

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER- IV EXAMINATION – SUMMER 2020

Subject Code: 2140606
Date: 29/10/2020
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.

MARKS

- Q.1** (a) There are 3 Red and 2 Black balls in a box. If 2 balls are selected at random, find the expected number of Black balls. **03**
- (b) Construct an Interpolating polynomial of degree 2 which takes the following values **04**

x	-1	0	1	3
y	2	1	0	-1

- (c) By using Method of least squares, fit a second degree parabola $y = a + bx + cx^2$ to the following data. **07**

x	0	1	2	3	4
y	1	1.8	1.3	2.5	2.3

- Q.2** (a) Considering following tabular values, Determine the area bounded by the given curve and X-axis between $x = 7.47$ to $x = 7.52$ by Trapezoidal rule. **03**

x	7.47	7.48	7.49	7.50	7.51	7.52
y	1.93	1.95	1.98	2.01	2.03	2.06

- (b) Using Simpson's 3/8 rule, evaluate $\int_0^1 \frac{\sin x}{x} dx$ with $n = 6$ **04**
- (c) Use Gauss-Seidel method to obtain the solution of the system **07**
- $$6x + y + z = 105, 4x + 8y + 3z = 155, 5x + 4y - 10z = 65$$

OR

- (c) 4 Coins are tossed simultaneously. What is the probability of getting (a) Two heads **07**
- (b) At least two heads (c) At most two heads

- Q.3** (a) Use Bisection method to find the real root of equation $2\sin x - x = 0$. **03**

- (b) Find a real root of $x^3 + x - 1 = 0$, correct to four decimal places using Newton-Raphson method. **04**

- (c) Using Newton's divided difference method, find $f(9)$ from the given data: **07**

x	5	7	11	13	17
$f(x)$	150	392	1452	2366	5202

OR

- Q.3** (a) Using Simpson's 1/3 rule, evaluate $\int_0^3 \cos^2 x dx$ taking 6 sub intervals. **03**

- (b) Solve the following linear system using Gauss Elimination method: **04**
- $$2x + y + z = 10, 3x + 2y + 3z = 18, x + 4y + 9z = 16$$

- (c) Use second order Runge-Kutta method to solve $\frac{dy}{dx} = 3x + y$, $y(1) = 1.5$ and find $y(1.2)$ with $h = 0.1$ 07

Q.4 (a) Use the Secant method to find approximate root of equation $xe^x - 1 = 0$. 03

- (b) Using Taylor's series method, obtain the solution of $\frac{dy}{dx} = xy^{\left(\frac{1}{3}\right)}$, $y(1) = 1$. Find the value of $y(1.1)$ 04

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

OR

Q.4 (a) Use Euler's Method to find $y(0.2)$ from the differential equation 03

$$\frac{dy}{dx} = y - \frac{2x}{y}, y(0) = 1$$

- (b) Evaluate $\int_0^1 \frac{1}{1+x} dx$ using the Gaussian Integration formula with $n = 2$. 04

- (c) Given that $\frac{dy}{dx} = x - y^2$, $y(0) = 0$, $y(0.2) = 0.02$, $y(0.4) = 0.0795$, $y(0.6) = 0.1762$ Evaluate $y(0.8)$ by Milne's Predictor – Corrector method. 07

Q.5 (a) The following table gives marks obtained by 50 students in a subject of Civil. Find the Median. 03

Marks	0-10	10-20	20-30	30-40	40-50
No. of Students	16	12	18	3	1

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

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

(c) Calculate Karl Pearson's co-efficient of skewness from the following data: 07

x	0-100	100-200	200-300	300-400	400-500	500-600	600-700	700-800
f	6	10	18	20	15	12	10	9

OR

Q.5 (a) Find the mean and standard deviation of a group of data points: 03

3, 4, 6, 7, 9, 15

(b) Ten Students got the following percentage of marks in Mathematics and Statistics. Calculate the correlation coefficient. 04

Roll no.	1	2	3	4	5	6	7	8	9	10
Maths	78	36	98	25	75	82	90	62	65	39
Statistics	84	51	91	60	68	62	86	58	53	47

(c) A study of the amount of rainfall and the quality of air pollution removed produced the following data: 07

Daily rainfall x	4.3	4.5	5.9	5.6	6.1	5.2	3.8	2.1	7.5
Particulate removed y	126	121	116	118	114	118	132	141	108

(a) Find the equation of the regression line to predict the particulate removed from the amount of daily rainfall.

(b) Find the amount of particulate removed when daily rainfall is $x = 4.8$ units.
