Reg. No.															

Question Paper Code	13609

B.E. / B.Tech. - DEGREE EXAMINATIONS, APRIL / MAY 2025

Fourth Semester

Computer and Communication Engineering

20CCPC401 - ANALOG AND DIGITAL COMMUNICATION

Regulations - 2020

Duration: 3 Hours | Max. Marks: 100

PART - A (MCQ) (10 × 1 = 10 Marks)

Answer ALL Questions

		Marks	K – Level	CO
1.	The main purpose of modulation in communication systems is to (a) Reduce noise (b) Increase bandwidth (c) Reduce antenna size (d) Transmit signals over long distances	1	K1	CO1
2.	In a superheterodyne receiver, the function of the local oscillator is to (a) Amplify the input signal (b) Convert the received signal to an intermediate frequency (c) Demodulate the signal (d) Filter the signal	1	K2	CO1
3.	In angle modulation, the parameter of the carrier wave that is varied is (a) Amplitude (b) Phase or frequency (c) Wavelength (d) Bandwidth	1	K1	CO2
4.	Which of the following blocks is essential for demodulating an FM signal? (a) Product Detector (b) Frequency Discriminator (c) Envelope Detector (d) Balanced Modulator	1	K2	CO2
5.	Which modulation technique uses variable-width pulses to convey information? (a) PAM (b) PWM (c) PPM (d) PCM	1	K1	CO3
6.	In Delta Modulation (DM), slope overload distortion occurs when (a) The sampling rate is too low (b) The step size is too large (c) The message signal changes too rapidly (d) Quantization noise is too high	1	K2	CO3
7.	Binary Frequency Shift Keying uses how many distinct frequencies to represent binary data? (a) One (b) Two (c) Four (d) Infinite	1	K1	CO4
8.	In Differential Phase Shift Keyingthe data is encoded (a) Based on absolute phase of carrier (b) Based on phase difference between successive bits (c) Using amplitude variation (d) Using frequency shift	1	K1	CO4
9.	The measure of uncertainty or average information content of a discrete source is called (a) Channel capacity (b) Mutual information (c) Entropy (d) Information rate	1	K1	CO5
10.	In Frequency Division Multiple Accessusers share the (a) Same frequency band but different time slots (b) Same time slot but different frequencies (c) Different frequency bands simultaneously (d) Same code but different time slots	1	K1	CO6

PART - B (12 × 2 = 24 Marks)

Answer ALL Questions

		Marks	K – Level	CO
11.	Differentiate DSBFC and DSBSC modulation.	2	K2	CO1
12.	What is VSB modulation and where is it typically used?	2	K2	CO1
13.	Define modulation index for both FM and PM. How are they different?	2	K1	CO2
14.	Write down the mathematical expression for an FM wave.	2	K2	CO2
15.	Define quantization and explain its role in PCM systems.	2	K1	CO3
16.	Write the basic principle of Delta Modulation**.**	2	K1	CO3

17.	What is Differential Phase Shift Keying and how does it differ from BPSK?		*2*	*K2*	*CO4*
18.	Recall the term Signal Space Representation in digital modulation.		*2*	*K2*	*CO4*
19.	Define entropy for a discrete memoryless source.		*2*	*K1*	*CO5*
20.	State the purpose of Viterbi decoding in communication systems.		*2*	*K2*	*CO5*
21.	Define Time Division Multiple Access and mention one application.		*2*	*K1*	*CO6*
22.	Discuss the role of Voice over LTE in modern cellular systems.		*2*	*K2*	*CO6*

PART - C (6 × 11 = 66 Marks)

Answer ALL Questions

23.	a)	Explain in detail the need for modulation in communication systems. Discuss with diagrams the principles of Amplitude Modulation (AM) and derive expressions for: a) Modulated wave b) Power relations in AM.	*11*	*K3*	*CO1*
		OR			
	b)	Explain the construction and working of a Tuned Radio Frequency (TRF) receiver. Discuss its limitations compared to the superheterodyne receiver.	*11*	*K3*	*CO1*
24.	a)	Explain the mathematical analysis of Frequency Modulation (FM) and Phase Modulation (PM). Derive expressions for the modulated wave and discuss their differences.	*11*	K3	*CO2*
		OR			
	b)	Explain the purpose and working of pre-emphasis and de-emphasis circuits in FM communication. Why are they necessary for high-quality transmission?	*11*	*K3*	*CO2*
25.	a)	Explain in detail the principle of Pulse Code Modulation**.** Derive the expression for Signal-to-Quantization-Noise Ratio and explain how it is affected by the number of quantization levels.	*11*	*K3*	*CO3*
		OR			
	b)	Compare and contrast the different sampling techniques: a) Impulse Sampling b) Natural Sampling c) Flat-Top Sampling Explain with neat diagrams.	*11*	*K3*	*CO3*
26.	a)	Discuss in detail Quadrature Phase Shift Keying (QPSK) and Quadrature Amplitude Modulation (QAM). Explain their constellation diagrams and compare their bandwidth efficiency and error performance.	*11*	*K3*	*CO4*
		OR			
	b)	Discuss Differential Phase Shift Keying (DPSK) in detail. Explain it's encoding, decoding, and error performance compared to other phase shift keying methods.	*11*	*K3*	*CO4*
27.	a)	State and prove the Source Coding Theorem. Explain its practical significance in data compression.	*11*	*K3*	*CO5*
		OR			
	b)	Describe the working of the Viterbi Algorithm for decoding convolutional codes. Discuss its advantages and limitations in digital communication.	*11*	*K3*	*CO5*
28.	a)	Explain the Cellular Telephony Concept including frequency reuse, cell splitting, and handoff mechanisms. Illustrate with suitable diagrams.	*11*	*K3*	*CO6*
		OR			
	b)	Discuss the architecture and working of Global System for Mobile Communications (GSM) and GPRS. Compare their features in terms of speed, services, and applications.	*11*	*K3*	*CO6*