

QP Code : 4167

(3 Hours)

[ Total Marks : 100

N.B. : (1) Q. No.1 is compulsory.

(2) Answer any four out of remaining six questions.

(3) Figures to the right indicate full marks.

(4) Use of statistical tables is permitted.

(5) Write the sub-questions of main question collectively together.

1. (a) Find the root of  $x^4 - x - 10 = 0$  which is near to 2 correct to 3 places of decimals using N-R method. 5

(b) The means of two samples of sizes 1000 and 2000 respectively are 67.50 and 68.0 inches. Can the samples be regarded as drawn from the same population of standard deviation 2.5 inches? 5

(c) A random variable X has the following probability distribution. 5

X:	0	1	2	3
P(X=x):	1/6	1/3	1/3	1/6

Compute i) Mean & variance,

ii) Moment generating function about the origin

(d) Two types of food packets say  $P_1$  &  $P_2$  are available, both containing vitamins,  $V_1$ ,  $V_2$  &  $V_3$ . A person needs 40 mg. of  $V_1$ , 120 mg. of  $V_2$  & 60 mg. of  $V_3$  per meal. The packet  $P_1$  contains 20 mg. of  $V_1$ , 40 mg. of  $V_2$  & 60 mg. of  $V_3$  &  $P_2$  contains 10 mg. of  $V_1$ , 60 mg. of  $V_2$  & 10 mg. of  $V_3$ . Costs of these food-packets are Rs. 3 & Rs. 2 per packet. Formulate the L.P.P. & find the minimum cost of diet that will supply the body the minimum quantity of vitamins by graphical method. 5

2. (a) Random samples of 200 bolts manufactured by a machine A & 100 bolts manufactured by a machine B showed 19 & 5 defective bolts respectively. Is there any significant difference between the performances of the machines? 6

(b) Solve the equations by Gauss-Seidel upto 3 iterations 6

$$25x + 2y + z = 69, 2x + 10y + z = 63, x + y + z = 43.$$

(c) Five dice are thrown together 96 times. The number of times 4, 5 or 6 was obtained is given below. 8

No. of times 4,5 or 6 obtained :	0	1	2	3	4	5
Frequency :	1	10	24	35	18	8

Fit a Binomial distribution if

(i) dice are unbiased

(ii) the nature of the dice is not known.

3. (a) A drug was administered to 5 persons and the systolic blood pressure before and after was measured. The results are given below
- |               |     |     |     |     |      |
|---------------|-----|-----|-----|-----|------|
| Candidates :  | I   | II  | III | IV  | V    |
| B.P. before : | 140 | 130 | 132 | 150 | 140  |
| B.P. after :  | 132 | 126 | 133 | 144 | 133. |
- Test whether the drug is effective in lowering the systolic blood pressure.
- (b) Find the mean and variance of the Poisson's distribution. 6
- (c) Evaluate  $\int_0^1 \frac{1}{1+x^2}$  between suitable intervals and hence find an approximate value of  $\pi$  by using 8
- 1) Trapezoidal rule & 2) Simpson's 1/3rd rule.
4. (a) Determine all basic solutions to the following problem. 6
- Maximize  $z = x_1 - 2x_2 + 4x_3$   
 subject to  $x_1 + 2x_2 + 3x_3 = 7$   
 $3x_1 + 4x_2 + 6x_3 = 15.$
- (b) Prove that  $\left(\frac{\Delta^2}{E}\right)e^x \left[\frac{E(e^x)}{\Delta^2 e^x}\right] = e^x$  the interval of differencing being h. 6
- (c) Find the value of k such that the following will be the density function. 8
- Find  $P(x \leq 1.5)$ ,  $P(x > 1)$   
 Where  $f(x) = kx, 0 \leq x \leq 1$   
 $= k, 1 \leq x \leq 2$   
 $= k(3 - x), 2 \leq x \leq 3$
5. (a) Using Lagrange's interpolation formula, find  $f(4)$  from  $f(0) = 2, f(1) = 3, f(2) = 12, f(5) = 12$  6
- (b) Express into factorial polynomial the function 6
- $x^4 - 8x^3 + 18x^2 - 10x$ , also find the function whose first difference is the given function.

- (c) In a certain factory turning out blades there is a small chance  $1/250$  for a blade to be defective. The blades are supplied in packets of 10. Calculate the approximate number of packets containing (i) no defective, (ii) one defective, (iii) two defective blades in a consignment of 10,000 packets using (a) Binomial Distribution, (b) Poisson approximation to Binomial Distribution. 8

6. (a) Find  $f(4.4)$  from the following table 6

X	0	2	4	6	8	10	12
f(x)	12	7	6	7	13	32	77

- (b) 300 digits were chosen at random from a table of random numbers. The frequency of digits was as follows. 6

Digit	0	1	2	3	4	5	6	7	8	9	Total
Freq.	28	29	33	31	26	35	32	30	31	25	300

Using  $\chi^2$  -test examine the hypothesis that the digits were distributed in equal numbers in the table.

- (c) Calculate the first four raw & central moments for the following data: 8

x:	1	2	3	4	5	6	7	8	9
f:	1	6	13	25	30	22	9	5	2

7. (a) Given  $6Y = 5X + 90$ ,  $15X = 8Y + 130$ ,  $\sigma_x^2 = 16$ . 6

Find (i)  $\bar{x}$  &  $\bar{y}$  (ii)  $r$  and (iii)  $\sigma_y^2$

- (b) If  $u = x - y$ ,  $v = x + y$  and if  $x, y$  are uncorrelated, prove that 6

$$r_{uv} = \frac{\sigma_x^2 - \sigma_y^2}{\sigma_x^2 + \sigma_y^2}$$

- (c) Solve the following L.P.P. by simplex method. 8

Maximize  $z = x_1 + 1.5x_2$   
 Subject to  $2x_1 + x_2 \leq 150$   
 $4x_1 + 2x_2 \leq 250$   
 $4x_1 + 2x_2 \leq 280$   
 $x_1, x_2 \geq 0$