Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–V (NEW) EXAMINATION – WINTER 2023

Subject Code:2151004 Date:15-12-2023

Subject Name:Electronics and 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 terms: Communication Process, Modulation and Demodulation. Also enlist various needs for adopting Modulation process in communication process.	**07**
	(b)	Define terms: Aperiodic signal, Channel Selectivity, Skin effect, Noise factor, Effective modulation index of multitone modulated signal, Carson's Rule and Signal to Noise ratio (SNR).	**07**
Q.2	**(a)**	Classify and define various signals in detail.	**07**
	(b)	Write short note on Series Tuned Circuits.	**07**
		OR	
	(b)	Define the term passive components and describe Parallel tuned circuits with all details.	**07**
Q.3	**(a)**	Derive a mathematical equation of a single tone Sinusoidally amplitude modulated signal. The equation of amplitude modulated wave is given by $s(t)=20[1+0.8\cos(2\pi\times10^3t)]\cos(4\pi\times10^5t)$. Find the carrier power, the total sideband power, and the band width of AM wave.	**07**
	(b)	Describe any one direct method to generate direct List out different methods of Sinusoidally modulated SSB wave generation. Describe balanced modulator-filter method in details for the same purpose.	**07**
		OR	
Q.3	**(a)**	Derive a mathematical equation of multi tone Sinusoidally amplitude modulated signal. A modulating signal $m(t)=10\cos(2\pi\times10^3t)$ is amplitude modulated with a carrier signal $c(t)=50\cos(2\pi\times10^5t)$. Find the modulation index, the carrier power and the power required for transmitting AM wave.	**07**
	(b)	Describe in details about envelope detector as a amplitude demodulator circuit.	**07**
Q.4	**(a)**	Derive a mathematical equation of a single tone Sinusoidally frequency modulated signal. Also draw a FM wave in the time domain.	**07**
	(b)	Describe in detail, working principle of PLL detector as a Frequency demodulator circuit.	**07**
		OR	
Q.4	**(a)**	With the neat block diagram, describe the Armstrong method of FM wave generation.	**07**
	(b)	Describe the working principle of Super heterodyne radio receiver with neat block diagram.	**07**
Q.5	**(a)**	Describe Thermal noise and Shot noise. Justify the given statement: "SNR value of signals must be greater than or equal to one.	**07**
	(b)	Derive an equation of Noise factor in three stage cascaded amplifiers. A sinusoidal modulating waveform of amplitude 5 V and a frequency of 2 KHz are	**07**

applied to FM generator, which has a frequency sensitivity of 40 Hz/volt. Calculate the frequency deviation, modulation index, and bandwidth.

OR

Q.5 **(a)** Describe Partition noise, Low frequency noise and Burst noise. An FM wave is given by $s(t)=20\cos(8\pi\times10^{6}t+9\sin(2\pi\times10^{3}t))$. Calculate the frequency deviation, bandwidth, and power of FM wave. **07**

(b) Mention the significance of Ham radio during natural calamities **07**

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