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# Assignment MST-013

for

# M.Sc. (Applied Statistics) (MSCAST)

Valid from January 2026 to December 2026


**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/2026

**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/2026**

**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: **(2×5=10)**

a) The total number of all possible samples of size 2 without replacement from a population of size 7 is 49.

b) RBD is suitable in situations where it is not possible to divide the experimental material into a number of homogeneous blocks.

c) If experimental error is reduced considerably and the efficiency of the design is decreased.

d) If strata are heterogeneous then stratified sampling schemes provides estimates with greater precision.

e) As we increase the sample size, representativeness of the population by the sample decreases.

**2. (a)** Draw all possible samples of size 2 from the population [2, 3, 4] and verify that $E(\bar{x}) = \bar{X}$. Also find variance of $\bar{x}$. **(07)**

**(b)** A sample of 60 students is to be drawn from a population consisting of 600 students belonging to two villages, A and B. The means and standard deviations of their marks are give below:

| **Villages** | **Stratum sizes ($N_i$)** | **Means ($x_i$)** | **Standard deviations** |
|---|---|---|---|
| **Village A** | 400 | 60 | 20 |
| **Village B** | 200 | 120 | 80 |

What are the sample sizes for the two villages using proportional allocation technique? **(08)**

**3.(a)** 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)**

(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. **(10)**

**4.** The following data relate to production in kg of three varieties P, Q, R of wheat:

| | | | | | |
|---|---|---|---|---|---|
| P : | 14 | 16 | 18 | | |
| Q : | 14 | 13 | 15 | 22 | |
| R : | 18 | 16 | 19 | 15 | 20 |

Is there any significant difference among the three varieties at 5% level of significance? **(10)**

**5.** A researcher wants to test four diets A, B, C, D on growth rate in mice. These animals are divided into 3 groups according to their weights. Heaviest 4, next 4 and lightest 4 are put in Block I, Block II, and Block III, respectively. Within each block, one of the diets is given at random to the animals. After 15 days, increase in weight is noted, which is given in the following table:

| **Blocks** | **Treatments/Diets** | | | |
|---|---|---|---|---|
| | **A** | **B** | **C** | **D** |
| **I** | 12 | 8 | 6 | 5 |
| **II** | 15 | 12 | 9 | 6 |
| **III** | 14 | 10 | 8 | 5 |

Perform a two-way ANOVA to test whether the data indicates any significant difference between' the four diets due to different blocks. **(10)**

**6.** In the following data, two values are missing. Estimate these values by Yates method and analyse the data by suitable technique.

| **Treatments** | **Blocks** | | |
|---|---|---|---|
| | **I** | **II** | **III** |
| **A** | 12 | 14 | 12 |
| **B** | 10 | y | 8 |
| **C** | x | 15 | 10 |

**(15)**

**7.(a)** Identify the design given in the following table and then carry out the analysis:

| **Column** | **Row** | | | |
|---|---|---|---|---|
| | **I** | **II** | **III** | **IV** |
| **I** | A 8 | C 18 | B 11 | D 8 |
| **II** | C 16 | B 10 | D 7 | A 4 |
| **III** | B 12 | D 10 | A 6 | C 20 |
| **IV** | D 10 | A 9 | C 28 | B 16 |

**(14)**

**(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 | | | | | |

**(6)**