Reg. No.															

Question Paper Code	14191

M.E. / M.Tech. - DEGREE EXAMINATIONS, NOV / DEC 2025

First Semester

M.E. - Communication Systems

24PCOPC102 - ADVANCED DIGITAL COMMUNICATION TECHNIQUES

Regulations - 2024

Duration: 3 Hours | Max. Marks: 100

PART - A (MCQ) (10 × 1 = 10 Marks)

Answer ALL Questions

		Marks	K – Level	CO
1.	Optimum receivers in AWGN are designed to? (a) Reduce bandwidth (b) Maximize SNR at the decision device (c) Minimize carrier frequency (d) Increase transmitter power	1	K1	CO1
2.	What type of detection is required for M-PSK modulation? (a) Non-coherent detection (b) Coherent detection (c) Envelope detection (d) Energy detection	1	K1	CO1
3.	ISI in band-limited channels occurs due to_____ (a) Perfect filtering (b) Pulse spreading beyond symbol duration (c) Infinite bandwidth (d) Absence of noise	1	K1	CO2
4.	The Viterbi algorithm is mainly used to_____ (a) Control carrier synchronization (b) Perform maximum likelihood sequence detection (c) Generate M-FSK signals (d) Estimate Rayleigh fading parameters	1	K1	CO2
5.	Hamming codes are primarily used to? (a) Increase bandwidth (b) Correct single-bit errors (c) Reduce modulation order (d) Improve antenna gain	1	K1	CO3
6.	Soft-decision decoding in convolutional codes provides better performance because? (a) It ignores noise characteristics (b) It reduces the number of trellis state (c) It uses quantized signal levels instead of probability information (d) It uses more detailed reliability information from the demodulator	1	K1	CO3
7.	OFDM reduces the effect of ISI by_____ (a) Using extremely high transmit power (b) Using closely spaced orthogonal subcarriers (c) Reducing the number of subcarriers (d) Increasing carrier frequency	1	K1	CO4
8.	In single carrier modulation, data symbols are transmitted (a) In parallel over multiple subcarriers (b) Sequentially over one carrier (c) Randomly over different carriers (d) None of the above	1	K1	CO4
9.	The optimum multiuser detector in CDMA aims to_____ (a) Maximize bit error rate (b) Cancel interference from other users (c) Increase transmission delay (d) Reduce processing gain	1	K1	CO5
10.	Successive Interference Cancellation (SIC) works by: (a) Removing all users jointly (b) Decoding all users simultaneously (c) Detecting stronger users first and subtracting their contribution (d) Using orthogonal codes	1	K1	CO6

PART - B (12 × 2 = 24 Marks)

Answer ALL Questions

		Marks	K – Level	CO
11.	What is a coherent receiver? Mention its properties.	2	K2	CO1

12.	Compute the error probability for both coherent and non-coherent signaling.	2	K2	CO1
13.	State the principle and features of Zero forcing Equalizer.	2	K1	CO2
14.	List out the characteristics of bandlimited channels.	2	K1	CO2
15.	Calculate the capacity of AWGN channel with bandwidth 200 Khz and SNR of 15 dB.	2	K2	CO3
16.	Differentiate LBC and Convolutional codes.	2	K2	CO3
17.	What are the advantages and disadvantages of OFDM?	2	K1	CO4
18.	Explain the significance of orthogonality among subcarriers in OFDM.	2	K2	CO4
19.	Peak-to-Average Power Ratio (PAPR) improves efficiency-justify.	2	K2	CO5
20.	Multiuser detection important in CDMA systems – Elucidate.	2	K2	CO5
21.	Describe the role of bit and power allocation in multicarrier modulation.	2	K2	CO1
22.	Prove that spreading in CDMA provides robustness against interference.	2	K2	CO2

PART - C (6 × 11 = 66 Marks)

Answer ALL Questions

23.	a)	With the help of circuit schematic constellation diagram explain the principle of operation of M-ary Quadrature Amplitude modulation system. Also derive and analyze the BER.	11	K4	CO1
		OR			
	b)	Discuss and critically evaluate the influence of the specific fading channel model (Rayleigh vs. Rician) on the design and complexity of a wireless receiver.	11	K4	CO1
24.	a)	Explain the concept of LMS equalizer with a neat diagram. Mention its applications.	11	K2	CO2
		OR			
	b)	Draw a neat schematic of an Adaptive equalizer and explain its principle in detail. Bring out its design detail.	11	K2	CO2
25.	a)	Construct a cyclic (7,4) code using generator polynomial $g(x) = 1 + x + x^3$. Encode the message 1111.	11	K3	CO3
		OR			
	b)	For the given convolutional encoder determine (i) Dimension of the code, (ii) Code rate, iii) Constraint length (iv)Generating sequence and (v) Code the input message sequence m={ 1 1 0 1 1 1 0}.	11	K3	CO3
26.	a)	Illustrate how OFDM concept is emerged in multicarrier modulation technique.	11	K2	CO4
		OR			
	b)	Describe the complete modulation and demodulation process of an OFDM system using block diagrams. Explain the function of each block.	11	K2	CO4
27.	a)	Describe the working of a Direct Sequence CDMA (DS-CDMA) system with a neat block diagram.	11	K2	CO5
		OR			
	b)	With suitable diagrams, explain the principle of successive interference cancellation (SIC). Discuss its advantages, limitations, and practical implementation issues.	11	K2	CO5
28.	a)	Discuss the bit and power allocation strategies in multicarrier modulation.	11	K2	CO6
		OR			
	b)	Discuss the challenges of multiuser detection in CDMA systems and how various detectors attempt to balance performance and computational complexity.	11	K2	CO6