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B.Tech. (Sem. - 5th)

NUMERICAL ANALYSIS

SUBJECT CODE : EE - 311 / AM - 351

Paper ID : [A0418]

[Note : Please fill subject code and paper ID on OMR]

Time : 03 Hours **Maximum Marks : 60**

Instruction to Candidates:

1) Section - A is **Compulsory**.
2) Attempt any **Four** questions from Section - B.
3) Attempt any **Two** questions from Section - C.

Section - A

Q1) *(10 x 2 = 20)*

a) How Secant method is better than method of False Position?

b) State the conditions when Newton Raphson method fails.

c) Explain the concept of pivoting.

d) Give principle of least squares method.

e) Give properties of triangular matrices.

f) Give formula for composite Simpson's rule.

g) Define the operators Δ, ∇, E and μ.

h) Write Newton's backward difference formula for derivatives.

i) Using Picard's method to find first approximation of $\frac{dy}{dx} = x + y^2$, $y(0) = 1$.

j) Give the name of 3 numerical methods for solving ordinary differential equation.

Section - B

(4 x 5 = 20)

Q2) Using Regula Falsi method, find a root of the equation $2x = \cos x + 3$, upto 4 decimal places.

Q3) Using Gauss elimination method with partial pivoting, solve

$$\begin{bmatrix} 2 & 1 & 1 & -2 \\ 4 & 0 & 2 & 1 \\ 3 & 2 & 2 & 0 \\ 1 & 3 & 2 & -1 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \\ w \end{bmatrix} = \begin{bmatrix} -10 \\ 8 \\ 7 \\ -5 \end{bmatrix}.$$

Q4) Evaluate $\int_0^1 \frac{1}{1+x}\,dx$, using Trapezoidal rule by taking 7 subintervals.

Q5) Using Taylor's series method, find y at $x = 0.1$ and 0.2 upto 3 decimals from $\frac{dy}{dx} = x^2y - 1, y(0) = 1.$

Q6) Using modified Euler's method, solve y(0.3) from $\frac{dy}{dx} = x + y$, y(0) = 1. (Take $h = 0.1$)

Section - C

(2 x 10 = 20)

Q7) (a) Using Runge Kutta method of order 4, find $y(0.2)$ upto 3 decimals from $\frac{dy}{dx} = y^2 + x, y(0) = 1.$

(b) What is meant by the term 'order' in Runge Kutta method of order 4?

Q8) (a) Find approximate value of $f'(1.1)$, from the following data

x	1.0	1.1	1.2	1.3	1.4
$f(x)$	0.98	0.40	0.78	0.12	0.45

(b) Use LU decomposition to solve $3x + 2y + 7z = 4$; $2x + 3y + z = 5$; $3x + 4y + z = 7$.

Q9) Solve the system of non-linear equations $x^2 + y = 11$, $x + y^2 = 7$, by using Newton-Raphson method. Carry out two iterations. (Take $x_0 = 3.5, y_0 = -1.8$)