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

(ii) Questions : 8 Sub. Code : 0 5 4 3

Exam. Code : 0 0 0 6

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

(2042)

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) Use Newton-Raphson's method to find a root of $x^3 - 2x - 5 = 0$ close to $x_0 = 2$. 3

   (b) Use Secant method to find an approximate value of $\sqrt{12}$. 3

2. (a) Obtain the function whose first difference is $5x^2 + 10x + 1$. 3

   (b) Find the cubic Lagrange's interpolating polynomial from the following data : 3

x	:	0	1	2	5
f(x)	:	2	3	12	147

3. (a) Find x for which y is maximum :

x	:	1.2	1.3	1.4	1.5	1.6
y	:	0.9320	0.9636	0.9855	0.9975	0.9996

Also find maximum value of y. 3

(b) Find f'(5) :

x	:	0	1	3
f(x)	:	0	0.84	0.42

3

4. (a) Find the value of $\int_1^2 \frac{dx}{x}$ by Simpson's 1/3rd rule. Hence obtain approximate value of $\log_e 2$. 3

(b) Evaluate $\int_{-2}^{4} (2x^3 - 3x^2 + 4x - 5)\,dx$ using Gauss-Legendre two point formula. 3

UNIT—II

5. Solve using LU decomposition method :

$10x + 2y + z = 9,\ 2x + 20y - 2z = -44,$

$-2x + 3y + 10z = 22.$ 6

6. (a) Apply Gauss-Jordan method to solve the equations :

$x + y + z = 9,\ 2x - 3y + 4z = 13,\ 3x + 4y + 5z = 40.$ 3

(b) Apply Runge-Kutta's method of 4th order to find approximate value of y at $x = 0.2$ for $\frac{dy}{dx} = x + y^2$, $y(0) = 1$, taking $h = 0.1$. 3

7. (a) Using Given's method, reduce the following matrix to the tri-diagonal form :

$$A = \begin{bmatrix} 2 & 1 & 3 \\ 1 & 4 & 2 \\ 3 & 2 & 3 \end{bmatrix}.$$ 3

(b) Find the largest eigen value and corresponding eigen vector of the matrix $\begin{bmatrix} 1 & 2 & 3 \\ 0 & -4 & 2 \\ 0 & 0 & 7 \end{bmatrix}$. 3

8. (a) Apply Picard's method to solve the initial value problem upto 3rd approximation :

$\frac{dy}{dx} = x^2 + y^2$ given that $y = 0$ when $x = 0$. 3

(b) Using Euler's method, solve for y at $x = 0.1$ from $\frac{dy}{dx} = x + y + xy$, $y(0) = 1$, $h = 0.025$. 3