Enrolment No./Seat No_____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–V EXAMINATION – SUMMER 2025

Subject Code:2151004 Date:22-05-2025

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.**
4. **Simple and non-programmable scientific calculators are allowed.**

			MARKS
Q.1	**(a)**	Define the following terms: i) Energy Signal, ii) Power Signal, iii) Parseval's theorem for energy signal	**03**
	(b)	What is modulation and why modulation is required in communication?	**04**
	(c)	What are the natural sources of noise? Explain Shot noise, Partition noise and Thermal noise.	**07**
Q.2	**(a)**	Define the following terms: i) Noise Factor, ii) PSD of White Noise iii) Signal to Noise Ratio	**03**
	(b)	Explain the Skin effect.	**04**
	(c)	A modulating signal $\mathrm{m}(t) = 10\cos(2\pi \times 10^3 t)$ is amplitude modulated with a carrier signal $\mathrm{c}(t) = 50\cos(2\pi \times 10^5 t)$. Find the modulation index, the carrier power, and the power required for transmitting AM wave.	**07**
		OR	
	(c)	Explain Amplitude Modulation with required waveforms. Derive the mathematical equation for an Amplitude modulated wave.	**07**
Q.3	**(a)**	State and prove time shifting property of Fourier transform.	**03**
	(b)	An amplifier with 10 dB noise figure and 3 dB power gain is cascaded with a second amplifier which has a 10 dB power gain. What is the overall noise figure?	**04**
	(c)	What are the different methods for generation of SSB signals? Explain SSB generation by phase shift method with necessary block diagram and derivations	**07**
		OR	
Q.3	**(a)**	State and prove Time-scaling property of Fourier transform.	**03**
	(b)	Two resistors 20 KΩ and 50 KΩ are at room temperature (290K) for a bandwidth of 100KHz. Calculate thermal noise (i) for each resistor (ii) for two resistors in series (iii) for two resistors in parallel	**04**
	(c)	With help of neat diagram describe the working of a super heterodyne receiver.	**07**
Q.4	**(a)**	Compare DSB-FC and SSB –SC modulation schemes and prove that use of SSB technology is preferable as compared to use of DSB technology.	**03**
	(b)	Find the Fourier Transform of following function: $x(t) = rect\left(\frac{t}{\tau}\right) = \begin{cases} 1 & \text{for } -\frac{\tau}{2} < \frac{\tau}{2} \\ 0 & otherwise \end{cases}$	**04**
	(c)	Enlist various methods of FM generation. Explain any one of them.	**07**
		OR	
Q.4	**(a)**	What is VSB what is its significance?	**03**
	(b)	Give a comparison between Series Tuned and Parallel Tuned circuits.	**04**
	(c)	An FM wave is given by $x(t) = 20\sin(6 \times 10^8 t + 7\sin 1250t)$. Determine: i) carrier frequency	**07**

ii) modulating frequency
iii) modulation index and
iv) maximum deviation

Q.5 **(a)** Define the following terms related with radio receiver: **03**
(i) selectivity (ii) fidelity (iii) sensitivity

(b) Explain the importance of pre-emphasis and de-emphasis circuits. **04**

(c) Describe the technology behind Ham Radio and discuss its importance during natural calamities. **07**

OR

Q.5 **(a)** Define Image Frequency. An AM broadcast receiver has an IF of 465 kHz and is tuned to 1000 kHz and the RF stage has one tuned circuit with a Q of 50. Calculate the image frequency. **03**

(b) With the help of neat diagram and waveform explain the operation of an envelope detector. **04**

(c) List all the basic FM demodulators. Draw and explain Foster Seeley Discriminator in detail. **07**

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