B4.1-R4: COMPUTER BASED STATISTICAL & NUMERICAL METHODS

NOTE:

> 1. Answer question 1 and any FOUR from questions 2 to 7.
> 2. Parts of the same question should be answered together and in the same sequence.
> 3. Only Non-Programmable and Non-Storage type Scientific Calculator allowed.

Time: 3 Hours **Total Marks: 100**

1.

a) Find the possible percentage error in computing the resistance r from the formula $\frac{1}{r} = \frac{1}{r_1} + \frac{1}{r_2}$ if r_1 and r_2 are both in error by 2%.

b) A sales executive recalls his part sales records per phone calls as follows:

Sales in units	0	1	2	3	4	5
Probability	0.15	0.20	0.10	0.05	0.30	0.20

Calculate his average number of units sold per call.

c) A coin is tossed six times. Calculate the probability of obtaining four or more heads.

d) In a normal distribution, 7% of the items are under 35 and 89% are under 63. Determine the mean and variance of the distribution.

e) A river is 80 meters wide. The depth 'd' in meters at a distance x meters from one bank is given by the following table. Calculate the area of cross section of the river, using Trapezoidal rule.

X	0	10	20	30	40	50	60	70	80
d	0	4	7	9	12	15	14	8	3

f) For the following data, approximate $(\frac{dy}{dx})$ at x=2.

X	0	2	3
Y	2	-2	-1

g) Given that the regression equation of Y on X and of X on Y are respectively Y=X and 4X-Y=3, and the second moment of X about origin is 2. Find the correlation coefficient between X and Y.

(7x4)

2.

a) If the density functions of a continuous random variable X is given by
$$f(x) = 0, \ x<0$$
$$= ax, \ 0 \leq x \leq 2,$$
$$= (4-x)a, \ 2 \leq x \leq 4$$
$$= 0, \ x>4$$

 i) Find the value of a
 ii) Find the cumulative distribution function of X
 iii) Find $P(X>2.5)$.

b) Find the maximum or minimum value of y for the following data:

X	0.60	0.65	0.70	0.75
Y	0.6221	0.6155	0.6138	0.6170

(9+9)

3.

a) Show that Newton-Raphson method has a quadric convergence and find the smallest positive root of $x^3 - 5x + 3 = 0$.

b) Evaluate the following integrals using Simpson's 1/3rd rule with two and four sub- intervals.

$$\int_0^1 \frac{dx}{3+2x}$$

c) Solve the following system of equations by Gauss-Seidal method:

$$10x - 2y - 3z = 205$$
$$-2x + 10y - 2z = 154$$
$$-2x - y + 10z = 120$$

(6+6+6)

4.

a) If F(x) and f(x) be the distribution and the density function of X, respectively, then find the distribution and density function of Y=a X +b , a≠ 0,b are real.

b) If X and Y are independent normal variates with means 2, 5 and variances 4, 9 respectively. Find the value of K such that

$$P(X + Y \leq K) = P(3X - Y \geq 3K).$$

(9+9)

5.

a) From a large lot of mangoes, a random sample of 600 mangoes was drawn and 60 were found to be bad. Find the standard error of the proportion of bad mangoes in this sample. Hence, find the 3σ limits for the percentage of bad mangoes in this lot.

b) Fit a Poisson distribution for the following data and test the goodness of fit at 5% level of significance.

X	0	1	2	3	4	5
f(x)	110	170	130	60	23	7

(9+9)

6.

a) A target is to be destroyed in a bombing exercise. There is 75% chance that any one bomb will strike the target. Assume that two direct hits are required to destroy the target completely. How many bombs must be dropped in order that the chance of destroying the target is greater than or equal to 99%?

b) A normally distributed population has mean 6.8 and standard deviation 1.5. A sample of size 400 has mean 6.75. Is the difference between the population mean and the sample than significant? (**Use α=0.05**)

(9+9)

7.

a) The number of employees in a company is given below:

Year	1992	1993	1994	1995	1996	1997	1998
No. of Employees	1000	1050	1120	1210	1270	1350	1400

Estimate a linear trend using the method of least squares.

b) The ages of husbands and their wives are given in the following table:

x (age of Husband)	23	27	28	29	30
y(age of wife)	18	22	23	23	25

Calculate the coefficient of correlation between x and y from the above table.

(9+9)