

Even Semester Examination, 2023–24
B.Tech. – Electronics & Communication Engineering
Digital Communication

Duration: 3:00 hrs**Max Marks: 100**

Note: - Attempt all questions. All Questions carry equal marks. In case of any ambiguity or missing data, the same may be assumed and state the assumption made in the answer.

Q 1.	Answer any four parts of the following. a) What is the difference between baseband and passband signals? Explain in detail. b) In which condition Delta sigma modulation is applicable and why? c) What is the difference between orthonormal and orthogonal signal? Specify the role of gram-Schmidt procedure in digital communication? d) Explain how can you convert a continuous signal into sequence of bits that can be transmitted over a digital communication system? e) Explain the term in brief “synchronous detection”, “envelope detection”, “Coherent detection” and “non-coherent detection”? f) State and prove sampling theorem for band pass signals.	5x4=20
Q 2.	Answer any four parts of the following. a) Explain the process of generation and detection of PWM signal. b) What do you mean by constellation diagram? Arrange the P_e of ASK, BPSK and QPSK in an ascending order. c) Derive the relations between maximum amplitude of the signal, step size, modulating frequency and sampling frequency to avoid slope overload error. Assume the $m(t) = \sin\omega_m t$. d) The number of quantization levels is increased from 4 to 64. Prove that the bandwidth required for the transmission of PCM signal is increased by 03 times. e) In a PCM system, each quantization level is encoded into 6 bits. Calculate the signal to quantization noise ratio in dB. f) Define quantization phenomena in digital communication and derive the relation between Levels and Bits? What is the expression of quantization noise in terms of step size?	5x4=20
Q 3.	Answer any two parts of the following. a) Define the Bandwidth of the PCM system and derive the general equation of SNqR in terms of levels and bits. What is 6dB rule? Is this rule valid for all types of quantizers? Comment. b) A sinusoidal signal of 2 kHz frequency is applied to a delta modulator. The sampling rate and step-size Δ of the delta modulator are 20,000 samples per second and 0.1 V, respectively. What is the maximum amplitude of the sinusoidal signal (in Volts) is to prevent slope overload, c) Explain about inter symbol interference and eye pattern phenomena in digital communication system.	10x2= 20
Q 4.	Answer any two parts of the following. a) Binary data is transmitted using ASK over an AWGN channel at a rate of 2.4 Mbps. The carrier amplitude at the receiver is 2 mV. Noise power spectral density, $N_0/2 = 10^{-15}$ W/Hz. Find the probability of error if the detection is coherent. (Assume the value if any data is missing). b) State and prove Shannon Hartley theorem. Also derive their required relation. c) Explain the operating principle of differential encoding. Write their advantages and disadvantages.	10x2= 20

Q 5.	<p>Answer any two parts of the following.</p> <p>a) Explain the generation and detection of QPSK signal. Justify with mathematical modeling and block diagrams.</p> <p>b) Prove that Probability of error depends on distance between constellation point, Compare with at least two case studies.</p> <p>c) Discuss the operating principle of Information Theory. What do you mean by channel capacity in Information Theory? Explain it with a suitable example.</p>	10x2= 20
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