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- (a) (i) FALSE. SRSWOR is more efficient than SRSWR  
 (ii) FALSE. ~~V(Y)~~ TRUE  
 (iii) TRUE  
 (iv) FALSE. In stratified sampling, sample mean is not an unbiased estimator of population mean  
 (v) TRUE.

2 a) Survey (2) Census Survey (2) Sample Survey (2)

b) Advantages (4)

b)  $E(S^2) = S^2$  for SRSWOR (5)  
 $= \sigma^2$  for SRSWR (5)

c) Obtaining expression for  $n$  general - (8)  
 for SRSWOR - (2)

3 a) Def<sup>n</sup> of estimator (3) Unbiasedness of estimator (3)

Its variance (4)

b) Obtain  $n_h = n \frac{W_h S_h / \sqrt{C_h}}{\sum_{h=1}^H W_h S_h / \sqrt{C_h}}$  - (8)

$n_h \propto \frac{N_h S_h}{\sqrt{C_h}}$  - (2)

c)  $V(\bar{y})_{SRSWOR} \geq V(\bar{y})_{prop}$  - (6)

$V(\bar{y})_{prop} \geq V(\bar{y})_{opt ( Ney )}$  - (4)

Q 4 a) Notations  $\text{---} \textcircled{2}$  Formulas for variances (2 each)  
Comparison of variances  $\text{---} \textcircled{4}$

b) Linear Regression estimate  $\text{---} \textcircled{3}$

Derivation of expression of variance when  $b$  unknown  $\text{---} \textcircled{5}$

State of estimate of variance  $\text{---} \textcircled{2}$

c) (i) Cluster sampling  $\text{---} \textcircled{5}$

(ii) Systematic sampling  $\text{---} \textcircled{5}$

Q 5 a) Definitions (2 each)

$$E(\bar{y}) = \bar{Y} \quad \text{---} \textcircled{3}$$

$$V(\bar{y}) = \frac{N-n}{N} \cdot \frac{S^2}{n} \quad \text{---} \textcircled{3}$$

b) Allocation, Proportional allocation, Neyman's AL  
(2 each)

~~$n_h$~~   $n_h$  for 2 cases with notations  $\text{---} \textcircled{4}$

c) Estimator of pop<sup>n</sup> Total  $Y$   $\text{---} \textcircled{2}$

Obtain Variance of estimator of pop<sup>n</sup> Total  $\text{---} \textcircled{6}$

Expression for estimate of this variance  $\text{---} \textcircled{2}$

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