

Reg. No.:

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TERM END EXAMINATIONS (TEE) – May 2023

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|--------------------------------------|--|-------------------|----------------------------------|
| Programme | : B.Tech. | Semester | : Summer Semester 2022-23 |
| Course Title/ Course Code | : Applied Numerical Methods / MAT2003 | Slot | : D21+D22+D23+D24+D25 |
| Time | : 1½ hours | Max. Marks | : 50 |

Answer ALL the Questions

Q. No. Question Description Marks

PART - A (30 Marks)

- 1 (a) Solve the following system by Gaussian elimination method 10

$$\begin{aligned}x_1 - x_2 + x_3 &= 1 \\-3x_1 + 2x_2 - 3x_3 &= -6 \\2x_1 - 5x_2 + 4x_3 &= 5\end{aligned}$$

OR

- (b) Find the smallest positive root of the equation $x^3 - 2x + 0.5 = 0$ using Newton's-Raphson method. 10

- 2 (a) Using Lagrange's formula find the value of x when $f(x) = 15$ from the given data : 10

| | | | | |
|---|----|----|----|----|
| x | 5 | 6 | 9 | 11 |
| y | 12 | 13 | 14 | 16 |

OR

- (b) The following table gives the census population of a town for the years 1931 to 1971. Estimate the population for the year 1965 by using an approximate interpolation formula. 10

| | | | | | |
|------------------------------|------|------|------|------|------|
| Year | 1931 | 1941 | 1951 | 1961 | 1971 |
| Population (in thousands) | 46 | 66 | 81 | 93 | 101 |

- 3 (a) The velocity of a train which starts from rest is given by the following table, the time being reckoned in minutes from the start and speed in kilometres per hour. 10

| | | | | | | | | | | |
|------------------|----|----------|----|----------|----------|----------|----------|----|---------|----|
| t min | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 |
| V km/ hour | 16 | 28 .8 | 40 | 46 .4 | 51 .2 | 32 .0 | 17 .6 | 8 | 3. 2 | 0 |

Estimate approximately by Simpson's rule the total distance run in 20 minutes.

OR

- (b) Find the solution of the heat equation $\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$ subject to the conditions $u(x, 0) = 0$, $u(0, t) = 0$ and $u(1, t) = t$. Compute u for $t = \frac{1}{8}$ in one step using Crank-Nicolson method. 10

PART - B (20 Marks)

- 4 Verify the diagonal dominance of the following system of equation. If not rearrange the equation into diagonal dominance and find the solution using Gauss-Seidel method. 10

$$3x + 4y + 15z = 54.8$$

$$x + 12y + 3z = 39.66$$

$$10x + y + 2z = 7.74$$

- 5 Using Euler's method solve for y at $x = 1$ from $\frac{dy}{dx} = 2e^x + y^2$, $y(0) = \frac{1}{2}$ taking $h = 0.25$. 10

