

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

Numerical Analysis: paper-VIII/CT-7(2018)

Answer any four: $10 \times 4 = 40$

1.(i) If a number be rounded to n correct significant figures, then the relative error is less than

$$\frac{1}{k \times 10^{n-1}} \cdot (n \neq 1).$$

where k is the first significant figure in the number.

(ii) If $f(x)$ is the polynomial of degree n then the n^{th} order difference is a constant and its $(n + 1)$ th difference vanishes.

(iii) If $f(x) = x^2$, Prove that $f[a, b, c] = 1$ for distinct a, b, c .

2(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

3(i) 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

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

(iii) Find the Newton-Cotes' closed type numerical integration formula in order to find the value of the integral

$$I = \int_a^b f(x) dx$$

for a given function $y = f(x)$ in the interval $[a, b]$

4(i) Find the Condition of convergency of N-R Method?

(ii) Find also the rate of convergency of N-R Method?

(iii) State the Gauss Elimination Method to solve a system of linear equation.

5(i) 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) State the advantage and disadvantage of N-R Method.

(ii) State the advantages and disadvantage of bisection method.

(iii) Find the positive root of the equation $f(x) = x^3 - 3x + 1.06$ by method of bisection correct to three significant figure.

6(i) 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.

OR

Apply Euler Maclaurin sum formula to find the sums $\frac{1}{11^3} + \frac{1}{12^2} + \dots + \frac{1}{50^3}$, correct upto 5 significant figures.

(ii) Evaluate $\int_{0.1}^{0.7} (e^x + 2x)dx$ by Trapezoidal Rule and Simpson's one-third Rule, taking $h = 0.1$ and correct upto 5- decimal places.