

CBCS SCHEME

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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

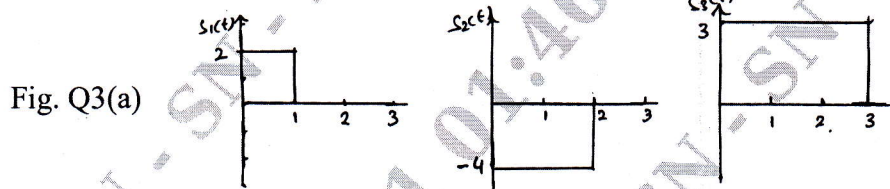
- 1 a. With neat diagram, explain Canonical representation of Band – pass signal. (10 Marks)
b. Obtain Hilbert transform of the following :
i) $x(t) = \cos 2\pi f_c t + \sin 2\pi f_c t$ ii) $x(t) = e^{-j2\pi f_c t}$ iii) $x(t) = \delta(t)$. (06 Marks)

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 quaternary (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)



- 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

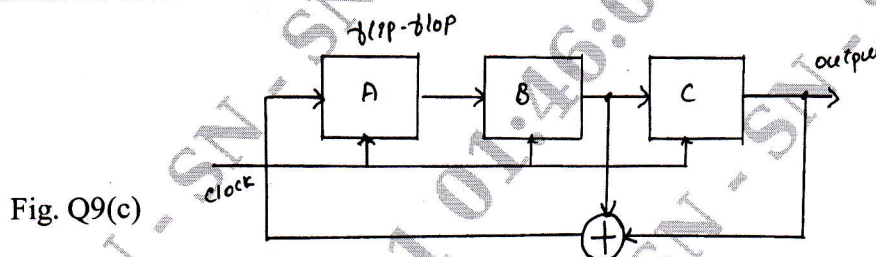
- 7 a. Explain the Nyquist criterion for distortion less base band binary transmission and obtain the ideal solution for zero ISI. (08 Marks)
- b. What is Linear equalizer? With a neat diagram, explain the concept of equalization using a linear transversal filter. (08 Marks)

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)

**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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