

BASIC SAMPLING THEORY

Time: Three Hours

Maximum: 75 Marks

SECTION-A (10 Marks)

Answer ALL questions

ALL questions carry **EQUAL** marks

$$(10 \times 1 = 10)$$

Module No.	Question No.	Question	K Level	CO
1	1	The complete enumeration of all units of a population is called: a) Survey b) Sampling c) Census d) Pilot survey	K1	CO1
	2	One of the functions of NSSO is to _____ a) Conduct industrial surveys b) Estimate population totals directly c) Collect socio-economic data for policy planning d) Publish census reports	K2	CO1
2	3	In simple random sampling without replacement (SRSWOR), the probability of selecting any particular unit in one draw is _____ a) $\frac{1}{N}$ b) $\frac{n}{N}$ c) $\frac{N-1}{N}$ d) $\frac{1}{n}$	K1	CO2
	4	The main difference between SRSWR and SRSWOR in terms of variance is _____ a) SRSWOR gives a larger variance b) SRSWR gives a smaller variance c) SRSWOR includes the finite population correction factor d) Both give exactly the same variance	K2	CO2
3	5	The unbiased estimator of the population mean in stratified sampling is _____ a) Sample mean from any one stratum b) Weighted average of stratum means c) Arithmetic mean of all sample units d) Population total divided by H	K1	CO3
	6	Which one of the following statements is true about stratified random sampling? a) Stratified sampling always gives smaller variance than SRS. b) Stratified sampling gives equal or smaller variance than SRS. c) Stratified sampling always gives larger variance than SRS. d) Stratified sampling always reduces cost.	K2	CO3
4	7	In circular systematic sampling, after reaching the last unit in the population: a) Sampling stops b) Sampling continues from the first unit again c) The last unit is repeated d) Extra units are discarded	K1	CO4
	8	The efficiency of systematic sampling compared to SRS is highest when: a) Population units are randomly ordered b) Population shows a linear trend c) Population has strong periodic patterns d) Sample size is small	K2	CO4
5	9	The main purpose of using an auxiliary variable in survey sampling is: a) To reduce sampling variance using known information b) To replace the study variable completely c) To increase sample size d) To avoid bias in population total	K1	CO5
	10	The bias of the ratio estimator decreases as: a) Sample size increases b) Correlation between study and auxiliary variable decreases c) Auxiliary variable variance increases d) Study variable variance increases	K2	CO5

Cont...

SECTION - B (35 Marks)

Answer ALL questions

ALL questions carry EQUAL Marks (5 × 7 = 35)

Module No.	Question No.	Question	K Level	CO
1	11.a.	Explain the advantages of sampling over complete census.	K2	CO1
		(OR)		
	11.b.	Describe the functions of NSSO and CSO in India.		
2	12.a.	Show that $\bar{y}_n$ is an unbiased estimate of $\bar{Y}_N$ in simple random sampling.	K3	CO2
		(OR)		
	12.b.	Obtain the confidence limits for the population mean under simple random sampling.	K4	
3	13.a.	Write about the advantages of stratified random sampling.	K4	CO3
		(OR)		
	13.b.	Prove that $V(\bar{y}_{st})$ under the proportional allocation of stratified random sampling.	K3	
4	14.a.	Prove that $V(\bar{y}_{sys}) = \frac{N-1}{N} S^2 - \frac{(n-1)k}{N} S_{wsys}^2$	K3	CO4
		(OR)		
	14.b.	Prove that systematic sampling gives more precise estimate of the population mean if $S_{wsys}^2 \geq S^2$.	K3	
5	15.a.	Show that $V(\hat{R}) = \left(\frac{1-f}{n}\right) R^2 [C_{yy} + C_{xx} - 2\rho C_x C_y]$.	K3	CO5
		(OR)		
	15.b.	Describe the variance of the separate regression estimator.	K4	

SECTION - C (30 Marks)

Answer ANY THREE questions

ALL questions carry EQUAL Marks (3 × 10 = 30)

PModule No.	Question No.	Question	K Level	CO
1	16	Explain the principal steps involved in the planning and execution of sample survey.	K4	CO1
2	17	Prove that in SRSWOR $V(\bar{y}_n) = \frac{N-n}{N} \cdot \frac{S^2}{n}$.	K4	CO2
3	18	Comparison of SRS with stratified sampling proportional and optimum allocation for fixed sample size n.	K5	CO3
4	19	Prove that $V(\bar{y}_{sys}) = \frac{nk-1}{nk} \frac{S^2}{n} \{1 + (n-1)\rho\}$.	K4	CO4
5	20	Prove that $V(\hat{y}_{RC}) = \sum_h N_h^2 \left(\frac{1-f_h}{n_h}\right) [S_{y_h}^2 + R_h^2 S_{x_h}^2 - 2R_h \rho_h S_{x_h} S_{y_h}]$ by taking the total sample size large.	K4	CO5