(3 Hours)

[Total Marks: 80]

N.B.: (1) Question No. one is compulsory.

(2) Answer any three questions from Q.2 to Q.6

(3) Use of stastical Tables permitted.

(4) Figures to the right indicate full marks

1. (a) Calculate the coefficient of correlation from the following data   5

x	2	9	7	6	5	1
y	9	4	5	2	3	13

(b) Evaluate the line integral $\int_0^{1+i} 3z^2 dz$ along the path $y = x$ 5

(c) Find the Eigen values of $2A^3 + 5A^2 - 3A$ where $A = \begin{bmatrix} 1 & 0 & 0 \\ 8 & 2 & 0 \\ 8 & 8 & -1 \end{bmatrix}$ 5

(d) The probability density function of a random variable x is

x	-2	-1	0	1	2	3
$P(x)$	0.1	3k	0.2	2k	0.3	5k

Find i) k   ii) mean   iii) standard deviation of the distribution.   5

2. (a) If the probability of a bad reaction from a certain injection is 0.001, determine the

chance that out of 2000 individuals more than two will get a bad reaction.   6

(b) The equations of the two regression lines are

$x + 6y = 6 \ and \ 3x + 2y = 10$,

find the means of x and y and the coefficient of correlation between x and y.   6

(c) Is the matrix $\begin{bmatrix} 8 & -8 & -2 \\ 4 & -3 & -2 \\ 3 & -4 & 1 \end{bmatrix}$ diagonalizable? If so find the diagonal form and

the transforming   matrix .   8

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3. (a) Find the Eigen values and the Eigen vectors of the matrix $\begin{bmatrix} 2 & 2 & 1 \\ 1 & 3 & 1 \\ 1 & 2 & 2 \end{bmatrix}$ 6

(b) Evaluate using Residue theorem $\oint_c \frac{z^4 dz}{(z+1)\ (z-2)}$ where c is the circle $|z| = 3$

6

(c) The weights of 1000 students were found to be normally distributed with mean 40 kgs and standard deviation 4 kgs. Find the expected number of students with weights i) less than 36 kgs, ii) more than 45 kgs. 8

4. (a) Evaluate $\oint_c \frac{(z+2)dz}{z^2(z-3)}$ where c is $|z| = 1$ 6

(b) A sample of 900 members is found to have mean of 3.4 cm, Can it be regarded as a truly random sample from alarge population with mean 3.25 cm and S.D. 1.61 cm? 6

(c) Solve the following LPP using Simplex method

$$\text{Minimize } z = x_1 - 3x_2 + 3x_3$$

$$\text{Subject to } \quad 3x_1 - x_2 + 2x_3 \le 7$$

$$2x_1 + 4x_2 \ge -12$$

$$-4x_1 + 3x_2 + 8x_3 \le 10$$

$$x_1, x_2, x_3 \ge 0 \qquad \qquad 8$$

5. (a) Find the Laurent's series for $f(z) = \frac{1}{(z-1)(z-2)}$

about $z = 0$ in the regions $i)\ 1 < |z| < 2,\ ii)|z| > 2$ 6

(b) Fit a Binomial distribution to the following data and compare the theoretical 6
frequencies with the actual ones

x	0	1	2	3	4	5
f	2	14	20	34	22	8

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(c) Solve the following LPP using the Dual Simplex method   8

$$\text{Minimize } z = 2x_1 + 2x_2 + 4x_3$$

$$\text{Subject to} \quad 2x_1 + 3x_2 + 5x_3 \geq 2$$

$$3x_1 + x_2 + 7x_3 \leq 3$$

$$x_1 + 4x_2 + 6x_3 \leq 5$$

$$x_1, x_2, x_3 \geq 0 .$$

6. (a) Find 4^A where $A = \begin{bmatrix} 3/2 & 1/2 \\ 1/2 & 3/2 \end{bmatrix}$ 6

(b) Solve the following NLPP using Kuhn-Tucker conditions

Maximize $z = 8x_1 + 10x_2 - x_1^2 - x_2^2$

Subject to $3x_1 + 2x_2 \leq 6$; and $x_1, x_2 \geq 0$ 6

(c) A die was thrown 132 times and the following frequencies were observed.

No. obtained	1	2	3	4	5	6	Total
Frequency	15	20	25	15	29	28	132

Test the hypothesis that the die is unbiased. Use χ^2 Test   8

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