Paper Code: MA-401 **Roll No.** | | | | | | | | | | |

B.Tech.

(SEM IV) EVEN SEMESTER EXAMINATION, 2015-16

COMPUTER BASED NUMERICAL METHODS

[Time: 3 hrs.] **[Max. Marks: 100]**

Note: i. Attempt ***ALL*** questions.
ii. Assume suitable data, if required.

1. Attempt any t***wo*** parts of the following:- **[10x2=20]**

(a) Using Muller's method, find a root of the following equation

$$x^3 + 2x^2 + 19x - 29 = 0$$

(b) Derive Newton Raphson method to find a root of the equation $f(x) = 0$. Find the order of convergence of this method.

(c) Using Chebyshev method, find a real root of the equation

$$x^4 - x - 10 = 0$$

2. Attempt any t***wo*** parts of the following:- **[10x2=20]**

(a) Solve the following system of linear algebraic equation by Gauss- Seidel method correct up to five decimal places.

$$19x + 11y + 5z = 37$$
$$13x + 23y + 7z = 41$$
$$29x + 11y + 43z = 103$$

(b) Solve the following system of equation by LU decomposition method.

$$x + 2y + 3z = 5$$
$$2x + 8y + 22z = 6$$
$$3x + 22y + 82z = -10$$

(c) Describe the Cholesky LL^T -factorization method. Hence, solve the following system of equations

$$5x + 11y + 19z = 29$$
$$11x + 19y + 13z = 51$$
$$19x + 13y + 31z = 41$$

3. Attempt any t***wo*** parts of the following: - **[10x2=20]**

(a) The following table gives the values of y which is a polynomial of degree five. It is known that there is error in $f(4)$. Correct the error.

x	0	1	2	3	4	5	6
$y = f(x)$	1	2	33	254	1035	3127	7777

(b) Using the Langarage method, find the interpolatory polynomial for the following data:

x	0	1	2	3	4	5
$f(x)$	1	14	15	17	5	11

(c) Find the cubic spline interpolation for the following data:

x	1	2	3	4	5
f(x)	1	0	1	0	1

4. Attempt any t***wo*** parts of the following: - **[10x2=20]**

(a) Evaluate the following using 1/3 -Simpson's rule.

$$\int_0^6 \frac{dx}{1+x3}$$

Also find the error in 1/3 -Simpson's rule.

(b) Use Romberg's method to compute the following, correct up to four decimal places.

$$\int_0^1 \frac{dx}{1+x3}$$

(c) Find *f'(4)* from the following data.

x	3	5	11	27	34
f(x)	-13	23	899	17315	35606

5. Attempt any t***wo*** parts of the following: - **[10x2=20]**

(a) Solve the following by Euler's modified method. Perform five iterations.

$$\frac{dy}{dx} = y + x$$

y (o) =1

(b) Apply Runge-Kutta 4th order method to find the approximate value of y for x = 0.6 in step length of 0.2, if

$$\frac{dy}{dx} = x + y2$$

given that y (o) =1

(c) Solve $\left(\frac{\partial 2u}{\partial x2}\right) + \left(\frac{\partial 2u}{\partial y2}\right) = 0$ over the square region of side 4 units, satisfying the following boundary conditions. (Choose h = 1 unit)

$u(x,0) = 3x$ *for* $0 \le x \le 4$
$u(x,4) = x^2$ *for* $0 \le x \le 4$
$u(0,y) = 0$ *for* $0 \le y \le 4$
$u(4,y) = 12+y$ *for* $0 \le y \le 4$