# UNIT VI: NUMERICAL METHODS

1] Find Lagrange's interpolation for

| X | 2 | 3 | 5 | 7 |
|---|---|---|---|---|
| Y=log X | 0.3010 | 0.4771 | 0.6990 | 0.8451 |

Use it to find log 47 .

2] Evaluate $\int_{0.2}^{1.4}(\sin x - log_e x + e^x)dx$ by Simpson's $\frac{3}{8}^{th}$ rule. Take h = 0.1 .

3] Solve $\frac{dy}{dx} = x^2 + y, x_0 = 0, y_0 = 1$ ,to find y at x=0.1, x=0.2 using modified Euler's method.

4] Using Runge-Kutta method of 4th order solve $\frac{dy}{dx} = x^2+y^2$ Subject to the conditions $x = 1, y = 1.5$ to find $y$ at $x = 1.1, x = 1.2, h = 0.1.$

5] Using Runge-Kutta method of 2nd order solve $\frac{dy}{dx} = \frac{1}{x+y}$ Subject to the conditions $x = 0, y = 1$ to find $y$ at $x = 0.4, h = 0.2.$

6] Use Simpson's $\frac{1}{3}^{rd}$ rule with 10 intervals to find $\int_0^{\frac{\pi}{2}}\left[\frac{sinx}{x}\right]dx.$

7] Use Trapezoidal rule with 4 intervals to find $\int_0^2\left[\frac{x}{\sqrt{2+x^2}}\right]dx.$

8] Find the values of $y$ for $x = 1.5, x = 4.5\ and\ \frac{dy}{dx}\ at\ x = 1.5$ for

| X | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| Y | 3.47 | 6.92 | 11.25 | 16.75 | 22.94 |

9] Find Lagrange's interpolation for

10]

| X | 0 | 1 | 2 |
|---|---|---|---|
| Y | 4 | 3 | 6 |

Use it to find y at x=1.5 .

11] Evaluate $\int_0^{\pi}\frac{sin^2\theta}{5+4cos\theta}d\theta$ by Simpson's $\frac{3}{8}^{th}$ rule. Take h = π/6 .

12] Solve $\frac{dy}{dx} = 1 + xy, x_0 = 0, y_0 = 1$ ,to find y at x=0.1, x=0.2 using modified Euler's method.

13] Using Runge-Kutta method of 4th order solve $\frac{dy}{dx} = \sqrt{x+y}$ Subject to the conditions $x = 0,$
$y = 1$ to find $y$ at $x = 0.2, h = 0.1.$

14] Use Simpson's $\frac{1}{3}^{rd}$ rule with 10 intervals to find $\int_1^2\frac{1}{x}dx.$

15] Find the values of $y$ for $x = 0.5$ for

| X | 0 | 1 | 2 | 3 | 4 |
|---|---|---|---|---|---|
| Y | 1 | 5 | 25 | 100 | 250 |

By Newton's Forward Difference.

16] From the Table ,Estimate the values of f(0.05),f(047) using appropriate interpolation formulae

| x | 0 | 0.1 | 0.2 | 0.3 | 0.4 | 0.5 |
|---|---|---|---|---|---|---|
| y | 1 | 1.046 | 1.09423 | 1.44 | 1.297 | 1.252 |

17] Given: log 2=0.3010 , log 3=0.4771 , log 5=0.6990 , log 7=0.8451find log 47 by using Lagrange's interpolation formula.

18] From the Table ,Estimate the values of f(0.25) using Lagrange's interpolation formula

| x | 0 | 0.1 | 0.2 | 0.3 | 0.4 | 0.5 |
|---|---|---|---|---|---|---|
| y | 1 | 1.046 | 1.09423 | 1.44 | 1.297 | 1.252 |

19] Evaluate $\int_0^3 \frac{dx}{1+x}$ with 7 ordinates by using Simpson's $3/8^{th}$ rule

Hint: To get 7ordinates divide interval into 6 equal parts.

20] From table, Use i) Trapezoidal rule ii) Simpson's $1/3^{rd}$ rule iii) Simpson's $3^{th}/8$ rule to find $\int_1^7 f(t)\,dt$

| t | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|
| f(t) | 81 | 75 | 80 | 83 | 78 | 70 | 60 |

21] Evaluate $\int_0^{0.8} [\log_e(x+1)+\sin 2x]\,dx$ where x is in radian. Using simpson's $1/3^{rd}$ rule, divide entire interval into 8 strips.

22] Solve $\frac{dy}{dx}=y^2-\frac{y}{x}$ , $y(1)=1$ for the interval $0(0.1)1.5$ by using Modified Euler's method

23] Solve $\frac{dy}{dx}=x+y$ , $y(0)=1$ for $h=0.2$ find $y(0.4)\wedge y(0.6)$by using Modified Euler's method

24] Solve $\frac{dy}{dx}=(1+x)y$ , $y(0)=1$ find $y(0.2)\wedge y(0.4)$by using Runge-Kutta Mehto of fourth order.

25] Solve $\frac{dy}{dx}=\frac{y^2-x^2}{y^2+x^2}$ , $y(0)=1$ find $y(0.2)\wedge y(0.4)$by using Runge-Kutta Mehto of fourth order.

26] Use Milne's Predictor-corrector method to find $y$ *at* $x=4.4$

Solution of equation $5x\frac{dy}{dx}+y^2-2=0$ is tabulated as

| x | 4 | 4.1 | 4.2 | 4.3 |
|---|---|---|---|---|
| y | 1 | 1.0049 | 1.0097 | 1.0143 |