



d) Using Gauss elimination method, the solution of system of equations

$$x + \frac{1}{4}y + \frac{1}{4}z = 1, \frac{15}{4}y - \frac{9}{4}z = 3, \frac{5}{4}y - \frac{19}{4}z = 3 \text{ is } \underline{\hspace{2cm}}. \quad [2]$$

i)  $x = 1, y = \frac{1}{2}, z = -\frac{1}{2}$       ii)  $x = \frac{1}{2}, y = 1, z = \frac{1}{2}$

iii)  $x = 2, y = \frac{1}{2}, z = 2$       iv)  $x = 1, y = 2, z = 3$

e) The first four central moments of a distribution are 0, 0.453, 0.06 and 0.502. The coefficient of Kurtosis  $\beta_2$  is \_\_\_\_\_. [1]

i) 0.0387      ii) 2.4463

iii) 25.8221      iv) 0.4088

f) If  $f(x)$  is a continuous function on  $[a, b]$  and  $f(a)f(b) < 0$ , then to find a root of  $f(x) = 0$ , initial approximation  $x_0$  by bisection method is \_\_\_\_\_. [1]

i)  $x_0 = \frac{a-b}{2}$       ii)  $x_0 = \frac{f(a)+f(b)}{2}$

iii)  $x_0 = \frac{a+b}{2}$       iv)  $x_0 = \frac{a-b}{a+b}$

**Q2) a)** The first four moments of a distribution about the value 5 are 2, 20, 40 and 50. Obtain the first four central moments,  $\beta_1$  and  $\beta_2$ . [5]

b) Fit a straight line of the form  $y = a + bx$  to the following data by the least square method. [5]

$x$	-2	1	3	6	8	9
$y$	17	14	12	9	7	6

c) For a bivariate data, the regression equation of  $y$  on  $x$  is  $8x - 10y = -66$  and the regression equation of  $x$  on  $y$  is  $40x - 18y = 214$ . Find the mean values of  $x$  and  $y$ . Also, find the correlation coefficient between  $x$  and  $y$ . [5]

OR

**Q3) a)** Following are the runs scored by two batsmen in 5 cricket matches. Which batsman is more consistent in scoring runs? [5]

Score by (x)	38	47	34	18	33
Batsman A					
Score by (y)	37	35	41	27	35
Batsman B					

- b) Fit a parabola of the form  $y = a + bx + cx^2$ . Using the least square method to the following data. [5]

$x$	-2	-1	0	1	2
$y$	-2	5	8	7	2

- c) Find the correlation coefficient between age in years ( $x$ ) and glucose level ( $y$ ) from the data of 5 people as follows. [5]

$x$	43	22	25	42	58
$y$	99	65	79	75	87

- Q4)** a) A fair die is tossed once. Random variable  $x$  denote the digit that appears as top face. Find the expectation  $E(x)$ . [5]
- b) The number of breakdowns of a computer in a week is a poisson variable with  $\lambda = np = 0.3$ . What is the probability that the computer will operate. [5]
- With no breakdown
  - At most one breakdown in a week.
- c) In a certain city 4000 lamps are installed. If the lamps have average life of 1500 burning hours. Assuming normal distribution. [5]
- How many lamps will fail in first 1400 hours?
  - How many lamps will last beyond 1600 hours?
- [Given :  $z = 1, A = 0.3413$ ]

OR

- Q5)** a) Two cards are drawn from a well shuffled pack of 52 cards. Find the probability that they are both kings if [5]
- The first card drawn is replaced
  - The first card drawn is not replaced
- b) A certain factory turning cotter pins knows that 2% of its product is defective. If it sells cotter pins and gurantees that not more than 5 pins will be defective in a box of 100 pins. Find the approximate probability that a box will fail to meet the guranteed quality. [5]

- c) A bank utilizes four windows to render fast service to the customers on a particular day 800 customers were observed. They were given service at the different windows as follows: [5]

Window Number	Number of Customers
1	150
2	250
3	170
4	230

Test whether the customers are uniformly distributed over the windows.

[Given:  $\chi_{3,0.05}^2 = 7.815$ ] [Use 5% level of significance]

- Q6) a) Find the root of the equation  $x^3 - 4x + 1 = 0$  lying in the interval  $\left(0, \frac{1}{2}\right)$  by

Bisection method correct upto 3 decimal places (Five iterations only) [5]

- b) Find the root of the equation  $x^2 - 12 = 0$  lying between (3, 4) by Newton-Raphson method correct upto 3 decimal places. [5]

- c) Solve by Gauss-Seidel method the system of equations. [5]

$$5x - y = 9$$

$$-x + 5y - z = 4$$

$$-y + 5z = -6$$

Take initial solution as  $\left(\frac{9}{5}, \frac{4}{5}, \frac{6}{5}\right)$  write numerical calculations correct upto three decimal places.

OR

- Q7) a) Solve by Gauss elimination method, [5]

$$2x + y + z = 10$$

$$3x + 2y + 3z = 18$$

$$x + 4y + 9z = 16$$

- b) Solve by Jacobi's iteration method, [5]

$$20x_1 + x_2 - 2x_3 = 17$$

$$3x_1 + 20x_2 - x_3 = -18$$

$$2x_1 - 3x_2 + 20x_3 = 25$$

Write numerical calculations correct upto 3 decimal places.

- c) Use Regula-Falsi method to find real root of the equation  $e^x - 4x = 0$  lying

between  $\left(0, \frac{1}{2}\right)$ , correct to three decimal places. [5]

- Q8) a)** Using Newton's forward interpolation formula, find the population in the year 1895 from given data, [5]

$x$ (year)	1891	1901	1911	1921	1931
$y$ (pop <sup>n</sup> )	46	66	81	93	101

- b) Evaluate,  $\int_0^1 e^x dx$  using Simpson's 1/3<sup>rd</sup> rule ( $h = 0.2$ ). [5]

- c) Use Euler's method to solve  $\frac{dy}{dx} = x^2 + y$ ,  $y(0) = 1$ ,  $h = 0.1$  Tabulate values of  $y$  for  $x = 0.1$  to  $x = 0.4$ . [5]

OR

- Q9) a)** Use Runge-Kutta method of 4<sup>th</sup> order to solve  $\frac{dy}{dx} = y - x$ ,  $y(0) = 1$  at  $x = 0.2$  with  $h = 0.2$ . [5]

- b) Using modified Euler's method find  $y(0.1)$ , given  $\frac{dy}{dx} = 1 + xy$ ,  $y(0) = 1$ ,  $h = 0.1$

(Two iterations only). [5]

- c) Using Newton's backward difference formula, find  $y$  at  $x = 3.5$  from following data, [5]

$x$	0	1	2	3	4	5
$y$	5.2	8	10.4	12.4	14	15.2

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