

No. of Printed Pages : 6

MST-013

M. SC. (APPLIED STATISTICS)
(MSCAST)

Term-End Examination

June, 2026

MST-013 : SURVEY SAMPLING AND DESIGN
OF EXPERIMENTS-I

Time : 3 Hours

Maximum Marks : 50

Note : (i) *Question No. 1 is compulsory.*

(ii) *Attempt any **four** questions from the remaining question Nos. 2 to 6.*

(iii) *Use of scientific calculator (non-programmable) is allowed.*

(iv) *Symbols have their usual meanings.*

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1. State whether the following statements are True or False. Give reasons in support of your answer. 2×5=10

- (a) The probability of selection of Simple Random Sampling without Replacement sample of size 3 from the population of size 5 is 0.1.
- (b) In Systematic Sampling, when population size N is multiple of the sample size n , the first unit is to be selected in the sample with probability $1/N$.
- (c) The error degrees of freedom in a One-way Analysis of Variance of population means at 4 levels of a factor with 06 observations each will be 20.
- (d) If there are two missing values in a Randomised Block Design with 4 blocks and 5 treatments the Error degrees of freedom will be 10.
- (e) When sample size n coincides with population size N (where N is finite), then sampling error will be more than 95%.

2. Below are given the weights of 5 students :

S.No.	1	2	3	4	5
Weight kg)	56	49	66	64	55

Draw all possible samples of size 2 from the above population. Show that (i) Sample mean is an unbiased estimator of population mean, and (ii) Sample mean square is an unbiased estimate of Population mean square. Also obtain the variance of sample mean estimator under Simple Random Sampling without Replacement. 10

3. (a) A population of size 800 is divided into 3 strata. Their sizes and Standard Deviations (S.D.) are given below :

Stratum No.	I	II	III
Size	200	300	300
S.D.	6	8	12

A stratified random sample of size 120 is to be drawn from the population. Determine the sizes of samples from the three strata in case of (i) Proportional Allocation, and (ii) Neyman's Optimum Allocation. 5

(b) Derive the expression of the Variance of the sample mean estimator under Post-stratified Stratified Random Sampling Scheme. 5

4. (a) Describe the assumptions of Analysis of Variance. 3

(b) An experiment was conducted to determine the effect of different months of planting and different methods of planting on the field of sugarcane. The data on yield (in quintals) are given below :

Method of Planting	Month of Planting			
	Oct.	Nov.	Feb.	March
I	7.10	3.69	4.70	1.90
II	10.29	4.79	4.50	2.64
III	8.0	3.58	4.90	1.80

Test whether the data indicate a significant difference at 5% level of significance between :

- (i) Different months of planting, and
- (ii) Different methods of planting. 7

5. Identify the design given in the following table and carryout the analysis : 10

Column Row	I	II	III	IV
I	(A) 08	(C) 18	(B) 11	(D) 08
II	(C) 16	(B) 10	(D) 07	(A) 04
III	(B) 12	(D) 10	(A) 06	(C) 20
IV	(D) 10	(A) 09	(C) 28	(B) 16

6. (a) Distinguish between :

- (i) Linear and Circular Systematic samplings
- (ii) Sampling and Non-sampling errors

4

(b) A company has three manufacturing units. The data of the number of

produced items in five randomly selected shifts at each manufacturing unit are given in the following table :

Unit 1	29	27	30	27	28
Unit 2	32	33	31	34	30
Unit 3	25	24	24	25	26

Test whether there is a significant difference between the average number of items at three manufacturing units at 5% level of significance. 6

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