

Assignment MST-014

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.

(Dr. Prabhat Kumar Sangal)
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Mob. No. : 9013873713

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-014/TMA/2025

NAME: _____

ENROLLMENT NO: _____

ADMISSION CYCLE: _____

PROGRAMME CODE: MSCAST

COURSE CODE: MST-014

COURSE TITLE: STATISTICAL QUALITY CONTROL AND TIME SERIES ANALYSIS

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-014: Statistical Quality Control and Time Series

Course Code: MST-014

Assignment Code: MST-014/TMA/2025

Maximum Marks: 100

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

1. (a) State whether the following statements are **True** or **False**. Give reason in support of your answer: (5×2=10)

- (i) The R- chart is suitable when subgroup size is greater than 10.
- (ii) In single sampling plan, if we increase acceptance number then the OC curve will be steeper.
- (iii) If the effect of summer and winter is not constant on the sale of AC then we use the additive model of the time series.
- (iv) If a researcher wants to find the relationship between today's unemployment and that of 5 years ago without considering what happens in between then the partial autocorrelation is the better way in comparison to autocorrelation.
- (v) A system has four components connected in parallel configuration with reliability 0.2, 0.4, 0.5, 0.8. To improve the reliability of the system most, we have to replace the component which reliability is 0.2.

- (b) Differentiate between the autoregressive and moving average models of time series.

(10)

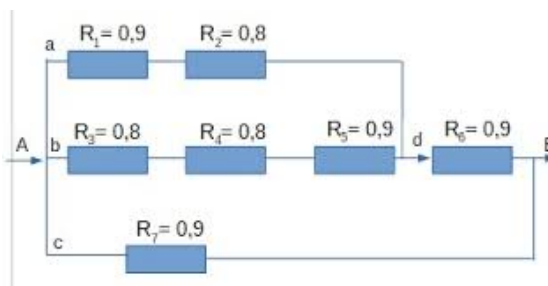
- 2 A manufacturer of men's jeans purchases zippers in lots of 500. The jeans manufacturer uses single-sample acceptance sampling with a sample size of 10 to determine whether to accept the lot. The manufacturer uses $c = 2$ as the acceptance number. Suppose 3% nonconforming zippers are acceptable to the manufacturer and 8% nonconforming zippers are not acceptable. Find

- (i) Probability of accepting a lot of incoming quality 0.04.
- (ii) Average outgoing quality (AOQ), if the rejected lots are screened and all defective zippers are replaced by non-defectives.

- (iii) Average total inspection (ATI).

(20)

- 3 A system has seven independent components and reliability block diagram of it shown as follows:



Find reliability of the system.

(20)

4. At a call centre, callers have to wait till an operator is ready to take their call. To monitor this process, 5 calls were recorded every hour for the 8-hour working day. The data below shows the waiting time in seconds:

Time	Sample Number				
	1	2	3	4	5
9 a.m	8	9	15	4	11
10	7	10	7	6	8
11	11	12	10	9	10
12	12	8	6	9	12
1 p.m.	11	10	6	14	11

2	7	7	10	4	11
3	10	7	4	10	10
4	8	11	11	11	7

- (i) Use the data to construct control charts for mean and comments about the process. If process is out of control, then calculate the revised control limits.
- (ii) If the specification limits as the 8 ± 2 , then calculate the process capability index C_{pk} and impetrate the result.

(20)

5. Consider the time series model

$$y_t = 10 + 0.5y_{t-1} - 0.8y_{t-2} + \varepsilon_t$$

where $\varepsilon_t \sim N[0,1]$

- (i) Is this a stationary time series?
- (ii) What are the mean and variance of the time series?
- (iii) Calculate the autocorrelation function.
- (iv) Plot the correlogram.

(20)