Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE- SEMESTER–IV (NEW) EXAMINATION – WINTER 2020

Subject Code:2140505 Date:09/02/2021

Subject Name:Chemical Engineering Maths

Time:02:30 PM TO 04:30 PM Total Marks:47

Instructions:

1. **Attempt any THREE questions from Q.1 to Q.6 .**
2. **Q.7 is compulsory.**
3. **Make suitable assumptions wherever necessary.**
4. **Figures to the right indicate full marks.**

MARKS

Q.1 **(a)** Describe different types of errors. **03**

(b) Find the absolute, relative and percentage errors if x is rounded-off to three decimal digits. Given x = 0.005998. **04**

(c) Find root of the equation $\cos x - x e^x = 0$ correct up to three decimal places using Secant Method. Use initial guesses 0 and 1 to obtain accuracy. **07**

Q.2 **(a)** Write short note on iterative methods. **03**

(b) Using bisection method, find a real root of the equation $x^3 - 4x - 9 = 0$, in four stages. **04**

(c) Derive a recurrence formula for finding Square root of N, using Newton Raphson method and hence compute square root of 27. **07**

Q.3 **(a)** Find the inverse of $A = \begin{bmatrix} 1 & 1 & 3 \\ 1 & 3 & -3 \\ -2 & -4 & -4 \end{bmatrix}$ **03**

(b) Find a real root of the equation $3x + sinx - e^x = 0$ by the method of false position correct to four decimal places. **04**

(c) Using Gauss Elimination method to solve the system of linear equations: **07**

$$2y + z = -8$$
$$x - 2y - 3z = 0$$
$$-x + y + 2z = 3$$

Q.4 **(a)** Explain Gauss-Jordan elimination method to solve system of linear equations. **03**

(b) By the method of least squares, find the straight line that best fits the following data: **04**

x	1	2	3	4	5
y	14	27	40	55	68

(c) Find the polynomial which takes the following values: **07**
$y(0) = 1$, $y(1) = 0$, $y(2) = 1$ and $y(3) = 10$. Also find $y(4)$.

Q.5 **(a)** Write an algorithm for Trapezoidal Rule. **03**

(b) Following table shows speed in m/s and time in second of a car : **04**

t	0	12	24	36	48	60	72	84	96	108	120
v	0	3.60	10.08	18.90	21.60	18.54	10.26	5.40	4.50	5.40	9.00

Using Simpson's 1/3 rule find the distance travelled by the car in 120 seconds.

(c) Use Lagrange's interpolation formula to find the value of y when $x = 10$, if the values of x and y are given below: **07**

x	5	6	9	11
y	12	13	14	16

Q.6 **(a)** Write an algorithm for Newton's Forward interpolation method. **03**

(b) Use Euler's method to solve the initial value problem $\frac{dy}{dx} = \frac{x-y}{2}$ on [0,3] with $y(0) = 1$ (take h= 0.25). **04**

(c) Evaluate the integral $\int_0^1 (4x - 3x^2)\,dx$ by taking n=10 using **07**
(a) Trapezoidal rule (b) Simpson's 1/3 rule.

Q.7 The following data gives pressure and volume of super-heated steam. Find the rate of change of pressure w.r.t. volume when V = 8. **05**

V	2	4	6	8	10
P	105	42.7	25.3	16.7	13

OR

Q.7 Solve by method of separation of variable $\frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} = 2(x + y)u$ **05**

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