**20EC503**

**Hall Ticket Number:**

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| **III/IV B.Tech (Regular\Supplementary) DEGREE EXAMINATION** | | | |
| **December, 2023** | **Electronics and Communication Engineering** | | |
| **Fifth Semester** | **Digital Communications** | | |
| **Time:** Three Hours | | **Maximum:** 70 Marks | |
| ***Answer question 1 compulsory.*** | | | **(14X1 = 14Marks)** |
| ***Answer one question from each unit.*** | | | **(4X14=56 Marks)** |
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|  |  |  | CO | BL | M | |
| 1 | a) | An audio signal, m(t)= 3cos(2π500t) is quantized using 6 bit PCM. Calculate the number of quantization levels. | CO1 | L3 | 1M | |
|  | b) | Represent the given data stream 10110010 in Bi-polar NRZ format | CO1 | L2 | 1M | |
|  | c) | What are the advantages of Delta Modulation | CO1 | L1 | 1M | |
|  | d) | In a PCM system with uniform quantization, increasing the number of bits from 5 to 9 will increase the signal to quantization noise ratio for a sinusoidal input by a factor of \_\_\_\_\_\_\_. | CO1 | L3 | 1M | |
|  | e) | Define correlative level coding. | CO2 | L1 | 1M | |
|  | f) | What is ISI and what are the causes of ISI? | CO2 | L1 | 1M | |
|  | g) | Why PSK is always preferable over ASK in coherent detection? | CO3 | L2 | 1M | |
|  | h) | The binary stream 1 1 0 0 1 is to be transmitted using DPSK. If the reference bit is ‘1’, what will be the transmitted phase sequence? | CO3 | L2 | 1M | |
|  | i) | Draw the constellation diagram of BFSK | CO3 | L1 | 1M | |
|  | j) | If the bandwidth required to transmit BPSK signal is 100 KHz, then find the bandwidth required for QPSK. | CO3 | L1 | 1M | |
|  | k) | What is processing gain? | CO4 | L1 | 1M | |
|  | l) | “Sun rises in the east” Find out the amount of information in the quoted statement. | CO4 | L2 | 1M | |
|  | m) | A source emits 3 symbols with probabilities ½, ¼, ¼. Calculate the entropy? | CO4 | L3 | 1M | |
|  | n) | What are the applications of spread spectrum? | CO4 | L1 | 1M | |
| **Unit-I** | | | | | | |
| 2 | a) | Draw the block diagram of PCM system and discuss the function of each block in detail. | CO1 | L2 | | 7M |
|  | b) | A modulating signal is represented as 12sin 6000πt. It is sampled at 20% higher than the Nyquist rate and converted into a discrete signal with 32 representation levels. Compute the following  i) step size, quantization noise power, signal-to-quantization noise ratio, and minimum transmission bandwidth required.  ii) If the number of bits per sample in a PCM system is increased from 5 to 7, what will be the signal-to-quantization noise ratio? | CO1 | L4 | | 7M |
|  |  | **(OR)** |  |  | |  |
| 3 | a) | a) What is the advantage of DPCM system over PCM system? Illustrate the working of DPCM transmitter and receiver with the help of diagram | CO1 | L2 | | 7M |
|  | b) | Why line codes are used in a PCM system. Assume the binary data at the output of the encoder is 110100110. This random binary data sequence is transmitted by using the following line codes. Sketch the corresponding waveforms:  i) unipolar NRZ ii) unipolar RZ iii) Bipolar NRZ iv) Manchester code | CO1 | L3 | | 7M |
| **Unit-II** | | | | | | |
| 4 | a) | What is Matched filter? Discuss the properties of matched filter | CO2 | L2 | | 7M |
| **P.T.O**  **20EC503** | | | | | | |
|  | b) | For input binary data 1011101 obtain the output of duo binary encoder and also the output of decoder | CO2 | L3 | | 7M |
| **(OR)** | | | | | | |
| 5 | a) | Explain the Gram-Schmidt Orthogonalization procedure. | CO2 | L3 | | 7M |
|  | b) | Explain the principle and operation of correlative coding | CO2 | L2 | | 7M |
| **Unit-III** | | | | | | |
| 6 | a) | A message signal is converted into a digital signal and is superimposed onto a carrier by altering the frequency in two levels. Develop a model that can able to generate the resultant signal and analyze it mathematically with suitable waveforms | CO3 | L6 | | 7M |
|  | b) | Assume that 4800 bits/sec random data are sent over band pass channel by using the following schemes: i) BASK ii) BFSK iii) BPSK iv)QPSK  Determine the Transmission bandwidth | CO3 | L4 | | 7M |
| **(OR)** | | | | | | |
| 7 | a) | Compare ASK, FSK and PSK. | CO3 | L2 | | 7M |
|  | b) | Consider the following system shown in figure. Construct the truth table and constellation diagram. The output s(t) is which signal and why | CO3 | L4 | | 7M |
| **Unit-IV** | | | | | | |
| 8 | a) | Analyse the generation of pseudo noise sequence by using four-bit shift registers. | CO4 | L4 | | 7M |
|  | b) | Discuss the frequency hopping spread spectrum with the help of neat diagrams. | CO4 | L3 | | 7M |
| **(OR)** | | | | | | |
| 9 | a) | One of the five possible messages Q1 , Q2 , Q3 , Q4 ,and Q5  having probabilities ,, ,  and  respectively, is transmitted. Calculate the average information and also calculate the information rate if r=1000 messages per second. | CO4 | L3 | | 7M |
|  | b) | Consider an alphabet of a discrete memory less source having five different source  symbols with their respective probabilities as 0.1, 0.2, 0.4, 0.1 and 0.2. Apply Huffman coding algorithm for the symbols and find its efficiency. | CO4 | L4 | | 7M |

