

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-III (NEW) EXAMINATION – WINTER 2021****Subject Code:3130908****Date:17-02-2022****Subject Name:Applied Mathematics for Electrical 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.

Q.1 (a) Construct the difference table for $f(x) = (x+2)^2$ for $x = 1, 2, 3$ and find $\nabla^2 f(3)$. **03**

(b) Find a real root of the equation $x^3 - 4x - 9 = 0$ using bisection method in four stages. **04**

(c) Explain Bay's rule for probability. Three boxes contained 10%, 20% and 30% red colors pens. A pen is selected at random whose color is red. Determine the probability that it came from 3rd box, 2nd box, 1st box. **07**

Q.2 (a) Prove that $(1 + \Delta)(1 - \nabla) = 1$. **03**

(b) Using Picard's method solve $\frac{dy}{dx} = x - y^2$ with the initial condition $y(0) = 1$ and compute $y(0.1)$. **04**

(c) Evaluate $\int_0^6 \frac{1}{1+x} dx$ for $n = 6$ using Simpson's one third rule and Simpson's three eights rule. Also find an approximate value of $\log_e 2$. **07**

OR

(c) Using the Runge Kutta method of fourth order solve $\frac{dy}{dx} = xy + y^2$ with the initial condition $y(0) = 1$. Compute $y(0.2)$ by taking $h = 0.1$. **07**

Q.3 (a) Is $f(x) = \frac{x}{6}, x = 0, 1, 2, 3, 4$ define probability distribution? Justify your answer. **03**

(b) Compute $f(9.2)$ from the following values using Newton's divided difference formula. **04**

x	8	9	9.5	11
$f(x)$	2.079442	2.197225	2.251292	2.397895

(c) Using the method of least squares, find the best fitting second degree curve to the given following data: **07**

x	1	2	3	4
y	6	11	18	27

OR

Q.3 (a) For the following distribution, find the value of k . **03**

x	1	2	3	4	5
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$f(x)$	0.1	k	0.2	$3k$	0.3
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- (b) Using the Euler's method, find $y(0.2)$ given that **04**
 $\frac{dy}{dx} = y - \frac{2x}{y}, y(0) = 1, h = 0.1$.

- (c) Find the root of the equation $x \sin x + \cos x = 0$ using Newton-Raphson method correct to three decimal places. **07**

- Q.4** (a) Find the median of the following data: **03**

Marks	<20	21-30	31-40	41-50	51-60	61-70
No. of Students	5	15	20	6	6	8

- (b) Using the Newton forward formula, find the approximate value of $f(1.6)$, if **04**

x	1	1.4	1.8	2.2
$f(x)$	3.49	4.82	5.96	6.5

- (c) The joint probability density function of two continuous random variable X and Y is given by **07**

$$f(x, y) = cxy; 0 < x < 4, 1 < y < 5$$

$$= 0; \text{ otherwise}$$

Find (a) value of constant c, (b) $P(X \geq 3, Y \leq 2)$,

(c) $P(1 < X < 2, 2 < Y < 3)$.

OR

- Q.4** (a) Find the first four moments of the observation 1,3,5,7,8,9. **03**

- (b) Using Lagrange's interpolation formula, find $f(3)$ from the data given: **04**

x	1	5	7	6
$f(x)$	1.10	2.00	3.23	4.50

- (c) Find a real root of the equation $x \log_{10} x = 1.2$ by using Regula-falsi method correct to four decimal places. (or four stages) **07**

- Q.5** (a) If A and B are independent events, where $P(A) = \frac{1}{4}, P(B) = \frac{2}{3}$. **03**

Find $P(A \cup B)$.

- (b) Compute $\int_0^2 (1+x) dx$ by a two point Gaussian quadrature formula. **04**

- (c) Find the Karl Pearson's coefficient of skewness for the following data: **07**

Marks	20	21	22	23	24	25	26	27	28
No. of students	7	12	25	10	8	6	8	3	1

OR

- Q.5** (a) If A and B are mutually exclusive events and $P(A) = 0.30, P(B) = 0.45$, then find the probability of the events, **03**

(a) $P(A')$ (b) $P(A \cup B)$ (c) $P(A' \cap B')$.

- (b) Evaluate the integration $\int_4^{5.2} \log_e x dx$ using Simpson's $\frac{3}{8}$ th rule. take **04**

$h = 0.2$.

- (c) Find the mean, median and mode for the following data: **07**

Class	50-53	53-56	56-59	59-62	62-65	65-68	68-71	71-74	74-77
Frequency	3	8	14	30	36	28	16	10	5
