

**BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(MID SEMESTER EXAMINATION)**

CLASS: BTECH
BRANCH: ALL

SEMESTER: V
SESSION: MO/2022

SUBJECT: MA407 SURVEY SAMPLING

TIME: 2 HOURS

FULL MARKS: 25

INSTRUCTIONS:

1. The total marks of the questions are 25.
 2. Candidates attempt for all 25 marks.
 3. Before attempting the question paper, be sure that you have got the correct question paper.
 4. The missing data, if any, may be assumed suitably.
 5. Tables/Data handbook/Graph paper etc. to be supplied to the candidates in the examination hall.
-

		CO	BL
Q1 (a)	Explain the law of statistical regularity and the law of inertia of large numbers pointing out their importance in sample survey.	[2]	1 1.11
Q1 (b)	Distinguish between sampling and non-sampling errors.	[3]	2 1.23
Q2 (a)	Show that, irrespective of whether sampling is done with replacement or without replacement, sample mean is an unbiased estimator of population mean.	[2]	4 1.25
Q2 (b)	Let X_1, X_2 and X_3 be a random sample of size 3 from a population with mean μ and variance unity. Define two estimators U and V as follows: $U = X_1 + X_2 - X_3 \text{ and } V = 2X_1 + 3X_2 - 4X_3 .$ Verify whether U and V are unbiased estimators for estimating the population mean and also find which one of the two is more efficient.	[3]	4 1.20
Q3 (a)	Define simple random sampling (SRS). For what population is it recommended?	[2]	3 1.10
Q3 (b)	Show that in simple random sampling without replacement, the probability of any population unit to be selected in the sample at any draw equals the probability that it is selected in the first draw.	[3]	3 1.32
Q4 (a)	Write expressions of variance of sample mean for simple random sampling with and without replacement. Hence compare the efficiencies of these two sampling schemes.	[2]	4 1.31
Q4 (b)	In a simple random sample without replacement of size 200 taken from a certain town having 2000 persons, 112 were found to be employed. Estimate the total number of employed persons in the town and also find the standard error of the estimate.	[3]	3 1.25
Q5 (a)	Which two factors are crucial in determining the sample size?	[2]	1 1.12
Q5 (b)	A study of sampling methods was conducted in a population having 400 sampling units. By total count it was obtained that the population mean = 39 and population mean square = 46. In simple random sampling without replacement, how many sampling units should be chosen to estimate the population mean with a permissible marginal error of 10% and confidence level 95%?	[3]	2 1.25

: : : : : 30/09/2022 : : : : : M