(i) Printed Pages : 3 Roll No. .....

(ii) Questions : 8 Sub. Code : 1 7 5 4 3

Exam. Code : 0 0 0 6

B.A./B.Sc. (General) 6th Semester

(2056)

MATHEMATICS

Paper–III : Numerical Analysis

Time Allowed : Three Hours] **[Maximum Marks : 30**

Note:— Attempt **five** questions in all, selecting at least **two** questions from each unit.

UNIT-I

1. (a) The equation $x^3-7x^2+16x-12=0$ has a double root at x = 2. Starting with initial approximation $x_0=1$, find the root using the modified Newton-Raphson method with four iterations.

(b) Find a root of the equation $x^3+x^2+x+7=0$ by the secant method using four iterations. 3, 3

2. (a) Obtain the function whose first difference is $9x^2+11x+5$.

(b) Using Lagrange Interpolation formula, express the function $\frac{x^2+x-3}{x^3-2x^2-x+2}$ as a sum of partial fractions. 3,3

3. From Stirling's formula, obtain the following result considering the differences up to third order:

$$\frac{d}{dx}(y_x)=\frac{2}{3}[y_{x+1}-y_{x-1}]-\frac{1}{12}[y_{x+2}-y_{x-2}].$$ 6

4. (a) Apply Gaussian Integration formula to evaluate the integral $\int_{-1}^{1}\frac{1}{1+x^2}dx$.

(b) Compare $\int_{0}^{1}\frac{x}{x^3+10}dx$ with 9 ordinates by Simpson's $\frac{1}{3}$ rule. 3, 3

UNIT-II

5. Solve the following equation by Gauss elimination method:

$x-3y+z=-1;\ 2x+y-4z=-1;\ 6x-7y+8z=7$ 6

6. Using LU Decomposition, solve the equation:

$$\begin{aligned} 2x_1+x_2+x_3 &= 2\\ x_1+3x_2+2x_3 &= 2\\ 3x_1+x_2+2x_3 &= 2 \end{aligned}$$ 6

7. Determine the largest eigenvalue and corresponding eigenvector of the matrix $A=\begin{bmatrix}4 & 1 & 0\\ 1 & 2 & 1\\ 0 & 1 & 4\end{bmatrix}$ using the Power method

with initial approximation to the eigenvector as $\begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}$. 6

8. Solve the differential equation $\frac{dy}{dx} = x^2 - y$ with $y(0) = 1$ at $x = 0.1$ and $x = 0.2$ by the Runge-Kutta fourth-order method. 6