

Seat No./Enrollment No.: _____

GUJARAT TECHNOLOGICAL UNIVERSITY
BACHELOR OF ENGINEERING – SEMESTER 4 – EXAMINATION – SUMMER 2026

Subject Code: BE04000031 **Date: 21/05/2026**

Subject Name: Principles of Communication

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)** Define communication system and explain it with the help of block diagram. **03**
 - (b)** Explain Modulation process with its requirement in communication system. **04**
 - (c)** Define Following Terms: (Draw diagram and write equations if any) **07**
 - 1. Multi-tone modulation
 - 2. Self-capacitance of a coil
 - 3. Power Spectrum Density
 - 4. Image frequency
 - 5. Carson's rule

- Q.2**
- (a)** Give Comparison between FM and AM system. **03**
 - (b)** Derive the total power of an AM wave in terms of carrier power and modulation index. **04**
 - (c)** An modulating signal $15\sin(2\pi \cdot 1500t)$ amplitude modulates a carrier signal $60\sin(2\pi \cdot 100,000t)$. Load resistance is 60Ω . Find i) modulation index, ii) Total power and iii) Draw its frequency spectrum iv) Total Bandwidth iv) Transmission efficiency vi) Transmitted current **07**

OR

- Q.2**
- (c)** Discuss the basic principle of FM detection and explain Foster-seeley Discriminator **07**
- Q.3**
- (a)** Differentiate SSB and VSB modulation. **03**
 - (b)** What do you mean by noise? Give classification of it. Briefly explain thermal noise. **04**
 - (c)** Define Noise factor. Derive the Friis's formula for noise factor when amplifiers are in cascade connection. **07**

OR

- Q.3**
- (a)** Explain Phase Modulation with necessary equation. **03**
 - (b)** Discuss the significance of pre-emphasis and de-emphasis in FM transmitter and receiver? **04**
 - (c)** Explain the indirect method of generating FM signal with block diagram and relevant mathematical expression. **07**

- Q.4**
- (a)** What is the significance of Amplitude limiter. **03**

(b) Two resistors $15\text{ k}\Omega$ and $30\text{ k}\Omega$ are at room temperature (290K) for a bandwidth of 300 kHz. Calculate thermal noise for each resistor, if two resistors are in series. **04**

(c) Draw block diagram of super heterodyne receiver and explain function of each block. **07**

OR

Q.4 (a) Calculate the FM modulation index for a system having peak frequency deviation of 50 kHz and modulating frequency of 5 kHz. **03**

(b) Find the fourier transform of : **04**

1. $x(t)=\delta(t)$

2. $x(t)=e^{-at}u(t)$

(c) Define amplitude modulation. Derive its mathematical expression and draw its frequency spectrum. Draw its waveforms for under, perfect and over modulation. **07**

Q.5 (a) Discuss about the Automatic Gain Control in brief. **03**

(b) A certain AM transmitter radiates 10kW with the carrier unmodulated and 11.8kW when the carrier is sinusoidally modulated. Calculate the modulation index. If another sine wave corresponding to 40% modulation is transmitted simultaneously, determine the total radiated power. **04**

(c) Draw and explain Series tuned circuits in detail. Derive its equation for Resonance frequency and Q-factor. **07**

OR

Q.5 (a) Explain the transmission of a signal through LTI system. **03**

(b) Discuss about the technology used in amateur radio. **04**

(c) Draw and explain circuit of envelope detector for AM. **07**
