No. of Printed Pages : 8 **MSTL–011(Set-II)**

M. SC. (APPLIED STATISTICS)

[M. SC. (AST)]

Term-End Practical Examination

June, 2025

MSTL–011(Set-II) : STATISTICAL COMPUTING USING R-I

Time : $2\frac{1}{2}$ Hours *Maximum Marks : 50*

***Note** : (i) Attempt any **two** questions.*

(ii) Solve the questions using R software and create a script file.

(iii) Symbols have their usual meanings.

(iv) Mention necessary formulae, steps, interpretations etc.

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1. (a) Create a scatter plot in the range $-8 \le x_1 \le 8$ and $-50 \le x_2 \le 50$ for the following data : 5

x_1	x_2
–3	9
–2	47
–1	26
0	27
1	49
2	45
3	41
4	12

Also perform the following tasks :

(i) Draw x-axis and y-axis at $x = 0$ and $y = 0$ by showing all four quadrants.

(ii) Add a line $y = 4x - 2$ to the above plot.

(b) In a single plot, draw the density function and distribution function of a Normal Distribution with the following parameters, using different line styles, and colours. Add the requisite Legend and Labels to the plot : 10

(i) $(\mu = 1, \sigma = 2)$

(ii) $(\mu = 1, \sigma = 9)$

(iii) $(\mu = 2, \sigma = 16)$

Also, find $P(X \leq 10)$ and $P(5 \leq X \leq 10)$ for each of the above cases.

(c) Consider the following data in which each column represents a systematic sample :

S_1	S_2	S_3	S_4	S_5	S_6	S_7
11	23	24	15	26	27	38
15	27	38	27	22	12	13
19	22	11	12	14	14	25
11	29	12	13	41	28	49

Compute the mean of the *i*th systematic sample and population mean. Also, compute the relative efficiency of systematic sampling with respect to the simple random sampling. 10

2. (a) Evaluate the following integral : 5

$$\int_{-1}^{-2} f(x)\,dx \text{ , where}$$

$$f(n) = \begin{cases} 4-3x, & -1 \le x < 1 \\ 2x+1, & 1 \le x < 2 \end{cases}$$

(b) A Latin square design was used to compare 5 varieties of oats. The yields (in kgs per plot) are given in the following table, where V_1, V_2, V_3, V_4 and V_5 refer to varieties of oats : 10

V_2 405	V_1 526	V_5 464	V_4 442	V_3 482
V_3 362	V_4 447	V_2 428	V_1 412	V_5 494
V_5 472	V_2 493	V_1 471	V_3 380	V_4 412
V_1 551	V_3 430	V_4 423	V_5 570	V_2 450
V_4 429	V_5 468	V_3 433	V_2 466	V_3 461

Perform the following tasks :

(i) Create a 'CSV' file for the analysis purpose.

(ii) Test for the differences between effect of varieties

(iii) Do the pairwise comparison (if required)

(c) Consider the following data :

Lot No.	Number Inspected	No. of Defectives
1	501	33
2	410	41
3	360	34
4	301	28
5	420	13
6	440	34
7	375	54
8	404	79
9	504	29
10	451	34

Perform the following tasks using quality control package : 10

(i) Construct control chart for number of defectives.

(ii) Check whether the process is under statistical control or not. If not, compute revised limits and construct revised control chart.

3. (a) Plot the distribution function of standard cauchy distribution using the **curve ( )** function in the range [– 10, 10]. 5

(b) Consider the following data of annual profits (in crores rupees) of a XUV company : 10

Year	Profit
2007	88
2008	92
2009	95
2010	95
2011	90
2012	85
2013	98
2014	95
2015	108
2016	118
2017	119
2018	117
2019	130

Do the following :

(i) Fit a linear and the quadratic trend to this data and suggest the most appropriate trend out of these two.

(ii) Plot the original, linear trend line and quadratic curve in a single plot.

(iii) Project the profit for the year 2020.

(c) The failure data for 500 electric heaters are given in the following table :

Operating Time	No. of Failure
0—6	26
6—12	25
12—18	20
18—24	38
24—30	47
30—36	48
36—42	55
42—48	44
48—54	39
54—60	35
60—66	60
66—72	63

Estimate the reliability function, cumulative failure distribution function, failure density function and hazard rate function. Place all these values as columns of a data frame. Also, plot the curves of the estimated functions. 10

× × × × ×