Roll No. ☐☐☐☐☐☐☐☐☐☐☐☐ **Total No. of Pages : 02**

Total No. of Questions : 09

B.Tech.(Electronics & Computer Engg.) (2011 Onwards) (Sem.–4)

NUMERICAL METHODS

Subject Code : BTEL-401

Paper ID : [A2023]

Time : 3 Hrs. **Max. Marks : 60**

INSTRUCTIONS TO CANDIDATES :

1. **SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.**
2. **SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.**
3. **SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.**

SECTION–A

1. Answer briefly :

a) Compute the percentage error in the time period T= $2\pi\sqrt{\frac{l}{g}}$ for I=1m if the error in the measurement of I is 0.01.

b) Write sufficient condition for convergence of the Iteration Method.

c) Write Geometrical Interpretation of Newton Raphson Method.

d) Prove that $\Delta = E\nabla$.

e) Write Newton's general interpolation formula.

f) Write normal equations for fitting the straight line using Method of least square method.

g) Write formula of Trapezoidal rule for numerical integration.

h) Define Eigen value and Eigen vector of square matrix.

i) Define initial value problem and Boundary value problem.

j) Write formula of Modified Euler's method.

SECTION-B

2. Solve the following system of non-linear equations by using Newton-Raphson Method $x^2 + xy + y^2 = 7$, $x^3 + y^3 = 9$ with (1.5,0.5) as initial approximation.

3. F(x) is a polynomial of degree four and given that f(4) = 270, f(5) = 648, $\Delta f(5) = 682$, $\Delta^3 f(4) = 132$. Find the value of f(5.8) using Gauss backward formula.

4. Obtain a relation of the form $y=ab^x$ for the following data by the method of least squares :

x	2	3	4	5	6
y	8.3	15.4	33.1	65.2	126.4

5. A rod is rotating in a plane. The following table gives the angle θ(in radians) through which the rod has turned for various values of time *t* (in seconds)

t :	0	0.2	0.4	0.6	0.8	1.0	1.2
θ :	0	0.12	0.49	1.12	2.02	3.20	4.67

Calculate the angular velocity and angular acceleration of the rod at t=0.6 sec.

6. Solve the system of equations :

$$x + y + z = 6$$

$$3x + (3 + \in)\, y + 4z = 20$$

$$2x + y + 3z = 13$$

Using Gauss Elimination method where $\in$ is small such that $1 \pm \in^2 = 1$. What happens if we do not use partial pivoting at second step?

SECTION-C

7. Find the smallest Eigen value of the matrix :

$$\begin{bmatrix} 1 & 2 & -2 & 4 \\ 1 & 12 & 3 & 5 \\ 3 & 13 & 0 & 7 \\ 2 & 11 & 2 & 2 \end{bmatrix} \text{ by Power's method.}$$

8. Using Milne's method, solve $\frac{dy}{dx} = 1 + y^2$ with y(0) = 0, y(0.2) = 0.2027, y(0.4) = 0.4228, $y(0.6) = 0.6841$, obtain $y(0.8)$, $y(1)$ and $y(-0.2)$.

9. Obtain cubic spline for every subinterval from the given data :

x :	0	1	2	3
f(x) :	1	2	33	244

with the end conditions $M_0 = M_3 = 0$. Hence find an estimate of f(2.5).