Assignment MST-013

for

M.Sc. (Applied Statistics) (MSCAST)

Valid from January 2025 to December 2025

SCHOOL OF SCIENCES
Indira Gandhi National Open University
New Delhi - 110068

Dear Learner,

Welcome to the M.Sc. (Applied Statistics) Programme.

As per the university guidelines, you need to complete the assignment for each theory course. Note that there are no assignments for lab courses in the MSCAST programme, namely, MSTL-011, MSTL-012, MSTL-013, MSTL-014, and MSTL-015. You should remember that writing answers to an assignment's questions will improve your writing skills and prepare you for the term-end examination.

It is compulsory to submit the assignments within the stipulated time to be eligible to appear in the term-end examination. You will not be allowed to appear for the term-end examination for a course if you do not submit the assignment for that course by the due date. As per the University guidelines, if you appear in the term-end examination of a course without submitting its assignment, the result of the term-end examination is liable to be cancelled/ withheld.

The assignments constitute the continuous component of the evaluation process and have 30% weightage in the final grading.

Before you write the assignments, you are advised to first go through the self-learning material for that course and then prepare the assignments carefully by following the instructions pertaining to the assignments. Your responses should not be a verbatim reproduction of the textual materials provided for self-learning purposes, but it should be in your own words.

If you have any doubts or problems pertaining to the course material and assignments, contact the programme in charge or the academic counsellor at your study centre. If you still have problems related to this assignment, feel free to contact the course coordinator.

Wishing you all the best in successfully completing the programme.

(Prof. Manish Trivedi)
Course Coordinator, MST-013
Email: manish_trivedi@ignou.ac.in

Instructions:

- Submit the assignments within the stipulated time. Otherwise, you will not be permitted to appear for the term-end examination.
- Solve the latest assignments uploaded for the current year/session.
- Read the instructions related to the assignments mentioned in the Programme Guide.
- Use only A-4 size paper to write your responses. It is mandatory to write all assignments neatly in your own handwriting. Typed or printed copies of the assignments will not be accepted. Note that you may use the printout only if a question specifically asks for the output of a program in MST-015 and MST-024.
- All questions given in the assignments are compulsory for each course.
- Express your response in your own words. You are advised to restrict your response based on the marks assigned to it. This will also help you to distribute your time in writing or completing your assignments on time.
- Securely fasten multiple pages together (you can staple or tie them) and number them carefully for each assignment separately.
- Do not forget to enclose the assignment question sheet of that course after the cover page of the assignment response (answer sheets). It is not compulsory to write each question separately before answering the question. Mention the question number for each answer.
- The solved assignment must be submitted at the Study Centre allotted to you before the due date set by the University. Please check the IGNOU website for updated information regarding the due date of assignment submission.
- You are advised to mention all information on the first page of the assignment response sheet, given on the next page.
- **Keep a copy of the assignment answer sheets with you before submission for future reference.**

ASSIGNMENT CODE: MST-013/TMA/2025

NAME: _____

ENROLLMENT NO: _____

ADMISSION CYCLE: _____

PROGRAMME CODE: MSCAST

COURSE CODE: MST-013

COURSE TITLE: SURVEY SAMPLING AND DESIGN OF EXPERIMENTS-I

REGIONAL CENTRE CODE: _____

STUDY CENTRE CODE: _____

ADDRESS: _____

_____

_____

CONTACT NUMBER: _____

EMAIL ID: _____

DATE OF SUBMISSION: _____

School of Sciences

Indira Gandhi National Open University

Maidan Garhi, New Delhi-110068 (INDIA)

TUTOR MARKED ASSIGNMENT
MST-013: Survey Sampling and Design of Experiments-I

Course Code: MST-013

Assignment Code: MST-013/TMA/2025

Maximum Marks: 100

Note: All questions are compulsory. Answer in your own words.

1. State whether the following statements are true or false and also give the reason in support of your answer: **(5×2=10)**

(a) $V_{opt}(\bar{x}_{st})$ lies between $V_{prop}(\bar{x}_{st})$ and $V_{Random}(\bar{x}_{st})$.

(b) The total number of all possible samples of size 3 without replacement from a population of size 7 is 21.

(c) While analysing the data of a 5 × 5 Latin Square design the d.f. for ESS is equal to 16.

(d) In a Two-way Analysis of Variance test with 5 observations per cell having 4 blocks and 4 treatments the degree of freedom for the total variation is 64.

(e) The probability of selection of a sample of n from the population by SRSWOR is $1/N$.

2(a) A sample of 100 employees is to be drawn from a population of collages A and B. The population means and population mean squares of their monthly wages are given below:

Village	N_i	$\bar{X}_i$	S_i^2
Collage A	400	60	20
Collage B	200	120	80

Draw the samples using Proportional and Neyman allocation techniques and compare. Obtain the sample mean and variances for the Proportional Allocation and SRSWOR for the given information. Then Find the percentage gain in precision of variances of sample mean under the Proportional Allocation over the that of SRSWOR.

(15)

(b) A population consists of 10 villages with a total of 212 households. The second column of the accompanying table shows the number of households corresponding to each village. Select a PPS with replacement sample of 6 villages by using the Cumulative Total method:

Village	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
No. of Households	35	28	20	25	30	19	10	12	18	15

(10)

3(a) In a population of size N = 5, the values of the population characteristics are 1, 3, 5, 7, 9, a sample of size 2 is drawn. Verify that $\bar{y}$ is an unbiased estimate of $\bar{Y}$ and $V(\bar{y})$ is equal to

$$V(\bar{y}) = \frac{N-n}{N.n} S^2.$$ **(12)**

(b) In order to compare the mileage yields of 3 kinds of Gasoline, several tests were run, and the following results were obtained:

Gasoline A:	19	21	20	18	21	21
Gasoline B:	23	20	22	20	24	23
Gasoline C:	20	17	21	19	20	17

Carry out the Analysis of Variance test and test whether there is significant differences between the average mileage of 3 kinds of gasoline at 5% level of significance.

(8)

4(a) A manurial trial with six levels of Farmyard Manure (FYM) was carried out in a randomised block design with 4 replications at the experimental station Junagarh with a new study the rate of decomposition of organic matters in soil and its synthetic capacity in soil on cotton crop. The yield per plot in kg for different levels of FYM and replications is given below:

Cotton Yield Per Plot (in Kg)

Levels of FYM	**Replications**			
	I	**II**	**III**	**IV**
1	6.90	4.60	4.40	4.81
2	6.48	5.57	4.28	4.45
3	6.52	7.60	5.30	5.30
4	6.90	6.65	6.75	7.75
5	6.00	6.18	6.50	5.50
6	7.90	7.57	6.80	6.62

Carry out the Analysis of Variance test and draw the conclusions. **(15)**

(b) For the given data the yield of the treatment 2 in 3rd block is missing. Estimate the missing value and analyse the data.

Treatments	**Blocks**			
	I	**II**	**III**	**IV**
1	105	114	108	109
2	112	113	Y	112
3	106	114	105	109

(10)

5(a) The following data is the data pertaining to a feeding trial on sheep. Treatments

A: Grazing only
B: Grazing + Maize Supplements
C: Grazing + Maize + Protein Supplement P_1
D: Grazing + Maize + Protein Supplement P_2
E: Grazing + Maize + Protein Supplement P_3

Layout and Wool Yield (100 gm) is given as:

32(D)	33(E)	30(C)	28(B)	24(A)
51(C)	45(D)	41(A)	45(E)	29(B)

41 (E)	29 (A)	24 (B)	36 (D)	35 (C)
38 (B)	39(C)	42(E)	23(A)	37(D)
38(A)	24(B)	21(D)	29(C)	26(E)

Analyse the design with appropriate method and calculate the Critical Difference for the treatment mean yield. **(15)**

(b) In a class of Statistics, total number of students is 30. Select the linear and circular systematic random samples of 12 students. The age of 30 students is given below:

Age:	22	25	22	21	22	25	24	23	22	21	20
	21	22	23	25	23	24	22	24	24	21	20
	23	21	22	20	20	21	22	25			

(5)