Assignment MST-014

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.

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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/2026

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

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TUTOR MARKED ASSIGNMENT
MST-014: Statistical Quality Control and Time Series

Course Code: MST-014

Assignment Code: MST-014/TMA/2026

Maximum Marks: 100

Note: Attempt all questions. Answer in your own words.

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

(i) The c-chart is suitable for moniterting to proportion of defective.

(ii) In single sampling plan, if we increase acceptance number then the OC curve will be steeper.

(iii) Autocorrelation measures the relationship between y_t and y_{t-k} after removing the effect of intermediate lags.

(iv) 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.

(v) In a series system, improving the reliability of the weakest component gives the maximum improvement in system reliability.

2. A factory purchases bolts in lots of 800. Acceptance is decided using a single-sampling plan with sample size n = 20 and acceptance number c = 3. Assume that 2% defective items are considered acceptable quality and 7% defective items are considered unacceptable quality.

Find:

(i) The probability of accepting a lot when the incoming quality level is 5% defective.

(ii) The Average Outgoing Quality (AOQ), assuming rejected lots are completely screened and defectives are replaced.

(iii) The Average Total Inspection (ATI). **(10)**

3. A system consists of six independent components arranged as follows:

- Two components with reliabilities 0.9 and 0.8 connected in series.
- This series combination is connected in parallel with a component of reliability 0.7.
- The resulting subsystem is connected in series with two components of reliabilities 0.85 and 0.95.

Draw the reliability block diagram and calculate the overall reliability of the system. **(10)**

4. In a manufacturing process, 4 items are inspected every hour for 10 consecutive hours. The measured quality characteristic (in mm) is given below:

Hour	1	2	3	4
1	50	52	51	49
2	51	50	53	52
3	49	50	48	51
4	52	54	53	51
5	50	49	51	50

6	53	52	54	55
7	48	49	50	47
8	51	52	50	51
9	54	55	53	54
10	50	51	49	50

(i) Construct conreol chart for variability and mean and comment on the state of statistical control. If the process is out of control, obtain revised control limits.

(ii) Given specification limits 50 ± 3, compute the process capability index (C_{pk}) and interpret the result.

(20)

5. Consider the time series model

$$y_t = 5 + 0.6y_{t-1} - 0.3y_{t-2} + \varepsilon_t$$

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

(i) State whether the process is stationary, giving reasons.

(ii) Find the mean of the process.

(iii) Obtain the variance of the process.

(iv) Derive the autocorrelation function up to lag 2 and sketch the correlogram**.** **(20)**

6. The marketing manager of a company recorded the number of mobiles sold quarterly for which are given in the following table:

Quarter / Year	**Q_1**	**Q_2**	**Q_3**	**Q_4**
2018	48	41	60	65
2019	58	52	68	74
2020	60	56	75	78

(i) Find the quarterly seasonal indexes for the mobile sold using the ratio to trend method.

(ii) Do seasonal forces significantly influence the sale of mobile? Comment.

(iii) Also find the deseasonalised values. **(20)**

7. Differentiate between the autoregressive and moving average models of time series.

(10)