



'समानो मन्त्रः समितिः समानी'

UNIVERSITY OF NORTH BENGAL

B.Sc. Programme 3rd Semester Examination, 2023

DSC1/2/3-P3-STATISTICS

METHODS OF SAMPLING AND SAMPLING DISTRIBUTION

Time Allotted: 2 Hours

Full Marks: 40

The figures in the margin indicate full marks.

GROUP-A

1. Answer any **five** questions from the following: 1×5 = 5
- (a) Explain parameter and statistic.
 - (b) What is random number?
 - (c) What is meant by stratified random sampling?
 - (d) State the formula for standard error of sample mean.
 - (e) Distinguish between 'standard error' and 'standard deviation'.
 - (f) What is bias and how does it arise in sampling?
 - (g) Write down two uses of chi-square distribution.
 - (h) What is sampling fluctuation?

GROUP-B

2. Answer any **three** questions from the following: 5×3 = 15
- (a) If a random variable X is distributed normally around a mean 20 with S.D. 3, describe the important characteristics of the probability distribution of $Y = \frac{X - 20}{3}$.
 - (b) State the situation when stratified samples will be suitable.
 - (c) A simple random sample of size 5 is drawn without replacement from a finite population consisting of 41 units. If the population standard deviation is 6.25, what is the standard error of sample mean? (Use finite population correlation)
 - (d) Describe important characteristics of t -distribution and F -distribution.
 - (e) A random sample of two individuals is to be drawn from a population of size 40. What is the possible number of distinct samples when sampling is (i) with replacement and (ii) without replacement?

GROUP-C

3. Answer any *two* questions from the following: 10×2 = 20

(a) Derive the formulae for expectation and standard error of sample mean in both simple random sampling with replacement (SRSWR) and simple random sampling without replacement (SRSWOR) from a finite population.

(b) If a random sample of size n is drawn from a normal population with mean μ and S.D. σ , then show that $\frac{\bar{x} - \mu}{s/\sqrt{n-1}}$ follows t -distribution with $(n-1)$ degrees of freedom (d.f.).

(c) Describe simple random sampling and cluster sampling with their advantages and disadvantages.

(d) If X_1, X_2, \dots, X_n is a simple random sample of size n from a finite population N units with mean μ and variance σ^2 , then show that:

(i) $\text{var}(X_i) = \sigma^2$

(ii) $\text{cov}(X_i, X_j) = 0$ in SRSWR

$$= -\frac{\sigma^2}{N-1} \text{ in SRSWOR}$$

where X_i and X_j denote the sample units obtained at the i^{th} and j^{th} drawing respectively.

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