CBCS SCHEME

USN | | | | | | | | | | |

15EC61

Sixth Semester B.E. Degree Examination, Jan./Feb. 2021

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. With neat diagram, explain Canonical representation of Band – pass signal. **(10 Marks)**

b. Obtain Hilbert transform of the following :

i) $x(t) = \cos 2\pi f_c t + \sin 2\pi f_c t$ ii) $x(t) = e^{-j2\pi f_c t}$ iii) $x(t) = \delta(t)$. **(06 Marks)**

OR

2 a. Explain the complex representation of band pass signals and systems. **(07 Marks)**

b. Given the data stream 1011100101. Sketch the pulses for each of the following line code :

i) Unipolar RZ ii) Bipolar NRZ iii) Manchester code

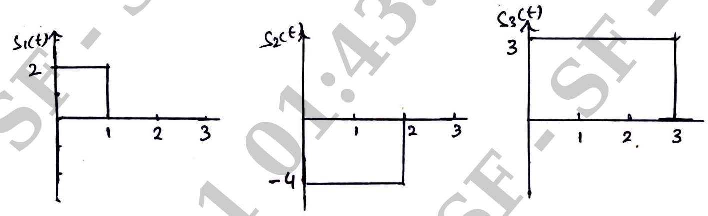
iv) Polar quarternary (Natural code). **(04 Marks)**

c. Write a short note on HDB3 signaling. **(05 Marks)**

Module-2

3 a. Using the Gram – Schmidt Orthogonalization procedure, find a set of Orthonormal basis functions to represent the three signals $S_1(t)$, $S_2(t)$ and $S_3(t)$, shown in Fig. Q3(a). **(10 Marks)**

Fig. Q3(a)



b. Explain the matched filter receiver with mathematical expression. **(06 Marks)**

OR

4 a. Explain the Geometric representation of signals. Illustrate the geometric interpretation of signals for the case of 2 – dimensional signal space with 3 signals $S_1(3, 1)$, $S_2(1, 2)$, $S_3(2,3)$. **(07 Marks)**

b. Obtain the decision rule for ML decoding and explain Correlation receiver. **(09 Marks)**

Module-3

5 a. With a block diagram of QPSK transmitter and receiver, explain generation and demodulation of a QPSK wave. **(08 Marks)**

b. Obtain the expression for probability of error of BPSK. **(08 Marks)**

OR

6 a. With a neat diagram, explain the DPSK transmitter and receiver. **(07 Marks)**

b. Describe briefly M – ary QAM. Obtain the constellation of QAM for M = 4 and draw the signal space diagram. **(06 Marks)**

c. Draw the QPSK waveform for the sequence 0 1 1 0 1 0 0 0 showing in – phase and Quadrature components. **(03 Marks)**

Module-4

7 a. Explain the Nyquist criterion for distortion less base band binary transmission and obtain the ideal solution for zero ISI. **(08 Marks)**

b. What is Linear equalizer? With a neat diagram, explain the concept of equalization using a linear transversal filter. **(08 Marks)**

OR

8 a. With a neat block diagram, explain the digital PAM transmission through band limited base band channels and obtain the expression for ISI. **(06 Marks)**

b. What is Eye pattern? Explain with diagram, for binary and quaternary PAM and effect of ISI on eye opening. **(05 Marks)**

c. The binary sequence 1 1 1 0 1 0 0 1 0 0 0 1 1 0 1 is the input to the precoder. Obtain the precoded sequence, transmitted sequence , the received sequence and the decoded sequence. **(05 Marks)**

Module-5

9 a. With a neat block diagram, explain the concept of Frequency Hopped Spread Spectrum. **(07 Marks)**

b. Explain the effect of dispreading on a Narrow band interference with necessary diagram. **(04 Marks)**

c. Find the output sequence of the shift register shown in Fig. Q9(c). The initial state of the register is 1 1 1. Demonstrate the balance property and run property of a PN sequence. Also sketch the autocorrelation function. **(05 Marks)**

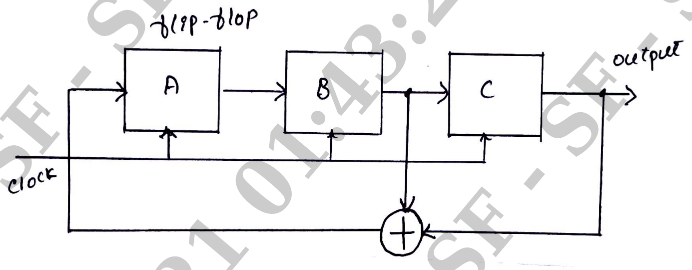


Fig. Q9(c)

OR

10 a. Explain the generation of Direct Sequence Spread Spectrum (DSSS) signal with relevant waveforms and spectrum. **(06 Marks)**

b. With a neat block diagram, explain the CDMA System based on IS – 95. **(07 Marks)**

c. Write a short note on Applications of Direct Sequence Spread Spectrum in CDMA. **(03 Marks)**

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