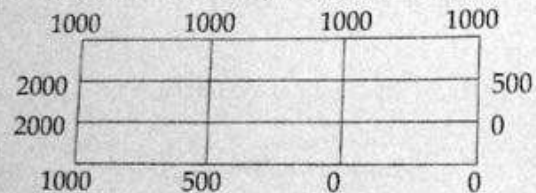


7. (a) Given $\frac{dy}{dx} = \frac{1}{2}xy$,
 $y(0) = 1$, $y(0.1) = 1.0025$, $y(0.2) = 1.0101$,
 $y(0.3) = 1.0228$
 Evaluate $y(0.4)$ by using Adams-Bashforth method.
- (b) Using Runge-Kutta method, compute $y(0.2)$ and $y(0.4)$ from

$$10 \frac{dy}{dx} = x^2 + y^2, y(0) = 1$$

SECTION - D

8. Solve the elliptic equation $u_{xx} + u_{yy} = 0$ for the following square mesh with boundary values as shown :



9. (a) Fit a parabola, by the method of least squares, to the following data :
- | | | | | | |
|------|---|----|----|----|----|
| $x:$ | 1 | 2 | 3 | 4 | 5 |
| $y:$ | 5 | 12 | 26 | 60 | 97 |
- (b) Solve the equation $\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$ subject to the conditions
 $u(x, 0) = \sin \pi x$, $0 \leq x \leq 1$; $u(0, t) = u(1, t) = 0$, using Crank Nicolson method.

Roll No.

24291

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

NUMERICAL METHODS AND COMPUTING TECHNIQUES

Paper : CE-309-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 : Question No. 1 is *compulsory*. Attempt total 5 questions with selecting *one* question from each Section. All questions carry equal marks.

1. (a) Describe Numerical differentiation and Numerical integration.
- (b) State Simpson's $\frac{3}{8}$ th Rule.
- (c) Using Euler's method, find approximate value of y when $x = 1$ of $\frac{dy}{dx} = x + y$, $y(0) = 1$ (take $h = 0.2$).
- (d) Define R.K. method.
- (e) What are direct methods and iterative method to solve the system of linear equations ?

- (f) Write the finite difference approximations to partial derivatives in x and y directions.
 (g) What is interpolation?
 (h) What is curve fitting? What is the need for such an exercise?

SECTION - A

2. (a) Determine $f(x)$ as a polynomial in x for the following data:

x :	-4	-1	0	2	5
$f(x)$:	1245	33	5	9	1335

by using Divided Diff. Table.

- (b) Find the cubic splines to fit the data and evaluate $y(1.5)$ and $y'(3)$:

x :	1	2	3	4
y :	1	2	5	11

3. (a) Find the iterative formulae for finding $\sqrt[3]{N}$, where N is a real number, using Newton-Raphson formula. Hence evaluate $\sqrt[3]{10}$ to four decimal places.
 (b) Find a real root of the equation $\tan x = x$ by fixed point method.

SECTION - B

4. (a) Solve the system:

$$9x - 2y + z = 50$$

$$x + 5y - 3z = 18$$

$$-2x + 2y + 7z = 19$$

by using Iterative method.

24291- (P-4)(Q-9)(22) (2)

- (b) Solve the equations:

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

$$3x + 2y + 3z = 18;$$

$$x + 4y + 9z = 16$$

by Gauss elimination method.

5. (a) Given that:

$$x: \quad 1.96 \quad 1.98 \quad 2.00 \quad 2.02 \quad 2.04$$

$$f(x): \quad 0.7825 \quad 0.7739 \quad 0.7651 \quad 0.7563 \quad 0.7473$$

find $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ at $x = 2.03$

- (b) Evaluate $\int_0^1 \frac{dx}{1+x^2}$ using

(i) Trapezoidal rule taking $h = \frac{1}{4}$

(ii) Simpson's rule taking $h = \frac{1}{6}$

SECTION - C

6. (a) Find the largest Eigen value of the matrix, using power method:

$$A = \begin{bmatrix} 1 & 2 & 3 \\ 0 & -4 & 2 \\ 0 & 0 & 7 \end{bmatrix}$$

- (b) Using modified Euler's method, obtain a solution of the equation $\frac{dy}{dx} = \log(x+y)$, with initial conditions $y = 2$ at $x = 0$, at $x = 1.2$ and 1.4 in steps of 0.2 .

24291- (P-4)(Q-9)(22) (3)

P. T. O.