111022

VCD/ SYB.Sc SEM-III STATISTICS II 100 MARKS 3 HRS

Note: (i) All questions are compulsory.

(ii) Use of Calculator is allowed.

Q.1) Answer the following questions

a) Correct the following if necessary: **(10M)**

i. If E(Parameter) = Statistic, then statistic is said to be an unbiased estimator of parameter.

ii. Cost function is considered in Neyman's allocation.

iii. SRSWOR is more efficient than SRSWOR.

iv. Ratio estimator is always more efficient than estimate of population mean.

v. Systematic sampling is not probability sampling.

b) Answer in One sentence: **(10M)**

i. State any two limitations of stratified random sampling.

ii. Define simple random sampling with replacement.

iii. Write 100(1-α)% C.I. for population mean based on the sample of size n selected by SRSWR.

iv. Define ratio estimate of population mean. State its variance

v. State any two advantages of using cluster sampling.

Q.2) Attempt any TWO **(20M)**

a) Explain Probability of drawing a sample using Simple Random Sampling with Replacement and without replacement.

b) Write characteristics of a good questionnaire.

c) A simple Random Sample of size 3 is drawn from a population of size N with replacement. Let P_1, P_2 and P_3 be the probabilities of the sample containing 1, 2 and 3 different units respectively. Then show that $P_1 = \frac{1}{N^2}$, $P_2 = \frac{3(N-1)}{N^2}$, $P_3 = \frac{(N-1)(N-2)}{N^2}$.

Q.3) Attempt any TWO **(20M)**

a) Describe the stratified random sampling procedure. How it is different from simple random sampling?

b) A population of size 2000 is divided into 4 strata. Their sizes and standard deviations are given below:

Stratum No.	Stratum Size (N_i)	S.D. (S_i)
1	400	6
2	600	8
3	500	12
4	500	14

A Stratified random sample of size 240 is to be drawn from the population. Determine the sample sizes from these 4 stratum under: (i) Proportional allocation (ii) Neyman's allocation.

c) Explain why we need stratification?

Q.4) Attempt any TWO **(20M)**

a) Prove that for large sample $V(r) \approx \frac{1}{\bar{X}^2}(1-\frac{n}{N})\frac{S_r^2}{n}$ where $S_r^2 = \frac{1}{N-1}\sum_1^N (Y_i - RX_i)^2$

b) A mathematics achievement test was given to 486 students prior to entering a certain college who then took a calculus class. A simple random sample of 10 students is selected and their calculus scores are recorded. It is known that average achievement test score for the 486 students was 52.

students	1	2	3	4	5	6	7	8	9	10
Test score x	43	52	39	34	75	21	64	57	28	47
Calculus score y	78	75	65	56	98	52	82	92	73	89

Estimate the average score by using regression estimation and estimate its S.E.

c) i. State the disadvantages of systematic sampling.

ii. Write a short note on cluster sampling.

Q.5) Attempt any TWO **(20M)**

a) i. In SRSWOR, the sample mean is an unbiased estimator of the population mean.

ii. Compare SRSWR with SRSWOR.

b) $V(\bar{y}_{st})$ is minimum for fixed sample size.

c) i. Distinguish between ratio estimation and regression estimation.

ii. Explain the procedure of two stage sampling.

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