

GUJARAT TECHNOLOGICAL UNIVERSITY
BACHELOR OF ENGINEERING – SEMESTER 5 – EXAMINATION – SUMMER 2026

Subject Code: 3151104

Date: 09/06/2026

Subject Name: Analog and Digital Communication

Time: 02:30 PM TO 05:00 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)** Discuss the advantages and disadvantages of Frequency Modulation over Amplitude Modulation. **03**
 - (b)** Define Following Terms: (Draw diagram and write equations if any) **04**
 - i) Sideband splatter in amplitude modulation
 - ii) Single tone modulation
 - iii) Carrier swing
 - (c)** Draw and explain the block diagram of Analog and Digital communication system. **07**
- Q.2**
- (a)** What do you mean by Frequency Division Multiplexing? **03**
 - (b)** Explain vestigial sideband (VSB). **04**
 - (c)** An AM signal is represented by **07**
$$e(t) = 7.5 (1 + 0.5 \sin(5027\pi t)) \cos(10053 \times 1000\pi t)$$

Calculate its i) Carrier frequency ii) Modulation index iii) Amplitude of modulating signal iv) Frequency of LSB and USB v) Amplitude of LSB and USB vi) Transmission efficiency vii) Total power delivered to load of 600Ω .
- OR
- Q.2**
- (c)** Explain the indirect method of generating FM signal with block diagram. Derive its relevant mathematical expression. **07**
- Q.3**
- (a)** Differentiate between Wideband frequency modulation and Narrowband frequency modulation. **03**
 - (b)** A carrier wave is represented by equation $12\sin(2\pi ft)$. Draw the wave-forms of Amplitude Modulation wave for depth of modulation of i) 1 ii) 0.5 iii) $3/2$. **04**
 - (c)** Enlist the methods used to generate Single Side Band modulation signal. Discuss any one method in detail. **07**
- OR
- Q.3**
- (a)** Compare DSBFC and DSBSC of amplitude modulation. **03**
 - (b)** Discuss the significance of pre-emphasis and de-emphasis in FM transmitter and receiver? **04**
 - (c)** Derive the mathematical expression of normal amplitude modulation and draw its and frequency spectrum. Derive its equation of transmitted power. **07**
- Q.4**
- (a)** State and prove sampling theorem in time domain. **03**
 - (b)** Discuss Modulation with its need for communication. **04**

(c) Draw Eye diagram. Show the significance of it in the pulse detection technique? **07**

OR

Q.4 (a) What do you mean by modulation index of frequency modulation? **03**

(b) Explain in brief Frequency Shifting Keying (FSK) technique and enlist its applications **04**

(c) Explain the different type of line coding techniques with suitable diagrams. **07**

Q.5 (a) Define the following terms: **03**

i) Scrambling

ii) Slope overloading

iii) Sample and Hold

(b) Derive the Expression of quantization error. **04**

(c) Draw the block diagram of regenerative repeater and briefly explain the function of each block. **07**

OR

Q.5 (a) Compare Differential Pulse Code Modulation and Pulse Code Modulation. **03**

(b) Draw the signals for Unipolar NRZ, Unipolar RZ, Polar NRZ and polar RZ for data stream 10110011. **04**

(c) Explain Inter symbol interference in digital communication and how to achieve zero ISI. **07**
