NUMERICAL ANALYSIS AND STATISTICS

I CS/BCA

16SACMA2

UNIT - II

PART - A

1) Write the Trapezoidal rule.
2) State the Simpson's 3/8 rule
3) Mention the various methods used to solve linear equations.
4) What is numerical differentiation?
5) State Simpson's 1/3 rule on numerical integration.
6) Solve by Gauss-Elimination method $x+y=2$, $2x+3y=5$.
7) State any two indirect methods to solve the linear systems.
8) State the condition for the convergence of Gauss Seidel method.
9) Compare Gauss Seidel method, Gauss Jordan method.
10) Define Gauss Elimination method.

PART - B

1) Find $\int_0^1 \frac{dx}{1+x^2}$ by Simpson's 1/3rd rule. Hence obtain the approximate value of π.

2) Evaluate $\int_0^{\pi/2} \sin x \, dx$ by Simpson's 1/3rd rules dividing the range $(0, \pi/2)$ into six equal parts.

3) Solve by Gauss Elimination method, $x+y+z=9$, $2x-3y+4z=13$, $3x+4y+5z=40$.

4) Calculate $\int_0^1 \frac{dx}{1+x}$ using Trapezoidal rule.

5) Using Gauss-Seidel method solve $10x-2y+z=12$, $x+9y-z=10$, $2x-y+11z=20$.

6) Dividing the range into 10 equal parts, evaluate $\int_0^{\pi} \sin x \, dx$ by Trapezoidal rule.

7) Solve the following equations by Gauss-elimination method.

$2x+y+4z=12$, $8x-3y+2z=20$, $4x+11y-z=33$.

8) Evaluate $I = \int_0^6 \frac{1}{1+x} dx$ using Simpson's $\frac{1}{3}$rd rule.

9) Solve the system of equations by Gauss elimination method, $x+2y+z=3$, $2x+3y+3z=10$, $3x-y+2z=13$.

10) Apply Gauss Seidel method to solve the system of equations, $x+y+54z=110$, $27x+6y-z=85$, $6x+15y-2z=72$.

PART-C

1) Solve by Gauss-Seidel method, the following system becomes, $28x+4y-z=32$, $x+3y+10z=24$, $2x+17y+4z=35$.

2) Explain Newton's forward difference method for numerical differentiation.

3) Solve the following system of equations by Gauss Jacobi method. $27x+6y-z=85$, $x+y+54z=110$, $6x+15y+2z=72$.

4) Evaluate $\int_0^{\pi/2} \sin x \, dx$ by Simpson's $\frac{1}{3}$ and $\frac{3}{8}$ rule.

5) Solve by Gauss-Seidel method.

$8x-3y+2z=20$, $4x+11y-z=33$, $6x+3y+12z=35$.

BASIC FORMULAE

UNIT-II

1) Trapezoidal Rule :-

$$\int_a^b y\,dx = \frac{h}{2}\left\{[y_1+y_n] + 2[y_2+y_3+\cdots+y_{n-1}]\right\}$$

$$= \frac{h}{2}[A+2B]$$

where A = sum of the first and the last ordinates,

B = sum of the remaining ordinates,

2) Simpson's first rule (or) $\frac{1}{3}$rd rule :-

$$\int_a^b y\,dx = \frac{h}{3}\left\{(y_1+y_n) + 4(y_2+y_4+\cdots) + 2(y_3+y_5+\cdots)\right\}$$

$$= \frac{h}{3}[A+4B+2C]$$

where A = Sum of the first and last ordinates

B = sum of the even ordinates

C = sum of the remaining ordinates.

Simpson's second rule (or) $\frac{3}{8}$th rule :-

$$\int_a^b y\,dx = \frac{3h}{8}\left\{[y_0+y_n] + 3(y_1+y_2+y_4+\cdots) + 2(y_3+y_6+\cdots)\right\}$$

BASIC FORMULAE

Unit-III

1) Taylor series:-

$$y_1 = y_0 + h y_0' + \frac{h^2}{2!} y_0'' + \cdots$$

2) Euler's Method:-

$$y_1 = y_0 + h\, f(x_0, y_0)$$

$$y_2 = y_1 + h\, f(x_1, y_1)$$

$$\vdots \quad \vdots \quad \vdots$$

In general, $y_{m+1} = y_m + h\, f(x_m, y_m)$

3) Runge-kutta 2nd order method

$$K_1 = h\, f(x_0, y_0)$$

$$K_2 = h\, f(x_0 + h, y_0 + K_1)$$

$$y_1 = y_0 + \frac{1}{2}(K_1 + K_2)$$

These equations specify a second order Runge-kutta algorithm.

4) (i) Adam's predictor formula

$$y_{k+1,p} = y_k + \frac{h}{24}\left[55y_k' - 59y_{k-1}' + 37y_{k-2}' - 9y_{k-2}'\right]$$

) Adam's corrector formula

$$y_{k+1,c} = y_k + \frac{h}{24}\left[9y'_{k+1} + 19y'_k - 5y'_{k-1} + y'_{k-2}\right]$$

5) i) Milne's Predictor formula

$$y_{n+1,p} = y_{n-3} + \frac{4h}{3}\left[2y'_{n-2} - y'_{n-1} + 2y'_n\right]$$

ii) Milne's corrector formula

$$y_{n+1,c} = y_{n-1} + \frac{h}{3}\left[y'_{n-1} + 4y'_n + y'_{n+1}\right]$$