling. With examples.  
  
(b) How does sampling without replacement differ from that with replacement? Which of the two gives lower value of the standard deviation of the sample mean? Explain by considering samples of size three from a population consisting of 10 numbers 2,3,6,8,11,12,15,17,18,20.
2. Discuss simple random sampling of attributes and find :  
(a) Unbiased estimate of variance of proportion.  
  
(b) Define sampling frame and method of collecting sample. How will you obtain a simple random sample of size 6 from a population of 36 units by using lottery method? Explain.
3. (a) Explain, how 'Random Number Table' are used to select a random sample of size n from a population of size N.  
  
(b) The following table of ten random numbers of two digits each is provided to the field investigator :  
34, 96, 61, 85, 49, 78, 50, 02, 27, 12  
How should he use this table to make a random selection of 5 plots out of 40 ? Explain.
4. If  $(X_i, Y_i)$   $i=1,2,\dots,N$  are the pairs of variates defined for unit  $i=1,2,\dots,N$  of the population and  $(\bar{x}, \bar{y})$  are corresponding means of the simple random sample  $(x_i, y_i)$   $i=1,2,\dots,n$  of size n taken without replacement, then prove that :  
(a)  $cov(\bar{x}_n, \bar{y}_n) = \frac{N-n}{Nn} \frac{1}{N-1} \sum_{i=1}^N (X_i - \bar{X}_N) (Y_i - \bar{Y}_N)$   
where  $\bar{X}_n, \bar{Y}_n$  are corresponding population means.  
  
(b) Prove that in SRSWOR the sample mean is an unbiased estimate of the population mean.
5. (a) Define Stratified Sampling and Various allocation method. In usual notations prove that  
$$V_{ran} > V_{prop} > V_{opt}$$

- (b) Define Stratified Proportional Sampling in detail with example. Describe the finite variance of Proportional sampling under stratification.
6. (a) Show that in simple random sampling the large sample variance of the regression estimator is given by  $V(\bar{y}_{st}) = \frac{1-f}{n} S_y^2 (1 - \rho^2)$ .  
 (b) Define ratio estimator for estimating the population mean of a study variable  $y$ . obtain its bias.
7. (a) Prove that the regression estimator is always more efficient as compare to ratio estimator and mean per unit estimator under simple random sample without replacement for estimating the population mean.  
 (b) Define the term regression method of estimation with example. Find variance if such estimator.
8. (a) In stratified random sample cost function  $C = a + \sum_{i=1}^k C_i k_i$ , where  $a$  is overhead cost and  $C_i$  is cost per unit in the  $i$ th stratum. Prove that  $V(\bar{y}_{st})$  is minimum if  $n_i \propto \frac{N_i S_i}{\sqrt{C_i}}$  and find  $V(\bar{y}_{st})$  in this case. The symbols have their usual meaning.  
 (b) Define stratified proportional sampling in your words with example and find the variance of it.
9. (a) Discuss the possible bias of the sample is taken by taking mangoes from the top in a basket of mangoes.  
 (b) Define finite population correction.  
 (c) Why sample survey is superior to a census survey.  
 (d) Discuss sampling and non-sampling error.  
 (e) Discuss proportion allocation used in sampling procedure.  
 (f) Show that in case of stratified sampling the larger the variability within a stratum, the larger should be the size of the sample from that stratum.  
 (g) Under what situations you should prefer ratio method?