Mugberia Gangadhar Mahavidyalaya

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

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

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

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) Let $u = 4x^6 + 3x - 9$. Find the percentage error in computing u at $x = 1.1$, if the error in x is 0.05. **VU-10**

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) Find the straight line which fits the following data given in the table :

x_i	0	1	2	3	4
y_i	1.0	2.9	4.8	6.7	8.6

OR

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

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

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

4(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

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

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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 Newton 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.

OR

The integral $\int_1^1 |x|dx$ is computed by the trapezoidal rule with step length $h = 0.01$. Then find the absolute error in the computed value **GATE-11**

(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.