C **Reg. No. :** | | | | | | | | | | | | |

Question Paper Code: R4405

B.E. / B.Tech. DEGREE EXAMINATION, NOV 2025

Fourth Semester

Electronics and Communication Engineering

R21UEC405 - ANALOG AND DIGITAL COMMUNICATION

(Regulations R2021)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions

PART A - (5 x 1 = 5 Marks)

1. The amplitude modulation is the process in which amplitude of the carrier signal changes with respect to _____ signal CO1- U

   (a) Modulating signal (b) Carrier signal

   (c) Suppressed carrier modulating signal (d) None of the above

2. A carrier signal of 100 MHz modulated using a sine wave whose frequency is 75 kHz with a deviation frequency of 50 kHz. What will be the modulation index? CO1- U

   (a) 0.555 (b) 0.667 (c) 0.778 (d) 0.889

3. The SNR in delta modulation is _____ CO1- U

   (a) Fair (b) Poor (c) Good (d) None of the above

4. The maximum bandwidth is occupied by CO1- U

   (a) ASK (b) BPSK (c) FSK (d) none of these

5. The Channel capacity is measured in terms of _____ CO1- U

   (a) 1 bits/channel (b) Number of inputs connected

   (c) Calls per channel (d) Number of output channels connected

PART – B (5 x 3= 15 Marks)

6. A 400 watts carrier is modulated to a depth of 75 percent. Calculate the total power in the modulated wave? CO2- App

7. Distinguish between narrow band and wide band FM CO1- U

8.	Define Inter symbol interference. How it can be reduced?		CO1- U	
9.	Sketch the ASK output for the binary sequence 110101.		CO2- App	
10.	What is the weight of the code? Calculate weight of X=01110101.		CO3- App	

PART – C (5 x 16= 80 Marks)

11.	(a)	Derive the expression of an AM wave, modulation index, total power and Transmission efficiency	CO1- U	(16)
		Or		
	(b)	Derive the expression of SSB-SC AM wave with time domain representation, Frequency spectrum and calculate its Power Savings.	CO1- U	(16)
12.	(a)	A 10 MHz carrier signal is frequency modulated by an analog signal. The maximum frequency deviation is 75 kHz. Determine the modulation index and the approximate transmission bandwidth of the FM signal if the frequency of the modulating signal is (a) 75 kHz (b) 300 kHz (c) 1 kHz Also comment on the type of FM modulation from the obtained results.Give the basic difference between Phase Modulation and Frequency modulation. Explain in detail about Wide Band FM with necessary equations.	CO2-App	(16)
		Or		
	(b)	An FM wave is represented by the voltage equation s(t)=10cos(8*106t+2sin3*104t). Calculate a) Modulating frequency b) Carrier frequency c) Modulation Index d) Frequency deviation e) Frequency deviation sensitivity	CO2-App	(16)
13.	(a)	Explain in detail about the Pulse Code modulation.	CO1- U	(16)
		Or		
	(b)	Explain in detail about the concept of sampling theorem, quantization and how it is applied to the various coding techniques.	CO1- U	(16)

14. (a) Suppose the binary data stream 1110010100 is differentially encoded and then transmitted using any of the line codes. Sketch each of the transmitted data streams, assuming the use of symbol 1 for the reference bit. How is the result affected if symbol 0 is used for reference bit? CO2-App (16)

Or

(b) A data bit sequence consists of the following stream of bits 10111010. Analyze and draw the nature of waveform transmitted by BPSK transmitter and Receiver CO2-App (16)

15. (a) For a discrete memory less source 'S' with 5 symbols s_1,s_2,s_3,s_4,s_5. The probability of occurrence of these symbols are given as $P(s_1)$ = 0.4, $P(s_2)$=0.2, $P(s_3)$=0.2, $P(s_4)$=0.1, $P(s_5)$=0.1. Construct a Huffman code and also calculate its efficiency. CO5-Ana (16)

Or

(b) Consider the generator polynomial for a (7,3) cyclic code defined by $g(p) = P_4+P_3+P_2+1$ CO5-Ana (16)

a) Find the encoding table for the cyclic code.

b) What is the minimum distance dmin of the code.