

Total No. of Questions : 6]

SEAT No. :

P1326

[Total No. of Pages : 2

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]

$$\text{Minimize } z = 5X_1 + 6X_2$$

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

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

$$\text{Where } X_1, X_2 \geq 0.$$

OR

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

$$\text{Maximize } Z = 7X_1 + 6X_2$$

$$\text{Subject to } X_1 + X_2 \leq 4;$$

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

$$\text{Where } X_1, X_2 \geq 0.$$

- 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]

EEE