

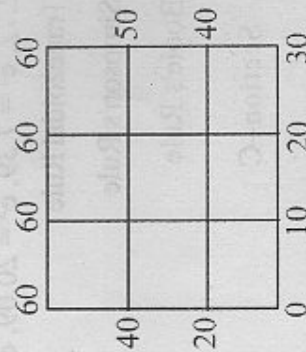
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7. Apply Milne's Method to find a solution of the differential equation $\frac{dy}{dx} = x - y^2$ in the range $0 \leq x \leq 1$ for the boundary condition $y = 0$ at $x = 0$, taking $h = 0.2$. Starting solutions required are to be obtained by using Taylor's series methods.

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 straight line, by the method of least squares, to the following data :

x :	1	2	3	4	5
y :	5	12	26	60	97

- (b) Evaluate the pivotal values of the equation

$$\frac{\partial^2 u}{\partial^2 t} = 16 \frac{\partial^2 u}{\partial^2 x} \text{ taking } \Delta x = 1 \text{ up to } t = 1.25.$$

The boundary conditions are

$$u(x, 0) = x^2(5 - x), \quad u(0, t) = u(5, t) = 0, \quad \text{and} \\ u_t(x, 0) = 0.$$

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B.Tech. 5th Semester (Civil Engg.) Examination,
December-2015

NUMERICAL METHODS AND COMPUTING
TECHNIQUES

Paper-CE-309-F

Time allowed : 3 hours] [Maximum marks : 100

Note : Q. No. 1 is compulsory. Attempt total five questions with selecting one question from each section. All questions carry equal marks.

- What is curve fitting ? What is the need for such an exercise ? 2.5×8
 - Define forward differences and backward differences.
 - What are direct methods and iterative method to solve the system of linear equations ?
 - Discuss initial value problems and B.V.P's.
 - What is Crank-Nicolson Method ? Why is it known as implicit method ?
 - Find by Taylor's series method, the value of y at $x = 0.1$ and $x = 0.2$ from $\frac{dy}{dx} = x^2y - 1, y(0) = 1$
 - Write down the Newton-Cotes Quadrature formula.

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- (h) Write the finite difference approximations to partial derivatives in x and y.

Section-A

2. (a) Fit a second degree parabola to the following data:

x:	1.0	1.5	2.0	2.5	3.0	3.5	4.0
y:	1.1	1.3	1.6	2.0	2.7	3.4	4.1

- (b) 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.

3. (a) Find a real root of the equation $x^3 + x^2 - 1 = 0$ by fixed point Method.

- (b) Find a real root of the equation $\log x = x - 3$ taking $x_0 = 0.25$, $x_1 = 0.5$, $x_2 = 1$ by using Muller's Method.

Section-B

4. (a) Solve the system

$$2x + 4y + z = 3$$

$$3x + 2y - 2z = -2$$

$$x - y + z = 6$$

by using Gauss elimination method

- (b) Solve the system

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

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

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

by using Relaxation method.

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5. (a) Derive the derivatives formulae using forward difference formula and hence find the first and second derivatives of $f(x)$ at 1.1 if

x:	1.0	1.2	1.4	1.6	1.8	2.0
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f(x):	0	0.128	0.544	1.296	2.432	4.00
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- (b) Evaluate $\int_0^4 e^x dx$

Given $e = 2.72$, $e^2 = 7.39$, $e^3 = 20.09$, $e^4 = 54.6$

by (i) Trapezoidal Rule

(ii) Simpson's Rule

(iii) Boole's Rule

Section-C

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

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

- (b) Using Runge-Kutta method, compute $y(0.2)$ and $y(0.4)$ from

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

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