CBCS SCHEME

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

18EC61

Sixth Semester B.E. Degree Examination, Feb./Mar. 2022
Digital Communication

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. Use of Error function table is permitted.

Module-1

1 a. Define Hilbert Transform. List the properties of the Hilbert Transform. **(04 Marks)**

b. Obtain the canonical representation of Bandpass signals. **(06 Marks)**

c. What is line coding? For the binary stream {011010}, sketch the following line codes:
(i) Unipolar NRZ (ii) Polar NRZ
(iii) Bipolar NRZ (iv) Manchester **(10 Marks)**

OR

2 a. Define Pre-envelope of a real valued signal. Given a Bandpass signal, g(t), sketch the amplitude spectra of the signal, g(t), pre-envelop $g_+(t)$ and complex envelope $\tilde{g}(t)$. **(08 Marks)**

b. For the AM signal, $s(t) = m(t)\cos(2\pi f_c t + \phi)$. Find the following :
(i) Pre-envelope (ii) Complex envelope (iii) In-phase and Quadrature components
(iv) Natural Envelope. **(08 Marks)**

c. Write a note on HDBN Signalling. **(04 Marks)**

Module-2

3 a. Explain the geometric representation of set of M-energy signals as linear combination of N-orthonormal basis functions. Illustrate for the case N = 2 and M = 3 with necessary diagrams and expressions. **(10 Marks)**

b. Explain the matched filter receiver. Obtain the expression for the impulse response of the matched filter. **(10 Marks)**

OR

4 a. Explain the Gram Schmitt orthogonalization procedure. **(10 Marks)**

b. Three signals $s_1(t)$, $s_2(t)$ and $s_3(t)$ are as shown in Fig.Q4(b). Apply GSOP to obtain an orthonormal basis function. Also give the signal constellation diagram.

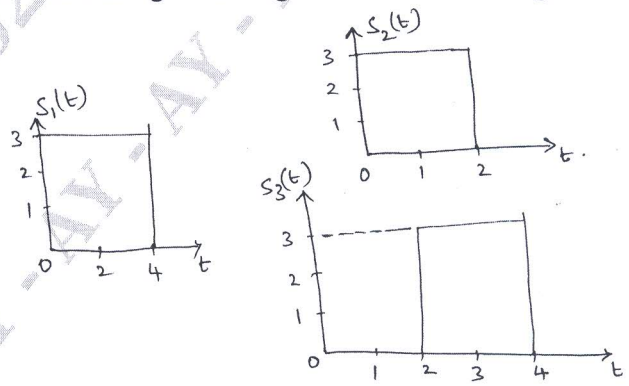

Fig.Q4(b) **(10 Marks)**

Module-3

5 a. With a neat block diagram, explain the generation and detection of BPSK technique. **(10 Marks)**

b. An FSK transmits binary data at the rate of 2.5×10^6 bps. During the course of transmission, AWGN of zero mean and PSD of 10^{-10} Watts/hz is added to the signal. In the absence of noise, amplitude of the received signal for digit 1 or 0 is 1 mV. Determine the average probability of symbol error for the following :

(i) BFSK using coherent detection

(ii) BFSK using non-coherent detection. **(10 Marks)**

OR

6 a. Describe QPSK signal with its signal space diagram? With the help of a block diagram, explain the QPSK generation and detection technique. **(10 Marks)**

b. Binary sequence, d_t {0010011001} is applied to the DPSK transmitter. Obtain differentially encoded sequence, DPSK waveform and in the absence of noise, reconstruct the original binary sequence. Also write the phase shift in the carrier signal for the differentially encoded sequence. **(10 Marks)**

Module-4

7 a. With a neat block diagram of a digital PAM system. Obtain the expression for ISI. **(06 Marks)**

b. State and prove Nyquist condition for zero ISI? **(06 Marks)**

c. For the binary data sequence $[d_K]$ given by {11101001000}. Determine the precoded sequence, transmitted sequence, received sequence and the decoded sequence. **(08 Marks)**

OR

8 a. What is zero forcing equalizer? With a neat block diagram, explain the operation of Linear Transversal filter. **(10 Marks)**

b. For a four level T_x with Duobinary pulses for the given data sequence, d_n{0013120332010}. Determine the Precoded sequence, Transmitted sequence, Received sequence, Decoded sequence with initial bit as 'zero'? **(10 Marks)**

Module-5

9 a. Explain the model of a spread spectrum digital communication system. **(08 Marks)**

b. Design a 4-stage linear feedback shift register. If the initial state is 1111, find the output sequence of the shift register. Also calculate the periodic length, L and processing gain, PG. **(08 Marks)**

c. Define the following :

(i) Processing gain (ii) Jamming margin **(04 Marks)**

OR

10 a. Explain the generation and demodulation of DSSS signals with necessary equations and block diagram. **(08 Marks)**

b. In a DSSS modulation, it is required to have a Jamming Margin > 26 dB. The ratio E_b / N_b is set at 10. Determine the minimum processing gain and the minimum number of stages required to generate the maximum length sequence. **(04 Marks)**

c. What are the advantages and disadvantages of spread spectrum modulation technique? **(08 Marks)**

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