$$\begin{bmatrix} 2 & 3 & 1 \\ 3 & 2 & 2 \\ 1 & 2 & 1 \end{bmatrix}$$

(b) Using House-holder's method, reduce the following matrix to the tri-diagonal form : 10

$$\begin{bmatrix} 1 & 4 & 3 \\ 4 & 1 & 2 \\ 3 & 2 & 1 \end{bmatrix}$$

SECTION – D

8. (a) Find an approximate value of y for $x = 0.2$, in step of 0.1, if $\frac{dy}{dx} = x + y^2$ with $y(0) = 1$ by using Runge-Kutta method of order 4. 10

(b) Solve the initial value problem $\frac{dy}{dx} = 1 + xy^2$, $y(0) = 1$ for $x = 0.4$ by using Milne's method given that $y(0.1) = 1.105$; $y(0.2) = 1.223$; $y(0.3) = 1.355$. 10

9. Solve the equation $\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$ subject to the conditions $u(x, 0) = \sin \pi x$, $0 \le x \le 1$; $u(0, t) = u(1, t) = 0$, using :

(i) Crank Nicolson method

(ii) Schmidt Method. $10 \times 2 = 20$

Roll No. .....

24262

B. Tech. 5th Semester (MAE) Examination – February, 2022

APPLIED NUMERICAL TECHNIQUE AND COMPUTING

Paper : ME-311-F

Time : Three Hours] *[Maximum Marks : 100*

Before answering the questions, candidates should ensure that they have been supplied the correct and complete question paper. No complaint in this regard, will be entertained after examination.

Note : Attempt ***five*** questions in all, selecting ***one*** question from each Section. Question No. **1** is ***compulsory***. All questions carry equal marks.

1. (a) Define inherent and truncation error.

(b) Differentiate between interpolation and extrapolation with suitable example.

(c) What is difference between linear and non-linear equation ?

(d) Define algebraic and transcendental equation with example.

P. T. O.

(e) Explain about Direct and iteration method.

(f) Define Eigen values and Eigen vectors.

(g) Define initial and boundary value problem.

(h) Explain Power method with example. $2.5 \times 8 = 20$

SECTION – A

2. (a) Round off $\sqrt{29}$ and $\sqrt{\pi}$ correct to 4 significant figures and compute absolute, Relative and percentage errors in each case. 10

(b) If $u = \frac{4x^2y^3}{z^4}$ and errors in x, y, z be 0.001, compute the relative maximum error in u when $x = y = z = 1$. 10

3. (a) Given the values : 10

x:	300	304	305	307
$\log_{10} x$:	2.4771	2.4849	2.4843	2.4871

Evaluate $\log_{10} 310$ by using Lagrange's and Newton divided difference interpolation formula.

(b) Fit a curve $y = ae^{bx}$ to the following data : 10

x:	2	4	6	8
y:	25	38	56	84

SECTION – B

4. Given that : 20

x:	1.0	1.1	1.2	1.3	1.4	1.5	1.6
y:	7.989	8.403	8.781	9.129	9.451	9.750	10.031

Find $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ at (i) $x = 1.1$ (ii) $x = 1.6$.

5. (a) Find a real root of the equation $x \log_{10} x = 1.2$ by Secant method correct to four decimal places. 10

(b) Find a real root of the equation $x^3 - 4x - 9 = 0$ correct to three decimal places by using Newton's Raphson method. 10

SECTION – C

6. (a) Using UV factorization method to solve the simultaneous linear equations : 10

$3x + 2y + 7z = 4;\ 2x + 3y + z = 5;\ 3x + 4y + z = 7.$

(b) Solve, by iteration method, the following simultaneous linear equations : 10

$9x - 2y + z = 50;\ x + 5y - 3z = 18;\ -2x + 2y + 7z = 19$

7. (a) Using Jacobi's method, find all Eigen values and corresponding Eigen vectors of the matrix : 10

P. T. O.