Reg. No.:

Name :

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TERM END EXAMINATIONS (TEE) – May 2023

Programme	:	**B.Tech.**	**Semester**	:	**Summer Semester 2022-23**
Course Title/ Course Code	:	**Applied Numerical Methods/ MAT2003**	**Slot**	:	**B11+B12+B13+B14+B15**
Time	:	**1½ hours**	**Max. Marks**	:	**50**

Answer ALL the Questions

Q. No.		Question Description	Marks

PART - A (30 Marks)

1 (a) Check the solvability of the following system of equations using Gauss Seidel iteration method. If not, solve the following system by rearranging. Perform three iterations with the initial approximation $X^{(0)} = (1, 0.8, 0.5)^T$, 10

$$x_1 + 3x_2 + x_3 = 4$$
$$4x_1 + 2x_2 + x_3 = 4$$
$$3x_1 + 2x_2 + 6x_3 = 7.$$

OR

(b) The equation $2e^{-x} = \frac{1}{x+2} + \frac{1}{x+1}$ has two roots. Calculate the roots up to five decimal places using Newton Raphson method. Take initial approximation $x_0 = -0.6, 0.8$ respectively. 10

2 (a) Using Newton's divided difference scheme, find the equation of the biquadratic curve passing through the points (-4,1245), (-1,33), (0,5), (2,9) and (5,1335). 10

OR

(b) A particle moves at the following velocities v (m/sec) at different instant of time t as described follows. Find the acceleration of the particle at $t = 1.1\ sec, 1.5\ sec$, 10

Time (t)	1.1	1.2	1.3	1.4	1.5
Velocity (v)	2.0091	2.0333	2.0692	2.1143	2.1667

3 (a) Consider $f(x) = \frac{x}{sinx}, f(0) = 1$. Evaluate the integral 10

$$I = \int_0^{0.5} f(x)\, dx$$

by taking $h = 0.25, 0.125, 0.0625$ successively using Trapezoidal rule.
Hence improve the value of the integral using Romberg's method, correct up to three decimal places.

OR

(b) Consider one dimensional heat equation: 10

$$\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2} \text{ in } 0 \leq x \leq 5, t \geq 0.$$

Given that, $u(x, 0) = 20, u(0, t) = 0, u(5, t) = 100$.
Find the solution of heat equation, using the Crank-Nicolson scheme with step size h=1 and k=1 up to two time level.

PART - B (20 Marks)

4 Given the points satisfying (0,0), $(\pi/2, 1)$ and $(\pi, 0)$ the function $y = sinx, (\ 0 \leq x \leq \pi)$, determine the value of $y(\pi/6)$ using cubic spline approximation. Instead of $h = \pi/2$, if we consider $h = \pi/4$, what will be the better approximation value of $y(\pi/6)$ using this method? 10

5 Consider the nonlinear initial value problem $\frac{dy}{dx} + y^2 = x, y(0) = 1$. Find the value $y(0.4)$ using Adam-Bashforth predictor corrector method. Initial values are given as follows: $y(0.1) = 0.9117, y(0.2) = 0.8494, y(0.3) = 0.8061$. 10

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