Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE- SEMESTER–V EXAMINATION – WINTER 2025

Subject Code:3151104 Date:21-11-2025

Subject Name:Analog and Digital 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.**

			MARKS
Q.1	**(a)**	Compare baseband versus carrier modulation.	**03**
	(b)	State and prove the sampling theorem.	**04**
	(c)	Discuss the QPSK modulation scheme in detail.	**07**
Q.2	**(a)**	Enlist the classification of signals. Also, define each category.	**03**
	(b)	Define FM and PM. Establish the relationship between FM and PM.	**04**
	(c)	What is aliasing? Discuss the factors responsible for aliasing. Also, discuss possible solutions for it.	**07**
		OR	
	(c)	Present analysis of double sideband amplitude modulation. Also, derive sideband and carrier power.	**07**
Q.3	**(a)**	Define ISI (inter-symbol interference). Discuss its effects on communication.	**03**
	(b)	Justify the need for line coding. Enlist various line coding schemes.	**04**
	(c)	What is quantization? Narrate its importance. Compare linear versus nonlinear quantization.	**07**
		OR	
Q.3	**(a)**	Define scrambling. What are the needs of scrambling?	**03**
	(b)	What is ADPCM? Explain it in brief.	**04**
	(c)	Explain Differential PCM in detail.	**07**
Q.4	**(a)**	Show bandwidth analysis of angle-modulated waves.	**03**
	(b)	Discuss practical issues in Signal Sampling and reconstruction.	**04**
	(c)	State and prove Nyquist's criteria for zero ISI.	**07**
		OR	
Q.4	**(a)**	What is the superheterodyne concept?	**03**
	(b)	What is adaptive delta modulation? Describe it in brief.	**04**
	(c)	Explain equalizers in detail.	**07**
Q.5	**(a)**	What is an eye diagram? What is its usage?	**03**
	(b)	Discuss the FM broadcasting system.	**04**
	(c)	Write a short note on delta modulation.	**07**
		OR	
Q.5	**(a)**	What is a compander? What is its usage?	**03**
	(b)	Write a short note on the GMSK modulation technique.	**04**
	(c)	What are preemphasis and deemphasis in FM? Explain them. Justify their needs in FM. Can we use them in AM? Why?	**07**

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Enrolment No./Seat No_____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE- SEMESTER–V (NEW) EXAMINATION – WINTER 2024

Subject Code:3151104 Date:02-12-2024

Subject Name:Analog and Digital 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.**

			Marks
Q-1	**(a)**	Define: Modulation index , SNR and Channel capacity.	**03**
	(b)	What is modulation? Why modulation required? Describe in detail.	**04**
	(c)	Draw and Explain block diagram of Communication System.	**07**
Q.2	**(a)**	Give comparison between AM and FM systems.	**03**
	(b)	An audio signal given as 15 sin ($2\pi(1500t)$) amplitude modulates a carrier given as 60 sin ($2\pi(100{,}000t)$). Determine the following 1. Sketch the Audio signal 2. Sketch the carrier signal. 3. Determine the percentage of index 4. Draw the frequency spectrum of modulated signal with all frequency component	**04**
	(c)	How AM waves are detected in Envelop Detector method.	**07**
		OR	
	(c)	Explain Armstrong method of FM generation with neat diagram.	**07**
Q.3	**(a)**	Explain DSB amplitude modulation with necessary figures.	**03**
	(b)	Explain pre-emphasis and de-emphasis in relation to FM.	**04**
	(c)	A 107.6 MHz carrier is frequency modulated by a 7 KHz sine wave. The resultant FM signal has a frequency deviation of 50 KHz. i) Find the carrier swing of the FM signal. ii) Determine the highest and lowest frequencies attained by the modulated signal iii) What is the modulation index of the FM wave?	**07**
		OR	
Q.3	**(a)**	What is Carson's rule in FM?	**03**
	(b)	State the difference between PCM, DPCM and Delta modulation.	**04**
	(c)	What is a super heterodyne receiver? Explain with block diagram.	**07**

Q.4	**(a)**	State and prove Sampling theorem.	**03**
	(b)	Discuss advantages and disadvantages of delta modulation	**04**
	(c)	Write a note on Differential Pulse Code Modulation.	**07**
		OR	
Q.4	**(a)**	What is Inter Symbol Interference? Explain the Nyquist's first criteria for zero ISI.	**03**
	(b)	Describe the effect of slope overloading and hunting in delta modulation.	**04**
	(c)	State advantages and disadvantages of digital communication over analog communication.	**07**
Q.5	**(a)**	Explain Noncoherent detection of Amplitude-Shift keying (ASK) signal with necessary equations and diagrams.	**03**
	(b)	What is an Eye diagram? Explain with example.	**04**
	(c)	What is scrambling? Explain scrambling and descrambling process with block diagram and suitable example.	**07**
		OR	
Q.5	**(a)**	Draw the signals for Unipolar NRZ, Unipolar RZ, Polar RZ for Data stream 1110000111.	**03**
	(b)	Differentiate BPSK,QPSK and DPSK.	**04**
	(c)	Draw and explain a Regenerative Repeater in detail.	**07**

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Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

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

Subject Code:3151104 Date:11-12-2023

Subject Name:Analog and Digital 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.**

			MARKS
Q.1	**(a)**	Define following: 1) Amplitude modulation 2) Frequency modulation 3) Phase modulation	**03**
	(b)	State any four benefits of Modulation.	**04**
	(c)	Draw and Explain block diagram of Communication System.	**07**
Q.2	**(a)**	Show difference between AM and FM system.	**03**
	(b)	Discuss under modulation (undershoot), perfect modulation and over modulation (overshoot) for various value of modulation index.	**04**
	(c)	How AM waves are detected in Envelop Detector method.	**07**
		OR	
	(c)	The antenna current of an AM transmitter is 8 amperes (8A) when only the carrier is sent, but it increases to 8.93A when the carrier is modulated by a single sine wave. Find the percentage modulation and also determine the antenna current when the percent of modulation changes to 0.8.	**07**
Q.3	**(a)**	State difference between Single sideband and Double sideband amplitude modulation.	**03**
	(b)	State the difference between PCM, DPCM and Delta modulation.	**04**
	(c)	What is a super heterodyne receiver? Explain with block diagram.	**07**
		OR	
Q.3	**(a)**	State the Carson's rule and explain in brief.	**03**
	(b)	A modulating signal 10 $\cos(2\pi \bullet 30 \times 10^3 t)$; Angle modulated a carrier Vc $\cos(w_c \bullet t)$. Calculate Modulation Index and bandwidth for the FM system. (Assume K_f = 15 kHz)	**04**
	(c)	Enlist various methods of FM generation. Explain any one of them.	**07**
Q.4	**(a)**	State 'Sampling Theorem'. Discuss Nyquist Rate of sampling.	**03**
	(b)	Explain mid-rise and mid-tread type of quantizer.	**04**
	(c)	State advantages and disadvantages of digital communication over analog communication.	**07**
		OR	
Q.4	**(a)**	Compare the On-off and Bipolar signaling for transmission of digital data.	**03**
	(b)	Describe the effect of slope overloading and hunting in delta modulation.	**04**
	(c)	Explain various type of sampling methods.	**07**

Q.5	**(a)**	Compare Amplitude Sift Keying (ASK) with Frequency Sift Keying (FSK).	**03**
	(b)	Given modulating bit stream is 10110011. Draw the ASK, FSK and BPSK signals. Also draw the waveforms for carrier and modulating bit stream.	**04**
	(c)	What is Line coding? Explain the different type of line coding techniques with suitable waveforms.	**07**

OR

Q.5	**(a)**	Give the full forms of following: 1) ISI, 2) PSD, 3) AMI	**03**
	(b)	Draw the signals for Unipolar NRZ, Unipolar RZ, Polar NRZ, Polar RZ for Data stream 10100111.	**04**
	(c)	State the importance of Regenerative repeater in digital communication and discuss briefly about the significance of individual components of Regenerative repeater.	**07**

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Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–V (NEW) EXAMINATION – WINTER 2022

Subject Code:3151104 Date:11-01-2023

Subject Name:Analog and Digital 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.**

			MARKS
Q.1	**(a)**	Define: Modulation, SNR and Channel capacity.	**03**
	(b)	Explain Noise immunity of digital signals.	**04**
	(c)	Explain the classification of signals.	**07**
Q.2	**(a)**	Explain DSB amplitude modulation with necessary figures.	**03**
	(b)	Explain PLL.	**04**
	(c)	Write a note on Envelope detector.	**07**
		OR	
	(c)	VSB is a clever compromise between SSB and DSB for broadcast television. Justify.	**07**
Q.3	**(a)**	State the unique features of FM.	**03**
	(b)	How the FM waves are generated?	**04**
	(c)	Explain Preemphasis and Deemphasis in FM broadcasting.	**07**
		OR	
Q.3	**(a)**	What is modulation index for FM?	**03**
	(b)	Write a note on demodulation of FM.	**04**
	(c)	Write a note on FM receiver.	**07**
Q.4	**(a)**	State and prove Sampling theorem.	**03**
	(b)	What is interpolation? Explain signal reconstruction using the interpolation formula.	**04**
	(c)	State the advantages of Digital Communication.	**07**
		OR	
Q.4	**(a)**	What is Companding?	**03**
	(b)	How to remove the disadvantage of thresholding of coding and overloading found in Delta modulation?	**04**
	(c)	Write a note on Differential Pulse Code Modulation.	**07**
Q.5	**(a)**	What is scrambling? Draw a typical scrambler and descrambler.	**03**
	(b)	What is an Eye diagram? Explain with example.	**04**
	(c)	Explain the components of digital communication system.	**07**
		OR	
Q.5	**(a)**	What do you understand by M-ary communication?	**03**
	(b)	Compare ASK and FSK.	**04**
	(c)	Draw and explain a Regenerative Repeater in detail.	**07**

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