

# Assignment MSTE-011

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.

**(Dr. Gajraj Singh)**  
**Course Coordinators, MSTE-011**  
**Email: [gajrajsingh@ignou.ac.in](mailto:gajrajsingh@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: MSTE-011/TMA/2026**

NAME: \_\_\_\_\_

ENROLLMENT NO: \_\_\_\_\_

ADMISSION CYCLE: \_\_\_\_\_

PROGRAMME CODE: MSCAST

COURSE CODE: MSTE-011

COURSE TITLE: OPERATIONS RESEARCH

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**  
**MSTE-011: Operations Research**

Course Code: MST-011  
Assignment Code: MSTE-011/TMA/2026  
Maximum Marks: 100

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

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

- (i) The objective function in a Linear Programming Problem must be linear.
- (ii) Degeneracy in the simplex method occurs when a basic variable becomes zero.
- (iii) The Hungarian method is used to solve maximization assignment problems directly.
- (iv) Shortages are not allowed in all inventory models.
- (v) In M/M/1 model, service times follow exponential distribution.

**2 (a)** Explain the Economic Order Quantity (EOQ) Model. Derive the EOQ formula and state the assumptions of the model.

**(b)** A service station has one server. Customers arrive at an average rate of 10 per hour and are served at an average rate of 15 per hour. Assuming a Poisson arrival and exponential service time, find:

- (a) Average number of customers in the system
- (b) Average waiting time in the queue
- (c) Probability that the system is empty

**(10×2=20)**

**3 (a)** Solve the following LPP using the graphical method:

Maximize  
 $Z = 3x + 5y$

Subject to:  
 $x+2y \leq 8, \quad 3x+2y \leq 12, \quad x, y \geq 0$

**(b)** Write the dual of the following primal problem:

Maximize  
 $Z=2x+3y$

Subject to:  
 $x+y \leq 4, \quad 2x+y \leq 5, \quad x, y \geq 0$

**(10×2=20)**

**4 (a)** The cost of a machine is ₹10,000 and its scrap value is negligible. Maintenance costs for successive years are given below:

Year	1	2	3	4	5
Cost (₹)	500	700	1,000	1,500	2,200

Determine the optimum replacement period.

**(b)** What is an Initial Basic Feasible Solution (IBFS)? Explain the following methods used to obtain

IBFS:

- (i) North-West Corner Rule
- (ii) Least Cost Method
- (iii) Vogel's Approximation Method (VAM)

**(10+15=25)**

**5 (a)** Discuss the applications of game theory in:

- (i) Economics
- (ii) Business and management
- (iii) Military strategy
- (iv) Advertising and marketing
- (v) Political science

**(b)** Discuss the applications of dynamic programming in Operations Research. Highlight its role in decision-making under multi-stage situations.

**(10+15=25)**