CBCS SCHEME

USN | | | | | | | | | | 18EC61

Sixth Semester B.E./B.Tech. Degree Examination, Dec.2025/Jan.2026
Digital Communication

Time: 3 hrs. Max. Marks: 100

Note: ***Answer any FIVE full questions, choosing ONE full question from each module.***

Module-1

1 a. Determine pre envelope and complex envelope of $x(t) = A\,\text{rect}(t/\tau)\cos(2\pi f_c t)$. **(06 Marks)**

b. Define Hilbert transform and determine Hilbert transform of x(t) = sin c(t). **(06 Marks)**

c. A binary data sequence is 11101001. Sketch the following line codes :
i) RZ unipolar
ii) RZ Bipolar
iii) Manchester
iv) NRZ polar. **(08 Marks)**

OR

2 a. State and prove Hilbert transform properties. **(07 Marks)**

b. Illustrate the linear modulator scheme for deriving the in phase and quadrature components of the band pass signal. **(08 Marks)**

c. Code the pattern "10100000110000110000000" using HDB3 encoding, B3ZS and AM1 encoding. **(05 Marks)**

Module-2

3 a. Obtain an expression for impulse response of a matched filter. **(07 Marks)**

b. Illustrate maximum likelihood decision rule for signal detection problem. **(07 Marks)**

c. Explain the model of digital communication system. **(06 Marks)**

OR

4 a. Three signals $S_1(t)$, $S_2(t)$ and $S_3(t)$ are shown in Fig.Q 4(a). Applying Gram-Schemidt orthogonalizaiton procedure to obtain orthonormal basis for the signals. Express the signals $S_1(t)$, $S_2(t)$ and $S_3(t)$ in terms of orthonormal basis function.

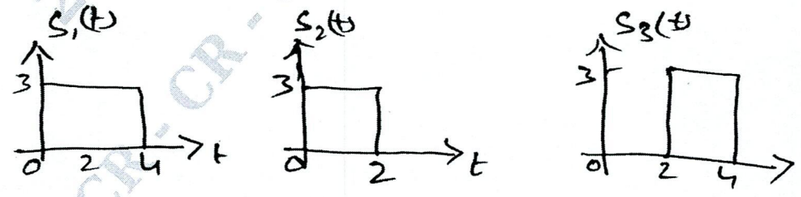

Fig.Q4(a) **(08 Marks)**

b. Show the energy of the signal is equal to squared length of signal vector. **(06 Marks)**

c. Illustrate the operation of correlator receiver. **(06 Marks)**

Module-3

5 a. With neat diagram and expressions, explain generation and coherent detection scheme of M-ary PSK. **(06 Marks)**

b. Explain the signal space representation, generation and coherent detection of binary frequency shift keying modulation. **(10 Marks)**

c. Derive an expression for probability of error of BPSK system. **(04 Marks)**

OR

6 a. Binary data is transmitted over AWGN channel using BFSK at a rate of 1 mbps. It is desired to have average probability of error. Noise PSD is W/Hz. Determine the average carrier power required at receiver input if the detector is of coherent type. **(07 Marks)**

b. Draw the constellation diagram of M = 16–ary QAM. **(03 Marks)**

c. Explain generation and detection of QPSK signal for a given binary sequence 110101. Obtain the QPSK waveform. **(10 Marks)**

Module-4

7 a. What is an ISI? Obtain the expression for output of receiving filter with ISI. **(06 Marks)**

b. The binary sequence 10001101001 is input to the pre coder used to modulate duo binary transmitting filter. Determine pre coded sequence, transmitted amplitude levels, received amplitude levels and decoded sequence. **(08 Marks)**

c. With respect to base band transmission. Explain the following terms with related equations and waveforms.
i) Nyquist conditions for zero ISI
ii) Raised cosine spectrum. **(06 Marks)**

OR

8 a. Draw and explain time domain and frequency domain characteristics of duo binary signals and modified duo binary signals. **(08 Marks)**

b. Explain the probability of error of digital PAM with zero ISI **(06 Marks)**

c. With neat diagram and relevant expression explain the concept of adaptive equalization. **(06 Marks)**

Module-5

9 a. Explain the generation and detection of direct sequence spread spectrum with relevant waveform and expression. **(10 Marks)**

b. With a neat block diagram explain the CDMA system based on IS-95. **(10 Marks)**

OR

10 a. With a neat block diagram, explain Frequency hopped spread spectrum technique. Explain the terms Chip rate, Jamming Margin and Processing gain. **(10 Marks)**

b. Explain the effect of de spreading on narrow band interference on DS-SS systems. A DS-SS systems is designed to have power ratio P_R/P_N at intended receiver 10^{-2}. If the desired $E_b/N_0 = 10$ for acceptable performance. Describe the value of minimum processing gain. **(04 Marks)**

c. List the application of DS-SS and explain any two in detail. **(06 Marks)**

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