Seat No.: _____   Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY
BE- SEMESTER–IV (NEW) EXAMINATION – WINTER 2020

Subject Code:2141703   Date:09/02/2021
Subject Name:Numerical Techniques & Statistical Methods
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)** An approximate value of p is 3.1428571 and its true value is 3.1415925. Compute the absolute and relative errors.   **03**

(b) An incomplete frequency distribution is given as follows:

Variable	10-20	20-30	30-40	40-50	50-60	60-70	70-80
Frequency	12	30	f_1	65	f_2	25	18

Given that the median value is 46, determine the value of f_1 and f_2.   **04**

(c) Solve the following system by Gauss-Seidal iteration method:

$$27x + 6y - z = 85$$
$$6x + 15y + 2z = 72$$
$$x + y + 54z = 110$$

          07

Q.2 **(a)** Find the value of f(5) by using Lagrange's interpolation method for the given data

x	1	2	3	4	7
f(x)	2	4	8	16	128

          03

(b) Solve the equation $x^3 - 3x - 5 = 0$ by using Newton Raphson method, correct up to four decimal places.   **04**

(c) Use Simpson's 1/3 and Simpson's 3/8 rule to evaluate the following integral

$$\int_0^1 \frac{1}{1 + x^2} dx$$

          07

Q.3 **(a)**   **03**
Use Taylor's series method to find the approximate value of $y(1.2)$ if

$$\frac{dy}{dx} = x + y; \ y(1) = 0.$$

(b) Population of a town was given below:

Year(x)	18	19	19	19	1931
Population (y)	46	66	81	93	101

04

Compute the population for the year 1925.

(c) Using Runge-Kutta method to find the approximate value of $y(0.2)$ if

$$\frac{dy}{dx} = x + y^2, \text{ given that } y(0) = 1 \text{ taking h} = 0.1.$$

07

Q.4 **(a)** Use Euler's method with h = 0.1 to find the solution of the equation

$$\frac{dy}{dx} = x^2 + y^2, \text{ given that } y(0) = 0 \text{ in the range } 0 \le x \le 5.$$

03

(b) Find first derivatives at x = 1.1 from the following table

X	1	1.2	1.4	1.6	1.8	2.0
f(x)	0	0.1280	0.5440	1.2960	2.4320	4.0000

04

(c) Using Milne's Predictor Corrector method to obtain $y(0.4)$ by solving

$$\frac{dy}{dx} = 2e^x - y \text{ given that } y(0) = 2, \ y(0.1) = 2.01, \ y(0.2) = 2.04, \ y(0.3) = 2.09.$$

07

Q.5 **(a)** A can hit a target 4 times in 5 shots, B, 3 times in 4 shots and C, 2 times in 3 shots. They fire a volley (it means one shot each). Find the probability that the target will be hit.

03

(b) Out of 800 families with 4 children each how many families would be expected to have   (i) at least one boy (ii) 2 boys and 2 girls

Assume equal probabilities for boys and girls.

04

(c) Five coin are tossed 3200 times and the following results are obtained:

Number of heads	0	1	2	3	4	5
Frequency	80	570	1100	900	500	50

If χ^2 for 5 d. f at 5% level of significance be 11.07, test the hypothesis that the coins are unbiased.

07

Q.6 **(a)** A factory produces razor blades. The probability of its being defective is 1/500. In 10,000 packets of 10 blades each, calculate the approximate numbers of packets have 2 defective blades.

03

(b) If Skulls are classified as A, B, C according as the length and breadth index as under 75, between 75 and 80, or over 80; find the approximately mean and the standard deviation of the classes in which A are 58% , B are 38% and C are 4% given

$$f(t) = \frac{1}{\sqrt{2\pi}} \int_0^t e^{-t^2/2} dt \ f(0.20) = 0.08 \text{ and } f(1.75) = 0.46.$$

04

(c) In a bolt factory, machines A, B, and C manufacture 25%, 35% and 40% of the total of their output 5%, 4% and 2% are defective bolts. A bolt is drawn at random from the product and is found to be defective. What are the chances that it was manufactured by machines A, B, or C?   **07**

Q.7 In an experiment on immunization of cattle from tuberculoses the following result were obtained:

	Affected	Unaffected
Inoculated	12	26
Not Inoculated	16	6

Examine the effect of vaccine in controlling the susceptibility to tuberculoses.

(Given that for 5% level of significance χ^2 for 1 d. f is 3.841, for 2 d. f. is 5.99 and for 3 d. f is 7.815).   **05**

OR

Q.7 The heights of 9 males of a given locality are found to be 45, 47, 50, 52, 48, 47, 49, 53, 51 inches. Is it reasonable to believe that the average height is differ significantly from assumed mean 47.5 inches? (Given that for 5% level of significance t for 7 d. f is 2.365, for 8 d. f. is 2.306 and for 9 d. f. is 2.262)   **05**

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