

Final-Assignment-Q.2 (12 marks)

Question 2. (12 marks)

Assume that the following are data from cluster sampling with simple random sampling of clusters. There are 10 clusters (primary units) and a total of 100 secondary units in the population. For each of the $n = 3$ selected clusters, y_i is the cluster total for the variable of interest and M_i is cluster size:

$$y_1 = 4, M_1 = 5; \quad y_2 = 12, M_2 = 20; \quad y_3 = 7, M_3 = 10.$$

- (a) (4 marks) Give an unbiased estimate of the population total. Estimate the variance of that estimator.

- (b) (4 marks) Give the ratio-type estimate of the population total and estimate the variance of that estimator.

- (c) (4 marks) Assuming that the sample was obtained with selection probabilities proportional to cluster size (PPS), with replacement, give an unbiased estimate of the population total and estimate the variance of that estimator.

- (d) (2 marks) Which of the sampling strategies in (a), (b) and (c) would you prefer?