

CBCS SCHEME

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15EC61

Sixth Semester B.E. Degree Examination, Dec.2023/Jan.2024 Digital Communication

Time: 3 hrs.

Max. Marks : 80

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

Module-1

- 1 a. What is Hilbert transform? Briefly explain the important properties of Hilbert transform. (04 Marks)
- b. With the help necessary equations and block diagram explain the canonical representation of Band – pass signals. (08 Marks)
- c. Write a short notes on B3ZS signaling. (04 Marks)

OR

- 2 a. For the binary data {0, 1, 1, 0, 1, 0, 0, 1}, draw the polar NRZ unipolar RZ signaling waveforms. (04 Marks)
- b. Derive the expression for the complex low pass representation of band pass systems. (08 Marks)
- c. Define pre-envelope of a real valued signal. Given a band pass signal $s(t)$, sketch the amplitude spectra of signal $s(t)$, pre-envelope and complex envelope. (04 Marks)

Module-2

- 3 a. Explain the geometric representation of signals. Show that energy of the signal is equal to the squared length of the vector representing it. (08 Marks)
- b. Derive the expressions for mean and variance of the correlator outputs. Also show that the correlator outputs are statistically independent. (08 Marks)

OR

- 4 a. Explain the Gram-Schmidt orthogonalization procedure. (06 Marks)
- b. Obtain the maximum likelihood decision rule for the signal detection problem. (10 Marks)

Module-3

- 5 a. What is BPSK? Derive the expression for the probability of error for the BPSK. (06 Marks)
- b. For the binary sequence [0, 1, 1, 0, 1, 0, 0, 0], draw the QPSK waveform. (04 Marks)
- c. With a neat diagram and expressions, explain the BFSK generation and non-coherent detection method. (06 Marks)

OR

- 6 a. Explain the generation and optimum detection of DPSK. (06 Marks)
- b. Explain the M-ary QAM system. (04 Marks)
- c. With a neat diagram, explain the generation and coherent detection of QPSK signals. (06 Marks)

Module-4

- 7 a. With a neat block diagram, explain the digital PAM transmission through band limited baseband channels. Also obtain the expression for inter symbol interference. (06 Marks)
- b. Explain the modified duo-binary signaling scheme, with pre-coding. Illustrate the encoding for the binary sequence "011100101". Assume previous pre-coder outputs as 1. (07 Marks)
- c. With neat diagram, explain the timing features pertaining to eye diagram and its interpretation for baseband binary data transmission system. (03 Marks)

OR

- 8 a. With neat sketches and expressions, explain raised cosine spectrum solution to reduce ISI. (06 Marks)
- b. What is the advantage of controlled ISI partial response signaling scheme? With block diagram, explain the duo-binary encoder with pre-coder. Mention the frequency response, impulse response and its features. (06 Marks)
- c. With neat diagram and relevant expressions, explain the concept of adaptive equalization. (04 Marks)

Module-5

- 9 a. Explain the model of a spread spectrum digital communication system. (06 Marks)
- b. With a neat block diagram, explain the frequency hopped spread spectrum. (06 Marks)
- c. Explain the effect of de-spreading on a narrow band interference. (04 Marks)

OR

- 10 a. Explain the generation and demodulation of DS spread spectrum signal. (06 Marks)
- b. With a neat block diagram, explain the operation of CDMA based on IS – 95. (06 Marks)
- c. Explain the low-delectability signal transmission and wireless LANS applications of DSSS. (04 Marks)
