Paper III : Numerical Analysis and Programming in 'C'

Section—A

$1 \times 10 = 10$

1. The value of $\Delta^3 (1 - x) (1 - 2x) (1 - 3x)$ is :

(a) -6 (b) 3 (c) 2 (d) -36.

2. For the values $f(0) = 3, f(1) = 6, f(2) = 11, f(3) = 18, f(4) = 27$, the form of the function $f(x)$ is :

(a) $x^2 + 2x + 3$ (b) $x^2 + 2x + 1$ (c) $x^2 + 2x + 5$ (d) $x^2 + 2x + 4$.

3. The divided difference $f(x_0, x_1)$ is equal to :

(a) $\frac{f(x_1) - f(x_0)}{x_1 + x_0}$ (b) $\frac{f(x_1) + f(x_0)}{x_1 + x_0}$

(c) $\frac{f(x_1) - f(x_0)}{x_1 - x_0}$ (d) $\frac{f(x_1) + f(x_0)}{x_1 - x_0}$.

4. The operator δ is defined as :

(a) $\delta = E^{1/2} - E^{-1/2}$ (b) $\delta = E^{1/2} + E^{1/2}$

(c) $\delta = E - E^{-1}$ (d) $\delta = E + E^{-1}$.

5. In Simpson's '$\frac{1}{3}$' rule we assume that y is a polynomial of degree.

(a) 1 (b) 2 (c) 3 (d) 4.

6. Which method is not applicable for solving differential equation ?

(a) Euler's method (b) Picard's method

(c) Runge-Kutta method (d) Gauss-Seidal method.

7. The eigen values of the matrix $A = \begin{bmatrix} 5 & 4 \\ 1 & 2 \end{bmatrix}$ are :

(a) 3, 5 (b) 2, 6 (c) 1, 6 (d) None of these.

8. Which of the following is different from others ?

(a) $x + = 11$ (b) $x = x + 1$ (c) $x = + 1$ (d) x ++.

9. 'If' statement is also called :

(a) Looping (b) Branching (c) Breaking (d) All of these.

10. The value of x in $x = 12 - 5 * 2 + 12/4$ is :

(a) 3 (b) 5 (c) 10 (d) 0.

PTO

Section—B

$3{\cdot}5 \times 5 = 17{\cdot}5$

1. What is lowest degree polynomial which takes values ?

x	0	1	2	3	4	5
$f(x)$	0	3	8	15	24	35

2. Show that : $\Delta \log f(x) = \log\left\{1 + \frac{\Delta f(x)}{f(x)}\right\}$

3. Calculate smallest positive root of $x^3 - 5x + 3 = 0$ by Newton-Raphson method.

4. Calculate $f(8)$ by Newtons divided difference formula from following table.

x :	0	1	3
$f(x)$:	1	2	10

5. Calculate $\int_0^6 \frac{dx}{(1+x)^2}$ by Simpson's $\frac{1}{3}$ rule.

6. Find the largest eigen value and corresponding eigen vector of the matrix $A = \begin{bmatrix} 1 & 6 & 1 \\ 1 & 2 & 0 \\ 0 & 0 & 3 \end{bmatrix}$.

7. Write a short note on strings.

8. Obtain the least square polynomial of degree one for $f(x) = x^{1/2}$ on $[0, 1]$.

Section—C

$7{\cdot}5 \times 3 = 22{\cdot}5$

1. Prove the nth difference of a polynomial of degree n is constant.

2. Show that divided differences are symmetric functions of their arguments.

3. Given $\frac{dy}{dx} = y - x$, $y(0) = 2$. Find, using Runge-Kutta fourth order formula $y(0{\cdot}1)$ and $y(0{\cdot}2)$ with $h = 0{\cdot}1$.

4. Find $y(2)$, if $y(x)$ is solution of $\frac{dy}{dx} = \frac{1}{2}(x + y)$, assuming $y(0) = 2$, $y(0{\cdot}5) = 2{\cdot}636$, $y(1{\cdot}0) = 3{\cdot}595$ and $y(1{\cdot}5) = 4{\cdot}968$.

5. What are different data types in 'C' Explain in detail with examples.