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SEAT No. :

**P1326**

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**TE/Insem./APR-106**

**T.E. (Mechanical/Auto. Engg./and Sandwich)**

**NUMERICAL METHODS AND OPTIMIZATION**

**(2015 Course) (Semester - II) (302047)**

*Time : 1 Hour]*

*[Max. Marks :30*

*Instructions to the candidates:*

- 1) *Attempt Q.1 or Q.2, Q.3 Or Q.4, Q.5 or Q.6.*
- 2) *Neat diagrams must be drawn whenever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Use of calculator is allowed.*
- 5) *Assume suitable data, if necessary.*

**Q1)** a) Determine the root of equation,  $f(x) = x - x^2 + 2$  using successive approximation method. The answer should be accurate, up to 3 decimal places. Take an initial guess as 0 and check condition of convergence. **[6]**

- b) Explain the terms with the help of example. **[4]**
- i) Truncation error,
  - ii) Round off error.

OR

**Q2)** a) Find the root of equation,  $f(x) = e^x - 2x - 2$  using bisection method; accurate up to 0.001. Take a=1 and b=2 as initial guesses. **[5]**

- b) Draw a flowchart for finding the root of equation using Newton-Raphson method (iteration based). **[5]**

**Q3)** a) Solve following system of equations by Gauss-Seidal method: **[6]**

$$8x + y + 4z = 9$$

$$7x + 52y + 13z = 100$$

$$3x + 8y + 29z = 71$$

- b) Draw a flowchart for Thomas Algorithm for Tri-diagonal Matrix. **[4]**

OR

**P.T.O.**

- Q4)** The upward velocity of a rocket is given at three different times in the following table: [10]

Time, t(s)	Velocity, v(m/s)
5	106.8
8	177.2
12	279.2

The velocity data is approximated by a polynomial as,

$$v(t) = a_1 t^2 + a_2 t + a_3, \quad 5 \leq t \leq 12$$

Find the values of  $a_1, a_2, a_3$  using the Gauss elimination with partial pivoting.

- Q5)** Use simplex method to solve following LPP: [10]

Minimize  $z = 5X_1 + 6X_2$

Subject to  $2X_1 + 5X_2 \geq 1500$ ;

$$3X_1 + X_2 \geq 1200,$$

Where  $X_1, X_2 \geq 0$ .

OR

- Q6) a)** Solve the following LP problem using graphical method: [6]

Maximize  $Z = 7X_1 + 6X_2$

Subject to  $X_1 + X_2 \leq 4$ ;

$$2X_1 + X_2 \leq 6,$$

Where  $X_1, X_2 \geq 0$ .

- b) A shop can make two types of sweets (A and B). they use two resources; flour and sugar. To make one packet of A, they need 2 kg of flour and 5 kg of sugar. To make one packet of B, they need 3 kg of flour and 3 kg of sugar. They have 28 kg of flour and 30 kg of sugar. These sweets are sold at Rs. 800 and 900 per packet respectively. Formulate LPP to maximize total revenue. [4]

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