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0404N77

Candidate's Seat No :_____

B.Sc Semester-6 Examination

CC 308

Statistics

April-2024

Time : 2-30 Hours] **[Max. Marks : 70**

Instructions

1. *All questions carry equal marks.*
2. *Figures to the right indicate full marks of the questions/sub-questions.*

Q. 1 *a* Define terms: *population, sample, sample survey* and *complete enumeration*. State difference between census and sample survey. *07*

b What is sampling? Write a note on Simple Random Sampling. State its advantages. *07*

OR

Q. 1 *a* In usual notations, for the simple random sampling under without replacement, prove that $E(s^2) = S^2$, hence or otherwise show that $E(v(\bar{y})) = V(\bar{y})$ *07*

b There were 1000 students in a college and a random sample of 200 students was taken. Out of these 200 students 40 students used to wear spectacles. Then, (i) estimate the number of students with spectacles in a college and find its standard error. *07*

Q. 2 *a* Explain terms in details: (i) *Stratification (ii) Stratified sampling.* With reference to *stratified sampling,* in usual notations, prove that $V(\bar{y}_{st}) = \frac{1}{N^2}\{\sum_h \frac{N_h^2 S_h^2}{n_h} - \sum_h N_h S_h^2\}$. *07*

b State different allocations used in *stratified sampling*. Explain, in detail, Proportional allocation. *07*

OR

Q. 2 *a* In usual notations, prove *07*

$$V(\bar{y}_{st})_{Neyman} = \left(\frac{1}{nN^2}\right)\sum_h (N_h S_h)^2 - \left(\frac{1}{N^2}\right)\sum_h N_h S_h^2$$

b Given fixed value C_0 of total cost C= $a + \Sigma_{h=1}^{k} b_h n_h$, determine sample size (n_h), so that variance of stratified mean, V(ȳst) becomes minimum. *07*

Q. 3 *a* Define Systematic sampling. Describe procedure of selecting a random sample under systematic sampling with N=nk. *07*

b In usual notations, prove that, if $S_{wsy}^2 > S^2$, systematic sampling is more efficient than simple random sampling. *07*

OR

Q. 3 *a* In usual notations, prove that if $N = nk$, $V(\bar{y}_{sy}) = \frac{N-1}{Nn}[1 + (n-1)\rho]S^2$ *07*
Where ρ = Intra class correlation coefficient between the pairs of units of same systematic Sample.

b In usual notations, prove that systematic sample mean is an unbiased estimate of population mean. *07*

Q. 4 *a* Give brief idea about *Two Stage Sampling*. Why two stage sampling is an incomplete stratification? *07*

b In usual notation for *two stage sampling* show that *07*

$$V(\bar{\bar{y}}) = \left(1 - f_1\right)\frac{S_1^2}{n} + \left(1 - f_2\right)\frac{S_2^2}{mn}$$

P T O

OR

Q. 4	*a*	*How does two stage sampling differ from cluster sampling?*	**07**
	b	For *Two Stage Sampling*, derive the formula for unbiased estimator of $V(\bar{y})$.	**07**
Q. 5		Answer the following questions: (Any Seven)	**14**
	1.	Give two names of the commonly used random numbers tables.	
	2.	State two of the available tests performed to ascertain randomness in these tables of random numbers. State the variance of proportion, in case of Simple Random Sampling.	
	3.	Give one example of hypothetical population.	
	4.	Explain with replacement and without replacement scheme in sampling.	
	5.	In Stratified Sampling, random samples from strata are selected using Simple Random Sampling. Do you agree?	
	6.	What is Optimal allocation?	
	7.	State the role of stratum standard deviation in allocation of sample sizes.	
	8.	Give one advantage of stratified sampling.	
	9.	State the formula to find gain due to stratification as compared to simple random sampling.	
	10.	Is $V_{Ran}(\bar{y})$ less than $V_{prop}(\bar{y}_{st})$? Do you agree?	
	11.	State one advantage of Systematic Sampling.	
	12.	Give one application of Two Stage Sampling.	
	13.	For systematic sampling, state the value of ρ, for which it is less precise.	
	14.	Give one application of Two Stage Sampling.	

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