Seat No./Enrollment No.: _____

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

Subject Code: 3154701 **Date: 21/05/2026**

Subject Name: Electronics and 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)**	Define 'Modulation Index' for AM. What happens to the signal if the modulation index exceeds 1?	**03**
	(b)	Differentiate between Narrowband FM (NBFM) and Wideband FM (WBFM) based on bandwidth and modulation index.	**04**
	(c)	Draw the detailed block diagram of a Superheterodyne FM Receiver and explain the function of each stage.	**07**
Q.2	**(a)**	State Parseval's theorem. Also, write Fourier Transform of unit impulse signal	**03**
	(b)	Explain the concept of energy and power signals with examples.	**04**
	(c)	Explain generation of SSB using filter method with block diagram.	**07**
		OR	
Q.2	**(c)**	Discuss trade-off between sensitivity and selectivity in receiver design.	**07**
Q.3	**(a)**	Discuss advantages of digital communication over analog communication.	**03**
	(b)	Explain condition for distortionless transmission.	**04**
	(c)	Compare DSB-FC, DSB-SC, and SSB-SC in terms of bandwidth, power, and complexity, and calculate the required bandwidth for both DSB-FC and SSB given a carrier frequency of 1 MHz and a modulating signal of 5 kHz.	**07**
		OR	
Q.3	**(a)**	What is a series tuned circuit? Define impedance at resonance for series circuit.	**03**
	(b)	Explain envelope detector with waveform.	**04**
	(c)	Explain working of PLL-based FM detector in detail.	**07**
Q.4	**(a)**	Explain adjacent channel selectivity.	**03**
	(b)	Derive expression for FM signal (time domain).	**04**
	(c)	Discuss in detail the roles of pre-emphasis and de-emphasis circuits in improving SNR in FM systems.	**07**
		OR	
Q.4	**(a)**	What is image frequency? Define image frequency rejection ratio (IFRR).	**03**
	(b)	For a frequency modulated (FM) signal with a deviation ratio of 4 and a maximum modulating frequency of 5 kHz, determine the maximum frequency deviation and the total required transmission bandwidth.	**04**

	(c)	Discuss the operating principle of the Foster-Seeley Discriminator with the help of circuit diagram.	**07**
Q.5	**(a)**	Explain SNR and its importance.	**03**
	(b)	What is automatic gain control (AGC)? Draw and explain simple AGC circuit.	**04**
	(c)	Explain noise in BJT and FET in detail.	**07**

OR

Q.5	**(a)**	Explain shot noise and list its characteristics.	**03**
	(b)	Explain advantages of Ham radio over modern communication systems.	**04**
	(c)	Derive the mathematical relationship between the Noise Factor (F) and the Noise Figure (NF). Also, calculate the overall noise factor for a receiver system consisting of two cascaded amplifiers with the following parameters: Stage 1 ($F_1 = 2$, $G_1 = 10$) and Stage 2 ($F_2 = 3$, $G_2 = 20$).	**07**

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