Roll No.

Total No. of Questions: 09   Total No. of Pages: 02

B. Tech. (CE) (Sem. 6)
NUMERICAL METHODS IN CIVIL ENGINEERING
Subject Code: BTCE-604
Paper ID: A2291

Time: 03 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.

   a)   Write a short note on initial value problem.

   b)   Find the Eigenvalues and Eigenvector of the matrix

   c)   Write a short note on Galerkin's method of least square.

   d)   Classify the equation
           $(1 + x^2)\frac{\partial^2 u}{\partial x^2} + (5 + 2x^2)\frac{\partial^2 u}{\partial x \partial t} + +(4 + x^2)\frac{\partial^2 u}{\partial t^2} = 0.$

   e)   Evaluate $\Delta^n(e^x)$, the interval of differencing being unity.

   f)   Find a second degree polynomial from the following data
           x: 0   1   2
           y: 1   6   17

   g)   Using iterative method find the inverse of matrix
           $\begin{bmatrix} 1 & 10 \\ 2 & 0 \end{bmatrix}$

   h)   Find the general solution of the difference equation
           $\Delta^2 u_n - 3\Delta u_n + 2u_n = 0$

   i)   Find the interval on which the root of the equation $x^3 - 2x - 5 = 0$ lies.

   j)   Write Newton Raphson formula for the solution of non-linear equation.

SECTION B

2. Solve the system by Jordan method
   $2x + y + z = 10$
   $3x + 2y + 3z = 18$
   $x + 4y + 9z = 16$

3. Solve the boundary value problem
   $\frac{d^2y}{dx^2} - y = 0$ with y(0)=0 and y(2)=3.62686

4. Find a real root of the equation $3x = \cos x + 1$.

5. Explain the New marks method for solving the non linear problems.

6. Fit a second degree polynomial to the following data

x:	1.0	1.5	2.0	2.5	3.0	3.5	4.0
y:	1.1	1.3	1.6	2.0	2.7	3.4	4.1

SECTION C

7. Using Runge Kutta method of fourth order, solve
   $\frac{dy}{dx} = \frac{y^2-x^2}{y^2+x^2}$ with y(0)=1 at x=0.2, 0.4

8. Solve the equation $u_{xx} + u_{yy} = -81xy,\ 0 < x < 1, 0 < y < 1$, given that u(0,y)=0, u(x,0)=0, u(1 ,y) = 100, u(x,1) = 100 and h $= \frac{1}{3}$

9. From the following table, estimate the number of students who obtained marks between 40 and 45:

Marks:	30-40	40-50	50-60	60-70	70-80
No. of Students:	31	42	51	35	31