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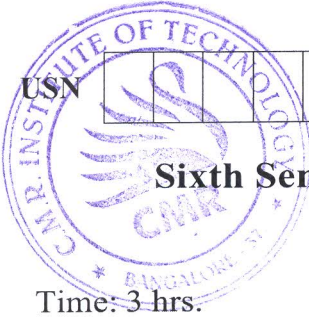### Sixth Semester B.E. Degree Examination, Dec.2023/Jan.2024
Digital Communication

Time: 3 hrs.   Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1   a. Define HT. State and prove the properties. Mention its applications.   **(10 Marks)**
    b. Define signaling format. Sketch the following format using data stream as 111000110:
       (i)   Unipolar RZ   (ii) Unipolar NRZ   (iii) Polar NRZ
       (iv) AMI   (v) Manchester NRZ   **(06 Marks)**
    c. Describe the overview of HDB3 format.   **(04 Marks)**

OR

2   a. Explain the pre-envelope of a band pass signals.   **(07 Marks)**
    b. Explain complex low pass representation of band pass systems.   **(07 Marks)**
    c. Explain canonical representation of band pass signals.   **(06 Marks)**

Module-2

3   a. Explain the Gram-Schmidt orthogonalization procedure.   **(08 Marks)**
    b. Explain the geometric representation of signals and express the energy of signal interms of
       the signal vector.   **(12 Marks)**

OR

4   a. Explain the matched filter receiver with the neat sketches and mathematical equations.
                                                                                    (08 Marks)
    b. Explain conversion of continuous AWGN channel into a vector channel.   **(07 Marks)**
    c. Describe the complex envelope of a band pass signal.   **(05 Marks)**

Module-3

5   a. Define PSK. Derive the probability of error of BPSK.   **(10 Marks)**
    b. Describe the QPSK signal with signal space diagram. With a neat diagram, explain the
       generation and detection of QPSK signal.   **(10 Marks)**

OR

6   a. Obtain the expression probability of symbol error of coherent FSK.   **(10 Marks)**
    b. Sketch the waveform of QPSK using 1100100001.   **(05 Marks)**
    c. Illustrate the operation of DPSK for the binary sequence 10010011.   **(05 Marks)**

Module-4

7   a. With a neat diagram, explain the digital PAM transmission through band limited channels.
                                                                                    (08 Marks)
    b. Explain signal design for band limited signals with controlled ISI (partial response signals).
                                                                                    (12 Marks)

OR

8 a. With a suitable diagram, explain adaptive equalizing filter.   (10 Marks)
   b. Describe signal design for band limited channels with zero ISI.   (10 Marks)

Module-5

9 a. With a neat sketch, explain direct sequence spread spectrum.   (10 Marks)
   b. Briefly explain the four applications of DS spread spectrum signals.   (10 Marks)

OR

10 a. With a suitable diagram, explain forward and reverse link of CDMA based IS-95. (12 Marks)
    b. A DSSS signal is designed so that the power ratio P_R/P_N at the intended receiver is 10^{-2}. If the desired $E_b/N_o = 10$ for acceptable performance, determine the minimum value of its processing gain.   (03 Marks)
    c. Illustrate slow frequency hopping.   (05 Marks)

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