

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-IV (NEW) EXAMINATION – WINTER 2023****Subject Code:2140606****Date:11-01-2024****Subject Name: Numerical And Statistical Methods for Civil Engineering****Time: 10:30 AM TO 01:00 PM****Total Marks:70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. Simple and non-programmable scientific calculators are allowed.

MARKS

- Q.1** (a) A committee of 3 is to be formed from a group of 20 people. How many different committees are possible? **03**
- (b) Solve the following system of equations by Gauss Elimination method: **04**
 $x + 3y + 2z = 5$, $2x + 4y - 6z = -4$, $x + 5y + 3z = 10$
- (c) Determine a real root of the equation $8x^3 - 2x - 1 = 0$ using Bisection method **07**

- Q.2** (a) Solve $x^3 - 5x + 3 = 0$ by Regula Falsi Method. **03**
- (b) Using Newton's divided difference formula, calculate the value of $f(6)$ from the following data: **04**

x	1	2	7	8
y	1	5	5	4

- (c) Using Lagrange's interpolation method, compute the value of y for $x=2.5$ from the following table: **07**

x	1	2	3	4
y	1	8	27	64

OR

- (c) Evaluate $\int_0^4 e^x dx$ using Simpson's 1/3 rule, taking $h = 1$ **07**

- Q.3** (a) If two dice are rolled, what is the probability that the sum of the upturned faces will equal 7? **03**
- (b) 10% of the bulbs produced in a factory are of red colour and 2% are red and defective. If one bulb is picked up at random, determine the probability of its being defective if it is red. **04**
- (c) Find the curve of the type $y = a e^{bx}$ to the following data by the method of least squares: **07**

x	1	5	7	9	12
y	10	15	12	15	21

OR

- Q.3** (a) Using least square method, write the normal equations to fit a 2nd order polynomial $y = a + bx + cx^2$. **03**
- (b) Use secant method to find a real root of the equation $x - 2 \sin x = 0$ with the initial estimates $x_0 = 2$ and $x_1 = 1.9$. **04**

- (c) Fit the straight line that best fits to the following data: 07

x	0	1	2	3	4
y	1	1.8	3.3	4.5	6.3

- Q.4 (a)** Prepare Newton's Forward difference table from the given data: 03

x	40	50	60	70	80
y	25	60	82	93	100

- (b) Find the cubic polynomial using Newton's forward interpolation which takes the following values: 04

x	0	1	2	3
f(x)	1	2	1	10

- (c) Solve the system of linear equations by Gauss-Seidal method: 07
 $28x + 4y - z = 32$, $x + 3y + 10z = 24$, $2x + 17y + 4z = 35$

OR

- Q.4 (a)** Discuss bracketing methods & open methods. 03

- (b) Use the Taylor series method to find $y(1.2)$, given that $\frac{dy}{dx} = x + y$, $y(1) = 0$. 04
 Taking $h=0.1$.

- (c) Obtain the line of regression of y on x for the data given below 07

x	1	3	5	7	9
y	15	18	21	23	22

- Q.5 (a)** Consider the following values to find $\int_{10}^{16} y \, dx$ by Simpson's 1/3 rule. 03

x	10	11	12	13	14	15	16
y	1.02	0.94	0.89	0.79	0.71	0.62	0.55

- (b) By Trapezoidal Rule, evaluate $\int_0^1 2e^x \, dx$ taking $h = 0.1$, $n = 10$ 04

- (c) Evaluate $\int_0^3 \frac{1}{1+x} \, dx$ by taking $n=6$ using Simpson's 3/8 rule and hence calculate $\log 2$ 07

OR

- Q.5 (a)** A bag contains 9 discs of which 4 are red, 3 are blue and 2 are yellow. The discs are similar in shape and size. A disc is drawn at random from the bag. Calculate the probability that it will be (i) red (ii) yellow. 03

- (b) Using Euler's method, find $y(0.2)$ given that $\frac{dy}{dx} = x + y$, $y(0) = 1$, Take $h=0.05$ 04

- (c) Use 4th order Range – Kutta method to find $y(0.2)$, given that $10\frac{dy}{dx} = x^2 + y^2$, $y(0) = 1$; $h=0.1$ 07
