.

Surprise Test :: Mathematics(Hon.):: Part-III/Sem-III

Numerical Analysis: paper-VIII/CT-7(2017)

Answer any four: $10 \times 6 = 60$

1.(i) Derived Newton-Gregory formula : $f(x+kh) = \sum_{i=0}^{k} \left({}^{k}C_i\right) \Delta^i f(x)$. **V.H. 97, 01, 05**

(iii) Write down the following numbers correct upto 4 fignificant figures?

(a) 0.00305, 200.51, 630, 0.01020 (b) 0.0063945, 0.090038 **VU-04**

(iii) What is the degree of precision(D.P)? Find the D.P of Simson 1/3 rule.

2(i) Derived the Fix point iteration (successive approximation) method

(ii) Define Order of Convergence of a iteration method

(iii) Find the Convergence of bisection Method V.H. 05; C.H. 05

3(i) Derived Newton's fundamental interpolation formula by divided difference formula.

(ii)Solve by Gauss-Seidel method the given system of linear equations

$$\begin{aligned} 83x_1 + 11x_2 - 4x_3 &= 95 \\ 7x_1 + 52x_2 + 13x_3 &= 104 \\ 3x_1 + 8x_2 + 29x_3 &= 71 \end{aligned}$$

OR

State Gauss-Seidel Iterative Method V.H. 00, 05; C.H. 03; B.H. 04, 06

4(i) (b) Derived the Euler's Modified Method(Euler-Cauchy Corrector Method) and also Solve by Modified Euler's method the following differential equation $\frac{dy}{dx} = x - y, y(0) = 1$ and $h = 0.1$. Find $y(0.1)$ and $y(0.2)$?

(ii) Find the values of $y(0.2)$ using Runge-Kutta Method of 4th order given that

$$\frac{dy}{dx} = xy + y^2, y(0) = 1$$

.

5(i)Prove that Newton Cotes' coefficients satisfy the relation $\sum_{i=0}^{n} k_i^{(n)} = 1$.

V.H. 03; B.H. 03

(ii) Prove that Newton Cotes' coefficients satisfy the relation $k_i^{(n)} = k_{n-i}^{(n)}$.,

V.H. 03; B.H. 05

(iii)Derived Simpson's One-third Rule from Newton cotes formula. OR Weddle's Rule from New-

ton cotes formula C.H. 01, 05; V.H. 01

6(i) State the Power method to find the Greatest Eigenvalue and corresponding eigenvector for any matrix of order n and find the Greatest Eigenvalue and corresponding eigenvector for the matrix $A = \begin{bmatrix} -15 & 4 & 3 \\ 10 & -12 & 6 \\ 20 & -4 & 2 \end{bmatrix}$ by Power Method.

(ii) Find the quadratic polynomial which takes the same values as f(x) at x=-1, 0, 1 and integrate it to prove that $\int_{-1}^{1} f(x)dx = \frac{1}{3}[f(-1) + 4f(0) + f(1)]$

Assuming the error to have the form $Af^{iv}(\xi), (-1 < \xi < 1)$, find the value of A.

(7)(a) What is the difference between interpolation and extrapolation formulas?

(b) State the Fundamental theorem of difference calculus.

(c) What is Confluent Divided Differences?

(d) Fit a second degree curve to the following data taking x as independent variable:

x_i	1	2	3	4	5	6	7	8	9
y_i	2	6	7	8	10	11	11	10	9

(8)(a) Obtain the least squares polynomial approximation of degree two for the function $f(x) = \sqrt{x}$ on the interval [0, 1].

(b)Solve the following system of equations by LU decomposition method:

$$\begin{aligned} 8x_1 - 3x_2 + 2x_3 &= 20 \\ 4x_1 + 11x_2 - x_3 &= 33 \\ 6x_1 + 3x_2 + 11x_3 &= 36 \end{aligned}$$

9(i)Obtain the Error in the Lagrange Interpolating Polynomial.

(ii)Using Newton's divided difference formula to find $f(5)$ from the following table:

x	0	2	3	4	7	8
$y = f(x)$	4	26	58	112	466	668

(iii) Find $f'(0.26)$ from the following table values using by Newton's backward difference interpolation formula.

x	0.10	0.15	0.20	0.25	0.30
$f(x)$	0.1003	0.1511	0.2027	0.2553	0.3093