

Oct-22/TE/Insem-573

T.E. (Mechanical/ Mechanical S/W)

NUMERICAL & STATISTICAL METHODS

(2019 Pattern) (Semester - I) (302041)

Time : 1 Hour]

[Max. Marks : 30

Instructions to the candidates :

- 1) Answer Q1 or Q2, Q3 or Q4.
- 2) Figures to the right side indicate full marks.
- 3) Use of electronic calculator is allowed.
- 4) Assume suitable data, if necessary.

- Q1)** a) Draw the flow chart of Bisection Method using accuracy criteria. [6]
 b) Solve the following simultaneous equations using Tri diagonal matrix algorithm (TDMA). [9]

$$5x_1 - x_2 = 5.5$$

$$-x_1 + 5x_2 - x_3 = 5,$$

$$-x_2 + 5x_3 - x_4 = 11.5,$$

$$-x_3 + 5x_4 = 16.5$$

OR

- Q2)** a) The upward velocity of a rocket is given at three different times in the following table : [8]

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, $v(t) = a_1 t^2 + a_2 t + a_3$, $5 \leq t \leq 12$. Find the values of a_1 , a_2 and a_3 using Gauss elimination with partial pivoting.

- b) Find the fourth root of 32, using Newton Raphson Method. Take accuracy 0.01. [7]

P.T.O.

- Q3) a)** Solve the differential equation by Euler's method to solve the initial value problem over the interval $x = 0$ to 2 with $h = 0.5$ where

$$\frac{dy}{dx} = yx^2 - 1.1y; \text{ where } y(0) = 1. \quad [5]$$

- b) Given the values of $u(x, y)$ on the boundary of the square is as follows. Evaluate the function $u(x, y)$ satisfying the Laplace equation $\nabla^2 u = 0$. Boundary conditions. Top = 1000; Bottom = 500; Left 2000; Right = 500 with 3×3 grid points. [10]

OR

- Q4) a)** A second order ODE is transformed into first order ODE as, $dy/dx = z$ and $dz/dx = 0.5x - y^2$.

Given that $y(0) = 2$ and $z(0) = 0$. Estimate the value of y and z at $x = 0.2$, take $h = 0.1$. [9]

- b) Draw the flow chart for solving the Laplace Equation. [6]
