1215-505-009.

Code No. 6382

FACULTY OF SCIENCE

M.Sc. III-Semester Examination, December 2016

Subject : Mathematics / Applied Mathematics

Paper - V (C)
Numerical Techniques

Time : 3 hours **Max. Marks : 80**

Note : Answer all questions from Part-A and Part-B. Each question carries 4 marks in Part-A and 12 marks in Part-B.

PART – A (8 x 4 = 32 Marks)
(Short Answer Type)

1 Describe secant method geometrically.
2 Establish the rate of convergence of Newton-Raphson method.
3 Explain partial and complete pivoting.
4 Explain partition method to find the inverse of a matrix.
5 Derive linear Lagrange interpolating polynomial.
6 Show that i) $\delta = \nabla(1-\nabla)^{-1/2}$ ii) $\mu = \left[1+\frac{\delta^2}{4}\right]^{1/2}$
7 Show that $E_2''(x_1) = -\frac{h^2}{12} f^{IV}(\xi_2), x_0 < \xi_2 < x_2$ for quadratic interpolation with uniform nodal points.
8 Derive Simpson rule and obtain the error estimate.

PART – B (4 x 12 = 48 Marks)
(Essay Answer Type)

9 a) Establish the rate of convergence of Secant method.

OR

b) Derive Muller's method. Use this method to find the root of the equation $f(x) = x^3 - 2x - 5 = 0$ which lies between 2 and 3.

10 a) Explain LU decomposition method. Find the inverse of the matrix

$$A = \begin{pmatrix} 3 & 2 & 1 \\ 2 & 3 & 2 \\ 1 & 2 & 2 \end{pmatrix}$$ by using LU decomposion method.

OR

b) Explain Gauss-Seidel iteration method. Solve the system of equations $2x_1 - x_2 + 0.x_3 = 7$, $-x_1 + 2x_2 - x_3 = 1$, $0x_1 - x_2 + 2x_3 = 1$ using Gauss-Siedel method.

11 a) Derive the Hermite interpolating polynomial which fits the data.

x	f(x)	f′(x)
−1	1	−5
0	1	1
1	3	7

OR

b) Use the method of least squares to fit the curve $f(x) = c_0 x + c_1 / \sqrt{x}$ for the following data.

x	0.2	0.3	0.5	1	2
f(x)	16	14	11	6	3

12 a) Derive implicit Runge-kutta method of order two and hence solve the IVP $y' = -2ty^2, y(0) = 1$ with $h = 0.2$ on $[0, 1]$.

OR

b) Solve the IVP $u' = -2tu^2$, $u(0) = 1$ with $h = 0.2$ on [0, 1] by using the predictor-corvetor method.

$$P : u_{j+1} = u_j + \frac{h}{2}\left(3u'_j - u'_{j-1}\right)$$

$$C : u_{j+1} = u_j + \frac{h}{2}\left(u'_{j+1} + u'_j\right)$$

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