

31N0706/31N0801

Roll No. \_\_\_\_\_

Total No. of Pages: **3**

**31N0706/31N0801**

**B. Tech. III - Sem. (Main) Exam., May - 2023**

**Electronics and Communication Engineering**

**3EC3 - 06 Advanced Engineering Mathematics-I**

**Common to EC, EI**

**Time: 3 Hours**

**Maximum Marks: 70**

**Instructions to Candidates:**

**Part - A:** Short answer questions (up to 25 words)  $10 \times 2$  marks = 20 marks.  
All ten questions are compulsory.

**Part - B:** Analytical/Problem solving questions  $5 \times 4$  marks = 20 marks.  
Candidates have to answer five questions out of seven.

**Part - C:** Descriptive/Analytical/Problem Solving questions  $3 \times 10$  marks = 30 marks.  
Candidates have to answer three questions out of five.

*Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.*

*Use of following supporting material is permitted during examination.  
(Mentioned in form No. 205)*

1. NIL

2. NIL

**PART - A**

Q.1 Evaluate  $\left(\frac{A^2}{E}\right) x^3$ , where interval of differencing being unity. [2]

Q.2 Write Gauss's forward interpolation formula. [2]

Q.3 Write Simpson's one - third rule used in numerical integration [2]

- Q.4 Prove that:  $\mu = \sqrt{\left(\frac{1+n^2}{4}\right)}$  [2]
- Q.5 Write the formula used in Regula-Falsi method. [2]
- Q.6 Define discrete random variable. [2]
- Q.7 Find the mathematical expectation  $E(X)$  for the following distribution: [2]

$x:$	-3	6	9
$p(x):$	$\frac{1}{6}$	$\frac{1}{2}$	$\frac{1}{3}$

- Q.8 Write the equation of line regression of  $y$  on  $x$ . [2]
- Q.9 State Parseval's theorem. [2]
- Q.10 Write one dimensional heat equation. [2]

### PART - B

Q.1 Use Newton's forward interpolation formula to find a second degree polynomial function passes through (0, 1), (1, 3), (2, 7) and (3, 13). [4]

Q.2 The distribution of weekly wages of 500 workers in factory is approximately normal with the mean and standard deviation of ₹75 and ₹15 respectively. Find the number of workers who receive weekly wages more than ₹90. [4]  
(Given that  $P(0 < z < 1) = 0.3413$ )

Q.3 Explain the steps (working procedure) of Bisection Method. [4]

Q.4 Fit a straight line to the following data treating  $y$  as the dependent variable:

$x:$	1	2	3	4	5
$y:$	35	68	100	138	170

Q.5 A coin is tossed until a head appears. What is the expectation of the number of tosses required? [4]

Q.6 Find the half range cosine series for the function  $f(x) = x; x \in (0, \pi)$  [4]

Q.7 Calculate the coefficient of correlation between  $x$  and  $y$  using the following data. [4]

$x:$	1	2	3	4	5
$y:$	5	4	3	2	6

### PART - C

Q.1 Find the Fourier series to represent the function  $f(x) = x + x^2$ ;  $x \in (-\pi, \pi)$  [10]

Q.2 Use Milne's method to solve the following differential equation: [10]

$$\frac{dy}{dx} = x - y^2, \text{ given that}$$

$$y(0) = 0.0000, y(0.2) = 0.0200, y(0.4) = 0.0795, y(0.6) = 0.1762$$

to find the approximate value of  $y(0.8)$ .

Q.3 Find the moment generating function (mgf) of a random variable  $X$  whose moment are given as [10]

$$\mu_r' = \frac{(r+1)!}{r!} 2^r$$

Q.4 Using Newton - Raphson method, find the cube root of 10. [10]

Q.5 Out of 800 families with 4 children each, how many families would be expected to have [10]

(i) 2 boy and 2 girls ✓

(ii) atleast one boy

(iii) no girl

(iv) utmost two girls?

Assume equal probabilities for boys and girls.