Enrollment No./Seat No.:

GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering - SEMESTER - V EXAMINATION - SUMMER 2025

Subject Code: 3154701 **Date: 13-05-2025**

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.**

			Marks
Q.1	**(a)**	State Carson's Rule. For an FM signal with deviation of 75 kHz and modulating frequency of 15 kHz, compute modulation index	**03**
	(b)	What is modulation? Explain the need for modulation.	**04**
	(c)	Explain the concept of balanced modulator with the help of circuit diagram and mathematical expressions	**07**
Q.2	**(a)**	Draw block diagram of Super-heterodyne AM receiver.	**03**
	(b)	Explain the difference between frequency and phase modulation	**04**
	(c)	Explain the generation of SSB waveform using The Phase shift method.	**07**
		OR	
	(c)	State and prove the Fourier transform of a rectangular pulse of width T. Also, Sketch its magnitude spectrum.	**07**
Q.3	**(a)**	What is the basic principle behind the Foster-Seeley discriminator?	**03**
	(b)	Explain the working of a diode envelope detector with a suitable waveform diagram.	**04**
	(c)	Compare bandwidth and power efficiency of DSBFC, DSBSC and SSBSC.	**07**
		OR	
	(a)	The antenna current of an AM transmitter is 8A for unmodulated carrier but it increases to 8.93A when the carrier is modulated by single sine wave. Find the percentage modulation. Determine the antenna current when percentage modulation changes to 0.8.	**03**
	(b)	Compare slope detector and balanced slope detector.	**04**
	(c)	What is image frequency (IF) and image frequency rejection ratio (IFRR)and how to improve it? Explain in detail.	**07**
Q.4	**(a)**	Describe how a series LC circuit acts as a band-pass filter.	**03**
	(b)	What is automatic gain control (AGC)? Draw and explain simple AGC circuit.	**04**
	(c)	List the major noise sources in a BJT. Explain each type in detail with its cause and characteristics.	**07**
		OR	
	(a)	Discuss the effect of bandwidth on the SNR of a receiver.	**03**

	(b)	Explain skin-effect and its impact on coil Q-factor at high frequencies.	**04**
	(c)	Draw and explain the Armstrong method of FM generation.	**07**
Q.5	**(a)**	Define sensitivity, selectivity and fidelity in the context of receiver.	**03**
	(b)	Differentiate between Energy Spectral Density (ESD) and Power Spectral Density (PSD) with examples	**04**
	(c)	Explain the necessity of pre emphasis and de emphasis circuits in FM with the help of circuit diagrams.	**07**

OR

	(a)	Briefly discuss one application of Ham radio during natural calamities.	**03**
	(b)	Draw and explain the working of a ratio detector circuit.	**04**
	(c)	Derive the Friis formula for noise factor in cascaded stages. For two cascaded amplifiers with $NF_1 = 3$ dB, $gain_1 = 10$ dB; $NF_2 = 5$ dB, $gain_2 = 15$ dB, compute overall NF.	**07**

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