



QP CODE: 26019341



Reg No :

Name :

M.Sc DEGREE (CSS) EXAMINATION, MARCH 2026**Fourth Semester**

M Sc STATISTICS

Core Courses - ST010401 - STATISTICAL COMPUTING IV USING R/SAS/MATLAB

2019 Admission Onwards

22D3709D

Time: 3 Hours

Weightage: 30

(Answer any **THREE** questions. Each question carries a weight of **10**)

1. Average consumption function for an economy is $C_t = \alpha + \beta Y_t + \varepsilon$ where C is the personal consumption expenditure in constant prices and Y is the personal disposable income in constant prices.
- (a) For the data given below carryout a test for presence of autocorrelation.
- (b) Obtain best linear unbiased estimates of the parameters.
- (c) Obtain an unbiased estimate of variance.

Year	1948	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962
C_t	197	202	215	217	222	235	236	250	262	269	271	287	296	302	317
Y_t	186	187	205	225	236	250	257	274	293	309	318	337	350	365	385

2. For the simultaneous equation model

$$Y_{1t} = \beta_{12}Y_{2t} + \gamma_{11}X_{1t} + U_{1t}; \quad Y_{2t} = \beta_{21}Y_{1t} + \gamma_{22}X_{2t} + \gamma_{23}X_{3t} + U_{2t}$$

where Y's are endogeneous and X's are exogeneous and U's are random components, find the two stage least squares estimate of parameters β_{12} and γ_{11} , given the following matrix of sum of products of observed values of X's and Y's

	Y_1	Y_2	X_1	X_2	X_3
Y_1	100	210	30	20	40
Y_2		500	5	50	160
X_1			100	5	10
X_2				50	5
X_3					40





3. Solve by Beale's method.

- (i) Maximize $f = 4x_1 + 6x_2 - x_1^2 - 3x_2^2$ subject to the constraints $x_1 + 2x_2 \leq 4$; $x_1, x_2 \geq 0$
 (ii) Minimize $Z = 6 - 6x_1 + 2x_1^2 - 2x_2$ subject to the constraints $x_1 + x_2 \leq 2$; $x_1, x_2 \geq 0$

4. Five jobs must go through the two machines A and B in the order AB. Processing time in hours are given below. Determine a sequence for the five jobs that will minimize the elapsed time.

Job	Machine A	Machine B
1	5	2
2	1	6
3	9	7
4	3	8
5	10	4

5. A paper mill uses a control chart to monitor the imperfection in finished rolls of paper. Production output is inspected for 20 days and the resulting data are shown below. Use these data to setup a control chart for defects pr roll of paper. Does the process appear to begin statistical control. What centre line and control limits would you recommend for controlling current production.

Day	No of rolls Produced	Total No of defects	Day	No of rolls Produced	Total No of defects
1	18	12	11	18	8
2	18	14	12	18	14
3	24	20	13	18	9
4	22	18	14	20	10
5	22	15	15	20	14
6	22	12	16	20	13
7	20	11	17	24	16
8	20	15	18	24	18
9	20	12	19	22	20
10	20	10	20	21	17

6. A process is being controlled with a fraction defective control chart. The process average has been shown to be 0.07. 3 sigma control limits are used and the procedure calls for taking daily sample of 400 items.
- (a) Calculate the upper and lower control limits.
- (b) If the process average suddenly shift to 0.10, what is the probability that the shift would be detected on the first subsequent sample?
- (c) What is the probability that the shift in part (b) is detected on the first and second sample taken after the shift?
- (d) What are the values of ARL when $p=0.07$ and when $p=0.1$?

