

No. of Printed Pages : 5 **MSTL-011(SET-II)**

**M. Sc. (APPLIED STATISTICS)
(MSCAST)**

**Term-End Practical Examination
December, 2024**

**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.

(iii) Symbols have their usual meanings.

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

1. (a) Evaluate $\int_0^3 f(x)dx$, where :

$$f(x) = \begin{cases} x+1, & 0 \leq x \leq 1 \\ 2x+3, & 1 \leq x < 3 \end{cases}$$

(b) Plot the probability mass function and distribution function of two binomial distributions, each with size 100 and probabilities 0.30 and 0.90, respectively.

- (c) Construct a suitable control chart for average and variability for the following data using formulae. Samples of 5 being taken every hour. Comment on whether the production seems to be under statistical control :

Sample No.	1	2	3	4	5
1	43	66	75	78	88
2	43	45	69	73	90
3	20	25	80	80	80
4	37	54	70	78	85
5	43	51	56	60	78
6	52	75	75	78	130
7	61	60	70	95	136
8	19	20	27	45	60
9	16	30	40	63	85
10	69	105	112	115	150
11	65	90	93	109	110
12	62	79	94	108	135

For $n = 5$, use $A_3 = 1.427$, $B_3 = 0$ and $B_4 = 2.089$. 5+5+15

2. (a) If X is a normally distributed random variable with mean 4 and standard deviation 9, then compute the 25th quartile and the following probabilities :
- (i) $P(X \geq 5)$
- (ii) $P(0 \leq X \leq 10)$
- (b) Fit quadratic and exponential trend equations for the following Gross Revenue (in lacs) data using formulae :

Year	Gross Revenue (in lacs)
1992	250
1993	170
1994	150
1995	120
1996	125
1997	130
1998	142
1999	165
2000	174
2001	210
2002	300
2003	340

2004	400
2005	490
2006	670
2007	750

Also, plot the actual data with fitted quadratic and exponential trend values. Verify your obtained results by using a suitable R function.

- (c) Consider the R built-in 'Nile' dataset available in the datasets package. The 'Nile' dataset is a yearly dataset, starting from 1871 and ending to 1970. Select systematic samples of sizes 10 and 14 from it. 5+10+10

3. (a) The failure density function of a random variable T is given by :

$$f(t) = \begin{cases} 0.6e^{-0.6t}, & t \geq 0 \\ 0, & \text{otherwise} \end{cases}$$

Plot the failure density function, cumulative failure distribution function, reliability function and hazard rate function. Also, compute the reliability of the component for a 10 hours mission time and the mean time to failure.

- (b) The following table gives the layout of a Latin Square Design with four blocks and four treatments A, B, C and D, each one is replicated four times; and in which one observation is missing due to some reasons. Create a '.CSV' file of the data and use it to obtain the estimate of the missing value and analyse the design. Also interpret the results :

A 110	B 125	C 105	D 115
B 120	A 110	D 115	C 105
C x	D 125	A 115	B 125
D 115	C 100	B 105	A 130

8+17

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