

ASSIGNMENT BOOKLET

Post Graduate Diploma in Applied Statistics (Specialisations in Industrial Statistics/Biostatistics)

MST-005

(Valid from 1st January 2025 to 31st December, 2025)

It is compulsory to submit the assignment before filling the Examination Form. Candidate should submit the latest assignment for the course for which they filled the examination form. Only Work Books/Lab Record Books are needed to be submitted for the Lab Courses.



School of Sciences
Indira Gandhi National Open University
Maidan Garhi, New Delhi-110068
(2025)

Dear Student,

Please read the information on assignments in the Programme Guide that we have sent you after your enrolment. A weightage of 30%, as you are aware, has been earmarked for continuous evaluation, **which would consist of one tutor-marked assignment** for this course. The assignment for the theory course MST-005 have been given in this booklet.

Instructions for Formatting Your Assignments

Before attempting the assignment, please read the following instructions carefully:

- 1) On top of the first page of your answer sheet, please write the details exactly in the following format:

ENROLLMENT NO :.....

NAME :.....

ADDRESS :.....

.....

.....

PROGRAMME CODE:

COURSE CODE:

COURSE TITLE:

STUDY CENTRE: DATE:

PLEASE FOLLOW THE ABOVE FORMAT STRICTLY TO FACILITATE EVALUATION AND TO AVOID DELAY.

- 2) Use only foolscap size writing paper (but not of very thin variety) for writing your answers.
- 3) Leave 4 cm margin on the left, top and bottom of your answer sheet.
- 4) Your answers should be precise.
- 5) This assignment is to be submitted at the Study Centre.

We strongly suggest that you should retain a copy of your answer sheets.

- 6) This assignment is valid from January 1st, 2025 up to December 31, 2025.
- 7) The latest assignments should be submitted by the candidate.
- 8) **You cannot fill the Exam Form for this course** till you have submitted this assignment. So solve it and **submit it to your study centre at the earliest**. If you wish to appear in the **TEE, June 2025**, you should submit your TMAs by **March 31, 2025**. Similarly, If you wish to appear in the **TEE, December 2025**, you should submit your TMAs by **September 30, 2025**.

We wish you good luck.

TUTOR MARKED ASSIGNMENT

MST-005: Statistical Techniques

Course Code: MST-005

Assignment Code: MST-005/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: (2×5=10)

- (a) The total number of all possible samples of size 2 without replacement from a population of size 7 is 21.
- (b) Consecutive 3 random numbers starting from 8937 by 'middle square method' are 8937, 8699, 6726.
- (c) RBD is suitable in situations where it is not possible to divide the experimental material into a number of homogeneous blocks.
- (d) As we increase the sample size, representativeness of the population by the sample decreases.
- (e) In a big hall, there are 50 rows and each row has 60 students. A research scholar selects 10 rows randomly and then randomly selects 15 students from each selected row. It is an example of cluster sampling procedure.

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} . (10)

- (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?

(6)

3. To determine the yield rate of wheat in a district of Punjab, 6 groups of 6 plots each were constructed. The data are given in the following table:

Plot No.	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6
1	8	6	18	13	17	12
2	13	5	8	7	15	15
3	11	16	6	13	10	11
4	26	5	10	6	21	17
5	13	16	16	7	20	8
6	31	5	20	2	25	10

Select a cluster sample of 3 clusters from the above data and find its sample mean. Further, explain the procedure of two-stage sampling if we want to draw a sample of 6 plots. Which are the 6 plots in your sample? (7)

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?

(7)

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

(12)

7. 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)

8. (a) The distribution function of Pareto distribution is given by

$$f(x) = 1 - \left(\frac{k}{x}\right)^a, \quad a > 0, 0 < k \leq x.$$

Given a $U \sim U(0, 1)$, generate a random number from the above distribution, when $a = 2$ and $k = 1$. Suppose $U = 0.5$, then find x . **(4)**

(b) Generate a complete cycle for the LCG given below: $x_i = (5x_{i-1} + 3) \bmod 16$, with $x_0 = 5$. A man tosses an unbiased coin ten times. Using the first ten random numbers generated above, obtain a sequence of heads and tails by taking Head (H) as $u \geq 0.5$. **(10)**

9. Times between successive crashes of a computer system were generated for a 6-month period and are given in increasing order as follows (time in hours):

1	10	20	30	40	52	63	70	80	90	100	102
130	140	190	210	266	310	530	590	640	1340		

The parameter $a = 0.00435$, mean $= 1/a = 230$ hrs.

Use the Kolmogorov-Smirnov test to examine the goodness of fit of exponential distribution. **(10)**