

Code No: 5220AK

R15

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M. Tech I Semester Examinations, February - 2017

COMPUTER ORIENTED NUMERICAL METHODS

(Structural Engineering)

Time: 3hrs

Max.Marks:75

Note: This question paper contains two parts A and B.

Part A is compulsory which carries 25 marks. Answer all questions in Part A.

Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

PART - A

5 × 5 Marks = 25

1. a) Find the Eigen values of $\begin{bmatrix} -3 & -7 & -5 \\ 2 & 4 & 3 \\ 1 & 2 & 2 \end{bmatrix}$. [5]

b) Obtain the piecewise linear interpolating polynomials for the function $f(x)$ given that $f(1) = 2$, $f(2) = 4$, $f(3) = 8$, $f(4) = 16$ and $f(7) = 128$. [5]

c) Prove that $1 + \mu^2 \delta^2 = \left(1 + \frac{1}{2} \delta^2\right)^2$ [5]

d) Derive a formula to find $\frac{dy}{dx}$ by numerical method. [5]

e) Apply Euler's method to solve $y' = x + y^2$, $y(0) = 1$ choosing the step length $h = 0.2$. Find $y(0.2)$, $y(0.4)$, $y(0.6)$. [5]

PART - B

5 × 10 Marks = 50

2. Use Householder's method to transform the given matrix to tridiagonal matrix. [10]

$$\begin{bmatrix} 2 & 1 & 1 \\ 1 & 1 & 0 \\ 1 & 0 & 1 \end{bmatrix}$$

OR

3. Solve the system of equations using Gauss seidal method [10]

$$9x + 2y + 4z = 20$$

$$x + 10y + 4z = 6$$

$$2x - 4y + 10z = -15$$

4. Find $f(84)$, from the following data [10]

x	40	50	60	70	80	90
y	184	204	226	250	276	304

OR

5. Find the polynomial $f(x)$ satisfied by the points (0, 1), (1, 3), (2, 7), (3, 13) using Newton's forward interpolation formula. [10]

6. Use Gauss Backward interpolation formula to find $\tan 50^{\circ}42'$ given that. [10]

x	50	51	52	53	54
$\tan x$	1.1918	1.2349	1.2799	1.327	1.3764

OR

7. Compute $y'(x)$ at $x = 0$ for $y = e^{2x}$ using Richardson's extrapolation. [10]

8. Evaluate $\int_0^1 \int_0^1 e^{xy} dx dy$, taking $h = k = 0.5$ by Trapezoidal rule. [10]

OR

9. Evaluate $\int_0^1 e^{-x^2} dx$ by dividing the range of integration into 4 equal parts using
 a) Trapezoidal rule, b) Simpsons $\frac{1}{3}$ rd rule. [10]

10. Find $y(0.1)$ and $y(0.2)$ given that $\frac{dy}{dx} = xy + y^2$ and $y(0) = 1$ using Taylor's series method. [10]

OR

11. Find the values of $y(0.25), y(0.5)$ and $y(0.75)$ by finite difference method, given that $y'' - 4y = 8$, $y(0) = 0$ and $y(1) = 0$. [10]

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