

# CBCS SCHEME

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18EC61

## Sixth Semester B.E. Degree Examination, June/July 2024 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. Define Hilbert transform, list the properties and applications of Hilbert transform. (06 Marks)
- b. Define pre-envelope of real valued signal. Given a band pass signal statement, sketch the amplitude spectra of signal statement, pre-envelope statement and complex envelope  $\tilde{s}(t)$ . (06 Marks)
- c. Explain the time domain procedure for complex presentation of bandpass signals and system. (08 Marks)

OR

- 2 a. Obtain the canonical representation of band pass signals. (07 Marks)
- b. What is line coding? For the binary stream 0110011 sketch the following line codes :
  - i) unipolar NRz
  - ii) polar MRz
  - iii) unipolar Rz
  - iv) bipolar Rz
  - v) Manchester.(06 Marks)
- c. Derive the expression for complex low pass representation of band pass systems. (07 Marks)

### Module-2

- 3 a. Explain the geometric representation of signals. Show that energy of signal is equal to the squared length of the vector representing it. (07 Marks)
- b. Explain with a neat diagram and necessary equations the matched filter receiver. (07 Marks)
- c. Explain the operation of correlation receiver with relevant diagrams. (06 Marks)

OR

- 4 a. Derive the expression for mean and variance of the correlator outputs. Also show that the correlator outputs are statistically independent. (10 Marks)
- b. i) Using the Gram-Schmidt orthogonalization procedure, find a set of orthogonal basis functions to represent the three signals  $S_1(t)$ ,  $S_2(t)$  and  $S_3(t)$  as shown in Fig.Q4(b)(i)
- ii) Express each of these signals in terms of set of basis functions found on part(i).

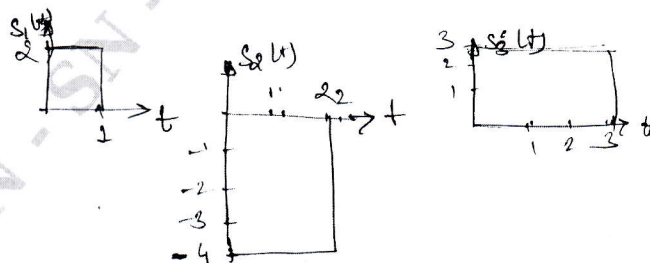


Fig.Q4(b)(i)

(10 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.  
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

**Module-3**

- 5 a. Explain BPSK system with the help of transmitter and receiver. Also derive the expression for probability of error of binary PSK. (10 Marks)  
 b. Explain with a neat block diagram generation and detection QPSK signals. (06 Marks)  
 c. Draw the signal-space diagram of M-ary QAM for  $M = 16$ . (04 Marks)

**OR**

- 6 a. Explain binary FSK. With a neat block diagram, describe a scheme for generating FSK signals. (10 Marks)  
 b. Explain with a neat diagram, generation and detection of DPSK signal. (10 Marks)

**Module-4**

- 7 a. What is ISI? Obtain the expression of output of a filter with inter-symbol interference. (08 Marks)  
 b. What are adaptive equalizers? Explain linear adaptive equalizer based on MSE criterion. (08 Marks)  
 c. Write a note on eye diagram. (04 Marks)

**OR**

- 8 a. Explain the design of band limited signals with controlled ISI. (10 Marks)  
 b. With a neat diagram, explain the concept of linear traversal filter. (06 Marks)  
 c. For the binary data sequence  $\{d_n\}$  given as 111010010001101 determine the precoded sequence  $\{i_n\}$ , the transmitted sequence  $\{a_n\}$ , the received sequence  $\{b_n\}$  and decoded sequence  $\{d_n\}$ . (04 Marks)

**Module-5**

- 9 a. Explain the generation and demodulation of DS spread spectrum signal. (08 Marks)  
 b. Explain with a neat block diagram, FH spread spectrum system. (06 Marks)  
 c. Mention the applications of DSSS and explain any one in detail. (06 Marks)

**OR**

- 10 a. With a neat diagram, explain the generation of PN sequence and state properties of ML sequences. (08 Marks)  
 b. Explain with a neat block diagram IS = 95 forward link. (07 Marks)  
 c. Explain the effect of despreading on narrow band interference in DSSS system. (05 Marks)

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