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By K B Hemanth Raj

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VI Sem EC

CBCS SCHEME

USN | | | | | | | | | | 15EC61

Sixth Semester B.E. Degree Examination, June/July 2019

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. Determine the Hilbert transform of the signal g(t) = sin c(t). **(04 Marks)**

b. Determine the pre-envelope and complex envelope of the signal shown in Fig.Q1(b). **(06 Marks)**

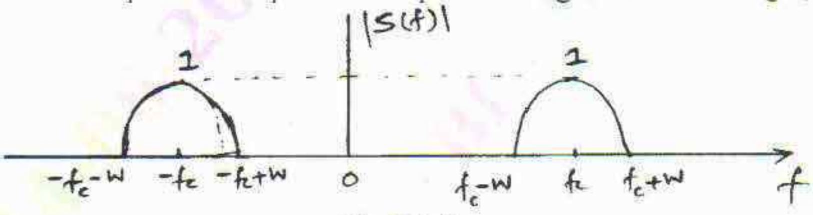

Fig.Q1(b)

c. Explain the time–domain procedure for the complex representation of band pass signals and systems. **(06 Marks)**

OR

2 a. For a binary sequence 0100000001011 construct i) RZBipolar format ii) Manchester format iii) B3Zs format iv) B6ZS format v) HDB3 format.
Also mention the application of B3ZS and B6Zs formats. **(07 Marks)**

b. Draw the power spectra of : i) RZAMI signal ii) NRZ polar signal. **(03 Marks)**

c. Consider a bandpass signal S(t) which is represented in terms of in-phase and quadrature components. Suggest a suitable scheme for :
i) extracting the in-phase and quadrature components from the band pass signal
ii) reconstructing the band pass signal from in-phase and quadrature components. **(06 Marks)**

Module-2

3 a. For the signals $s_1(t)$, $s_2(t)$, $s_3(t)$ and $s_4(t)$ shown in Fig.3(a), find a set of orthonormal basis functions using gram–Schmidt orthogonalization procedure. **(09 Marks)**

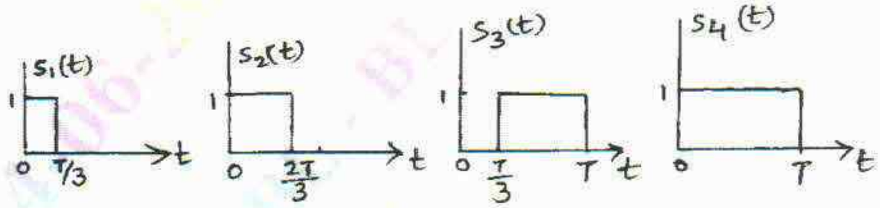

Fig.Q3(a)

b. Explain with neat diagram and necessary equations the matched filter receiver. **(07 Marks)**

OR

4 a. Obtain the decision rule for maximum likelihood decoding and explain the correlation receiver. **(08 Marks)**

b. Show that for a noisy input, the mean value of the j^{th} correlator output X_j depends only on S_{ij} and all the correlators outputs X_j, j = 1, 2, - - - - , N, have a variance equal to the PSD No/2 of the additive noise process w(t). **(08 Marks)**

Module-3

5 a. Sketch the QPSK wave form for the sequence 01101000. (06 Marks)

b. Obtain the expression for average probability of symbol error for BPSK using coherent detection. (06 Marks)

c. Obtain the constcleation of QAM for M = 16 and draw the signal space diagram. (04 Marks)

OR

6 a. Explain the generation and coherent detection of BFSK system. (06 Marks)

b. The binary sequence 1100100010 is applied to the DPSK transmitter

i) Sketch the resulting wave from at the transmitter output.

ii) Applying this waveform to the DPSK receiver, show that in the absence of noise, the original binary sequence is reconstructed at the receiver output. (06 Marks)

c. An FSK system transmits binary data at the rate of 2×10^6 bps. During the source of transmission, AWGN of zero mean and two sided PSD 10^{-20}Watts/Hz is added to the signal. The amplitude of the received sinusoidal wave for digit 1 or 0 is $1\mu v$. Determine the average probability of symbol error assuming non-coherent detection. (04 Marks)

Module-4

7 a. Explain the following terms with related equations and diagram with respect to base band transmission.

i) ISI and Nyquist condition for zero ISI

ii) Duobinary signal pulse

iii) Modified duobinary signal pulse

iv) Partial response signals

v) Raised cosine spectrum. (10 Marks)

b. Explain the need for precoder in a duobinary signaling. The binary sequence 111010010001101 is the input to the precoder whose output is used to modulate a duobinary transmitting filter. Obtain the precoded sequence, transmitted amplitude levels, the received signal levels and the decoded sequence. (06 Marks)

OR

8 a. With a neat diagram, explain the concept of linear traversal filter. (06 Marks)

b. Consider a channel distorted pulse x(t), at the input to the equalizer, given by $x(t) = \frac{1}{1+\left(\frac{2t}{T}\right)^2}$ where 1/T is the symbol rate. The pulse is sampled at the rate 2/T and equalized by a zero-forcing equalizer. Determine the coefficients of a five-tap zero-forcing equalizer. (06 Marks)

c. Write a note on eye diagram. (04 Marks)

Module-5

9 a. With a neat diagram explain the generation of PN sequences and state its properties. (06 Marks)

b. A DS spread–spectrum signal is designed so that the power ratio P_R/P_N at the intended receiver is 10^{-2}. If the desired $E_b/N_0 = 10$ for acceptable performance, determine the minimum value of the processing gain. (04 Marks)

c. Explain with neat block diagram FH spread –spectrum system. (06 Marks

OR

10 a. Explain the generation and demodulation of DS spread spectrum signal. (06 Marks)

b. Write a note on application of spread spectrum in wireless LANs. (04 Marks)

c. With a neat block diagram, explain the IS–95 reverse link. (06 Marks)