

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER– IV(NEW) EXAMINATION – SUMMER 2023****Subject Code:2140606****Date:07-07-2023****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) What is the probability that a leap year, selected at random, will contain 53 Sundays? **03**

(b) The regression equation calculated from a set of observation for two random variable are, $x = -0.4y + 6.4$ and $y = -0.6x + 4.6$, Calculate mean values of x and y. **04**

(c) Using Regula Falsi method find a positive real root of $x^4 = 10 + x$, correct to four decimal places. **07**

Q.2 (a) Write normal equation for the curve $y = \frac{a}{x} + bx$. **03**

(b) Find mode of the following data **04**

Age	0-6	6-12	12-18	18-24	24-30	30-36	36-42
Frequency	6	11	25	35	18	12	6

(c) Apply Newton's divided difference formula to find a polynomial of degree three using the following data: **07**

x	3	4	5	6
y	6	24	60	120

also find $y(1.5)$, $y'(1.5)$.

OR

(c) Calculate the rank coefficient from the sales and expenses of 10 firms as given below: **07**

Sales X	45	56	39	54	45	40	56	60	30	36
Expenses Y	40	36	30	44	36	32	45	42	20	36

Q.3 (a) Give comparison between Regula falsi method and Newton Raphson method. **03**

(b) A problem of statistics is given to three students A, B and C whose chances of solving it are $\frac{1}{2}$, $\frac{3}{4}$ and $\frac{1}{4}$ respectively. What is probability that the problem will be solved? **04**

(c) Find the no. of students who obtained marks between 25 to 35 and above 35 from the following data: **07**

Marks	0 - 10	10 - 20	20 - 30	30 - 40	40 - 50
No. of Students	1	3	5	7	4

OR

- Q.3** (a) Derive Euler's formula to solve first order differential equation with given initial condition. **03**
- (b) In a bolt factory, machines A, B and C manufacture respectively 25%, 35% and 40% of the total. If their output 5, 4 and 2 per cent are defective bolts. A bolt is drawn at random from the product and is found to be defective. What is probability that it was manufactured by machine B? **04**
- (c) Fit an exponential curve obeying the gas equation $PV^\gamma = K$ for the data: **07**

V : 50 100 150 200

P : 135 48 26 17

- Q.4** (a) Prove that $\Delta + \nabla = \frac{\Delta}{\nabla} - \frac{\nabla}{\Delta}$. **03**
- (b) Find the missing value in the table: **04**
- | | | | | | |
|---|----|-------|----|-------|------|
| X | 45 | 50 | 55 | 60 | 65 |
| Y | 3 | ----- | 2 | ----- | -2.4 |
- (c) Suppose the weight W of 600 male students are normally distributed with mean $\mu = 70$ kg and standard deviation $\sigma = 5$ kg. Find **07**
- No. of students with weight between 69 and 74 kg.
 - More than 76 kg.
- (Area between $z=0$ to $z=0.2$ is 0.0793, $z=0$ to $z=0.8$ is 0.2881 and at $z=0$ to $z=1.2$ is 0.3849)

OR

- Q.4** (a) Determine $E(2X+5)$ whereas the probability distribution of random variable X is $P(X)=1/2, 1/6, 1/3$ and $X=3, 1, -2$ **03**
- (b) Apply Simpson's 3/8 rule to obtain approximate value of $\int_{-1}^1 \frac{1}{1+x^2} dx$, by dividing into six number of equal parts. **04**
- (c) Solve the following system of linear equations by Gauss Seidal method: **07**
- $$3x + 20y - z = -18,$$
- $$2x - 3y + 20z = 25, \quad 20x + y - 2z = 17$$

- Q.5** (a) A die is tossed thrice. A success is getting 1 or 6 on a toss. Find the mean and variance of the number of successes. **03**
- (b) Compute the coefficient of skewness from the following data: **04**
- | | | | | | | | |
|---|---|---|---|----|----|----|----|
| x | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| f | 3 | 6 | 9 | 13 | 8 | 5 | 4 |
- (c) Apply Runge-Kutta fourth order method to find the value of y when $x=1$ given that $y=1$ when $x=0$ (taking $n=2$) and $\frac{dy}{dx} = \frac{y-x}{y+x}$. **07**

OR

- Q.5** (a) Prove that $1 + \frac{\delta^2}{2} = \sqrt{1 + \delta^2 \mu^2}$. **03**
- (b) Derive rate of convergence of Newton Raphson method. **04**
- (c) Using Milne's method, solve $y' = 1 + y^2$, with **07**
- $y(0) = 0, y(0.2) = 0.2027, y(0.4) = 0.4228, y(0.6) = 0.6841$, and obtain the value of $y(0.8)$ and $y(1.0)$.
