Roll No. ....

OLE-24291

B. Tech. 5th Semester (Civil) Examination – April, 2021

NUMERICAL METHODS AND COMPUTING TECHNIQUES

Paper : CE-309-F

Time : Three Hours] *[Maximum Marks : 100*

Before answering the questions, candidates should ensure that they have been supplied the correct and complete question paper. No complaint in this regard, will be entertained after examination.

Note : Attempt any ***five*** question in total by selecting ***one*** from each Section. Question No. **1** is ***compulsory***.

1. (a) Define Bezier curves.

(b) Write steps of Gauss elimination method.

(c) Solve $\frac{dy}{dx} = x + y,\ y(0) = 1,$ by Taylor's series method.

(d) Write finite difference approximation for $\frac{\partial^2 u}{\partial x^2}$ and $\frac{\partial^2 u}{\partial y^2}$.

SECTION – A

2. Using Newton's divided difference formula, evaluate $f(8)$ and $f(15)$ given :

x :	4	5	7	10	11	13
$f(x)$:	48	100	294	900	1210	2028

3. Find the positive root of $x^4 - x = 10$, correct to three decimal places, by using :

(i) Newton-Raphson method

(ii) Bisection method

SECTION – B

4. Solve $10x - 7y + 3z + 5u = 6$, $-6x + 8y - z - 4u = 5$, $3x + y + 4z + 11u = 2$, $5x - 9y - 2z + 4u = 7$ by Gauss-Jordan method.

5. Use Romberg's method to compute $\int_0^1 \frac{dx}{1+x^2}$ correct to four decimal places.

SECTION – C

6. Using Runge-Kutta method of order 4, find y for x = 0.1, 0.2, 0.3 given that $\frac{dy}{dx} = xy + y^2$, $y(0) = 1$. Continue the solution at x = 0.4 using Milne's method.

7. Find the largest eigen value and the corresponding eigen vector of the matrix $\begin{bmatrix} 2 & -1 & 0 \\ -1 & 2 & -1 \\ 0 & -1 & 2 \end{bmatrix}$ using power method, take $[1, 0, 0]^T$ as initial eigen vector.

SECTION – D

8. Obtain Standard five point formula for Laplace equation.

9. Solve $\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$ in $0 < x < 5$, $t \geq 0$ given that $u(x, 0)$ = 20, $u(0, t) = 0$, $u(5, t) = 100$. Compute u for the time step with $h = 1$ by Crank-Nicholson method.
