Name:.....
Roll No:.....

MAR ATHANASIUS COLLEGE OF ENGINEERING
KOTHAMANGALAM – 686666
(Govt. Aided Autonomous Institution)
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

B. TECH FIRST SERIES EXAMINATION, AUGUST 2026

(S5 ECE A&B) B24EC3T03 ANALOG AND DIGITAL COMMUNICATION

Max. Marks: 40 Duration: 1.5 Hours

PART A

Answer all questions. Each question carries 3 marks.

1. List the needs for modulation. (CO1)
2. A 105 MHz carrier signal is frequency modulated by 7 kHz sine wave. The resultant signal has a frequency deviation of 50 kHz. Determine the modulation index and bandwidth of FM wave. (CO1)
3. State any 3 properties of Cumulative Distribution Function (CDF). (CO2)
4. Differentiate between discrete random variables and continuous random variables. (CO2)

PART B

Answer all questions. Each question carries 14 marks.

5. a. Derive the mathematical expression for an amplitude modulated signal and draw its frequency spectrum. (CO1)

   b. The antenna current of an AM transmitter is 8A if only the carrier signal is sent, but it increases to 8.93A if the carrier is modulated by a sinusoidal wave. Determine the percentage of modulation. Also find the antenna current if the modulation index changes to 0.8. (CO1)

VISION
Embedding Creativity and fostering quality Education

MISSION
Advance the field of Electronics and Communication by developing and disseminating innovative practices and technologies.

Nurture technically competent professionals in Electronics and Communication Engineering equipped with the skills to address global challenges.

Foster socially responsible technocrats and entrepreneurs who contribute positively to society through their expertise and leadership.

6. a. A continuous random variable X has the probability density function (PDF) given (CO2)

$$f_X(x) = \begin{cases} kx, & 0 < x < 2, \\ 0, & \text{otherwise.} \end{cases}$$

Determine:

i) The value of k.

ii) The corresponding cumulative distribution function (CDF).

iii) The probability P(0.5 < X < 1.5).

b. The probability density function (PDF) of a continuous random variable X in the range (−3,3) is defined as (CO2)

$$f_X(x) = \begin{cases} \frac{1}{16}(3+x)^2, & -3 \le x \le -1, \\ \frac{1}{16}(2-6x^2), & -1 \le x \le 1, \\ \frac{1}{16}(3-x)^2, & 1 \le x \le 3. \end{cases}$$

Verify that the area under the curve is unity.