Assignment

Sub - Numerical
Method

B.Sc. Physical Science
first year

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Q.1. Using Runge kutta method of order 4, solve

$$\frac{dy}{dx} = \frac{y^2 - x^2}{y^2 + x^2} \text{ with } y(0) = 1 \text{ at } x = 0.5$$

Q.2. Use Euler's method with $h = 0.1$ to solve the differential equation $\frac{dy}{dx} = x^2 + y^2$, $y(0) = 1$ in the range $x = 0$ to $x = 0.3$

Q.3. Solve by Euler's modified method $\frac{dy}{dx} = \log(x+y)$; $y(0) = 2$ at $x = 1.2$ and 1.4 with $h = 0.2$

Q.4. Explain the Simpson's $\frac{1}{3}$ Rule, Simpson $\frac{3}{8}$ Rule, and Trapzoidal Rule

Q.5. Evaluate $\int_0^1 \frac{dx}{1+x}$ using

(a) Trapzoidal rule taking $h = \frac{1}{4}$

(b) Simpson's $\frac{1}{3}$ Rule taking $h = \frac{1}{4}$

(c) Simpson's $\frac{3}{8}$ Rule taking $h = \frac{1}{6}$

Q.6. The population of M.P. during the three census period was as follows: -

Year	Population
1951	2.7
1961	3.2
1971	3.8
1981	4.4
1991	5.8

find the value at 1967

Q.(7.)   Prove the following relations

(i) $E = \Delta + 1$
(ii) $E^{-1} = 1 - \nabla$
(iii) $E\nabla = \Delta$
(iv) $\delta = E^{1/2} - E^{-1/2}$

Q.(8.) Given. $A = \begin{bmatrix} 8 & 1 & -1 \\ -1 & 7 & -2 \\ 2 & 1 & 9 \end{bmatrix}$, $b = \begin{bmatrix} 8 \\ 4 \\ 12 \end{bmatrix}$ $(x_0, y_0, z_0) = (0, 0, 0)$

Solve using Gauss seidal method. [two iteration]

Q.(9.) Solve the system of eq^n by Gauss elimination method with row pivoting.

$$2x + y + z = 3$$
$$3x + 2y + z = 2$$
$$2x + y + 2z = 1$$

Q.10.(a) Explain the Newton Raphson method.
(b) Define the Rate of convergence and find the Rate of convergence of N-R method.