

GUJARAT TECHNOLOGICAL UNIVERSITY**BE- SEMESTER-IV (NEW) EXAMINATION – WINTER 2020****Subject Code:2140606****Date:09/02/2021****Subject Name:Numerical and Statistical Methods for Civil Engineering****Time:02:30 PM TO 04:30 PM****Total Marks:56****Instructions:**

1. Attempt any FOUR questions out of EIGHT questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

MARKS

- Q.1** (a) Prove that $E^2 = \mu + \frac{1}{2} \delta$. **03**
- (b) Fit a polynomial of degree three which takes the following values : **04**
- | | | | | |
|----|---|----|----|-----|
| X: | 3 | 4 | 5 | 6 |
| Y: | 6 | 24 | 60 | 120 |
- (c) Use the Runge-Kutta method of fourth order to solve **07**
- $$\frac{dy}{dx} = 1 + y^2$$
- Subject to $y(0) = 0$, find $y(0.2)$ and $y(0.4)$.
- Q.2** (a) Evaluate $\int_0^1 2e^x dx$ with $n=10$ using the trapezoidal rule. **03**
- (b) If 20 % of the bolts produced by a machine are defective, determine the Probability that out of 4 bolts chosen, at most 2 bolts will be defective. **04**
- (c) Solve the following system of linear equations by Gauss Seidel method **07**
- $$\begin{aligned} 6x + y + z &= 105 \\ 4x + 8y + 3z &= 155 \\ 5x + 4y - 10z &= 65 \end{aligned}$$
- Q.3** (a) Find a root of the equation $x^3 - 4x - 9 = 0$ using the Bisection method in four stages. **03**
- (b) Determine the root of $xe^x - 2 = 0$ by method of false position. **04**
- (c) Find a real root of the equation $x = e^{-x}$, using the Newton-Raphson method. **07**
- Q.4** (a) Write sample space of random experiment of tossing three coins together and obtain the probability of the event that one head and two tails obtained. **03**
- (b) Evaluate $\int_0^1 \frac{1}{1+x} dx$ with $n=6$ by using Simpson's 3/8 rule, and hence calculate $\log 2$. **04**
- (c) Fit a second degree parabola $y = a + bx^2$ to the following data : **07**
- | | | | | | |
|----|-----|-----|-----|------|------|
| x: | 1 | 2 | 3 | 4 | 5 |
| y: | 1.8 | 5.1 | 8.9 | 14.1 | 19.8 |

Q.5 (a) Use Lagrange's interpolation formula to find $y(4)$ from the following table: 03

x :	-1	0	2	3
y:	-8	3	1	2

(b) Using Newton's divided difference interpolation, compute the value of $f(6)$ from the table given below: 04

x	1	2	7	8
f(x)	1	5	5	4

(c) Use the Gauss Elimination method to solve the following equations : 07

$$x + 4y - z = -5$$

$$x + y - 6z = -12$$

$$3x - y - z = 4$$

Q.6 (a) Using Taylor's series method, find the value of $y(0.1)$, given $\frac{dy}{dx} = x^2 + y^2$ and $y(0) = 1$, correct to four decimal places. 03

(b) Using Stirling's formula, find $y(25)$ from the following table : 04

x:	20	24	28	32
y:	0.01427	0.01581	0.01772	0.01996

(c) Find the dominant eigen values of $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$ by power method and hence find the other eigen value also. 07

Q.7 (a) Use Euler's method, find $y(0.2)$ given $\frac{dy}{dx} = y - \frac{2x}{y}$, $y(0) = 1$ with $h = 0.1$. 03

(b) Fit a straight line for the following data: 04

X:	1	2	3	4	5	6
Y:	6	4	3	5	4	2

(c) Fit the curve $y = ax^b$ to the following data: 07

x:	61	26	7	2.6
y:	350	400	500	600

OR

Q.8 (a) Define Discrete Random Variable and Continuous Random Variable. 03

(b) Find the correlation coefficients from the following data : 04

X:	1	2	3	4	5	6	7
Y:	6	8	11	9	12	10	14

(c) From the following results, obtain the two regression equations and estimate the yield when rainfall is 29 cm and the rainfall, when the yield is 600Kg : 07

	Yield in Kg	Rainfall in cm
Mean	508.4	26.7
S.D.	36.8	4.6

The coefficient of correlation between yield and rainfall is 0.52.
