No. of Printed Pages : 6 **MSTL–011(Set-I)**

M. SC. (APPLIED STATISTICS)

[MSCAST]

Term-End Practical Examination

June, 2026

MSTL–011(Set-I) : 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, hypotheses, interpretations etc.

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1. (a) If X follows normal distribution with parameters, mean 4 and variance 16, then find q, such that $P(X \leq q) = 0.25$. Also, plot the density curve of the same in the range – 30 to 30.

(b) Create a function to compute the following expression :

$$n^m - \binom{n}{1}(n-1)^m + \binom{n}{2}(n-2)^m - \ldots + (-1)^{n-1}\binom{n}{n-1}1^m$$

Also, evaluate your function by considering $m = 5$ and $n = 3$.

(c) Generate a random sample of size 100 from negative binomial distribution with size 20 and probability 0.3. Considering the random numbers are numbered serially, select a systematic sample of size 20 from it. 5+10+10=25

2. (a) Evaluate $\int_0^3 9\,dx$.

(b) A sample of 50 employees is to be drawn from a population of 500 employees belonging to two Information Technology companies A and B. The

means and standard deviations of their monthly income in 1000's are as follows :

	Number of Employees	**Mean** $(\bar{X}_i)$	**Standard Deviation** (σ_i)
Company A	220	67	4
Company B	280	70	6

Obtain the variance of the estimator of the population mean in proportional allocation method of stratified sampling. Also, compare its efficiency with respect to simple random sampling.

(c) Consider the built-in dataset 'datasets :: uspop' that gives the population of the United States (in millions) as recorded by the decennial

census for the period 1790-1970. Create a function to compute the exponentially smoothed time series. Then run your function with smoothing constants λ = 0.1 and 0.6. Plot the original time series with the obtained exponentially smoothed time series in a single plot.

5+10+10=25

3. (a) Plot the OC and AOQ curves for single sampling plan with N = 2000, n = 500 and C = 14. Also, obtain the AOQL.

   (b) Consider the R built-in dataset 'datasets :: chickwts' of an experiment, that was conducted to measure and compare the effectiveness of various feed supplements on the growth rate of chickens. Create a box plot of the weight data according to the feeds. Also,

check whether the feeds differ significantly at 5% significance level.

(c) The following table gives the values of mean and standard deviation of 20 samples of 10 observations each :

S. No.	Mean	Standard Deviation
1	4.47	0.30
2	4.25	0.34
3	4.46	0.15
4	4.37	0.27
5	4.24	0.15
6	4.14	0.37
7	4.13	0.45
8	4.33	0.24
9	4.18	0.16
10	4.20	0.15
11	4.24	0.24
12	4.40	0.13
13	4.48	0.15
14	4.14	0.08

15	4.17	0.26
16	4.15	0.36
17	4.15	0.22
18	4.44	0.33
19	4.12	0.15
20	4.07	0.27

Use this data to compute the control limits and construct the $\bar{X}$ and S charts. Interpret the results. (Use $A_3 = 0.975$, $B_3 = 0.284$, $B_4 = 1.716$)

8+8+9=25

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