GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER–V EXAMINATION – SUMMER 2025

Subject Code:3151104   **Date:17-05-2025**

Subject Name:Analog and Digital 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)**	What do you mean by modulation index/modulation depth? Explain its significance in communication system.	**03**
	(b)	Explain Modulation process with its requirement in communication system.	**04**
	(c)	Define Following Terms: (Draw diagram and write equations if any)	**07**

          i)   Multi tone modulation
          ii)   Scrambling
          iii)   Aliasing
          iv)   Frequency Division Multiplexing
          v)   Phase modulation
          vi)   DSBSC
          vii)   Sideband splatter in amplitude modulation

Q.2	**(a)**	Why pre-emphasis and de-emphasis are used in FM transmitter and receiver?	**03**
	(b)	Draw and explain the basic block diagram of communication system.	**04**
	(c)	A modulating signal 10sin (2π*500t) is used to amplitude modulates a carrier of 50sin (2π*100000t). Find i) modulation index, ii) sideband frequencies, iii) amplitude of both side bands, iv) Total Bandwidth, v) Total power delivered to load of 600Ω, vi) power in carrier signal, vii) power in one sideband.	**07**

OR

	(c)	Explain amplitude modulation with its mathematical expression and frequency spectrum. Draw its waveforms for under, perfect and over modulation.	**07**

Q.3	**(a)**	Discuss the advantages and disadvantages of Frequency Modulation over Amplitude Modulation.	**03**
	(b)	Amplitude Modulated wave has maximum and minimum amplitudes are measured as 7.2 V and 1.8 V respectively. Calculate its modulation index and transmission efficiency.	**04**

(c) List the methods used to generate SSB modulation signal. Discuss any one method in detail. **07**

OR

Q.3 **(a)** Discuss about Carson's rule. **03**

(b) Explain vestigial sideband (VSB). **04**

(c) Explain the indirect method of generating FM signal with block diagram and relevant mathematical expression. **07**

Q.4 **(a)** Differentiate between RZ and NRZ line codes. **03**

(b) Derive the Expression of quantization error. **04**

(c) Differentiate Delta modulation and Adaptive delta modulation. Discuss the condition for avoiding slope overload error? **07**

OR

Q.4 **(a)** Why pulse shaping is required? **03**

(b) Explain in brief Amplitude Shifting Keying (FSK) technique and list the applications of it. **04**

(c) Draw the block diagram of regenerative repeater and briefly explain the function of each block. **07**

Q.5 **(a)** State and prove sampling theorem in time domain. **03**

(b) List the advantages of digital communication over analog communication. **04**

(c) Explain Time Division Multiplexing for PCM in T1 carrier systems. **07**

OR

Q.5 **(a)** Compare Polar, Bipolar signaling with respect to desirable properties of line codes. **03**

(b) Explain companding process in PCM and state the different laws for companding. **04**

(c) Explain the different type of line coding techniques with suitable diagrams. **07**

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