ADICHUNCHANAGIRI UNIVERSITY

**18EC52**

**Fifth Semester BE Degree Examination March 2021**

**(CBCS Scheme)**

Time: 3 Hours Max Marks: 100 Marks

**Sub: DIGITAL COMMUNICATION**

**Instructions:** 1. Answer five full questions

2. Choose one full question from each module

3. Your answer should be specific to the questions asked

4. Write the same question numbers as they appear in this question paper

5. Write Legibly.

**Module -1**

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| 1 | a | With neat block diagram, explain pulse code modulation and demodulation system | 8 | M |
|  | b | A PCM system uses a uniform quantizer followed by a 7-bit binary encoder. The bit rate of the system is 50 Mbits/sec.  i. What is the maximum message bandwidth for which the system operates satisfactorily?  ii. Determine output signal-to-quantization noise ratio when a full load sinusoidal modulating wave of frequency 1MHz is applied to the input signal. | 6 | M |
|  | c | What is slope overload distortion and granular noise in delta modulation and how can it be reduced? | 6 | M |
|  | Or | | | |
| 2 | a | Explain the principle of quantization and obtain the expression for the signal to quantization noise for the case of a uniform quantizer. | 8 | M |
|  | b | Determine the power spectral density for NRZ bipolar data formats. Assume that 1s and 0s in the input binary data occur with equal probability. | 6 | M |
|  | c | Explain HDB3 Signaling . Sketch HDB3 Signaling format for the binary stream 1100001000000000. | 6 | M |

**Module -2**

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| 3 | a | Explain Gram-Schmidt Orthogonalization procedure. | 7 | M |
|  | b | Consider the four signals s1(t), s2(t), s3(t) and s4(t) as shown in the figure. Use Gram-Schmidt Orthogonalization Procedure to find the orthonormal basis for this set of signals. Also express the signals in terms of the basis functions | 7 | M |
|  | c | Explain the matched filter receiver with the relevant mathematically  theory | 6 | M |
|  | Or | | | |
| 4 | a | Briefly describe the conversion of continuous AWGN channel in to a vector channel. | 6 | M |
|  | b | Explain correlation receiver | 7 | M |
|  | c | Explain the geometric representation of signals. Show that energy of the signal is equal to the squared length of the vector representing it | 7 | M |

**Module -3**

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| 5 | a | With a block diagram, explain coherent QPSK transmitter and receiver and derive the expression for probability of error | 8 | M |
|  | b | A set of binary data is sent at the rate of Rb = 100 kbps over a channel with 60 dB transmission loss and power spectral density η=10-12 W/Hz at the receiver. Determine the transmitted power for a bit error probability Pe = 10-3 for the following modulation schemes.  i)FSK  ii)PSK  iii)DPSK  iv)16 QAM | 8 | M |
|  | c | For the binary sequence given by 10010011, illustrate the operation of DPSK | 4 | M |
|  | Or | | | |
| 6 | a | Explain the generation and detection of binary PSK. Also derive the probability of error for PSK | 8 | M |
|  | b | Describe with diagrams the generation and detection of non-coherent BFSK. | 7 | M |
|  | c | Differentiate coherent and non-coherent detection | 5 | M |

**Module -4**

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| 7 | a | With neat diagram, explain the timing features pertaining to eye diagram and it interpretation for baseband binary data transmission system | 10 | M |
|  | b | With a neat block diagram, explain the digital PAM transmission through band limited baseband channels Also obtain the expression for inter symbol interference | 10 | M |
|  | Or | | | |
| 8 | a | State Nyquist‟s pulse shape criterion for zero ISI and explain | 7 | M |
|  | b | Explain the following terms with related diagrams respect to base band transmission,  i) Partial response signals  ii) Modified duo binary Signal | 8 | M |
|  | c | With neat sketches and expressions, explain raised cosine spectrum solution | 5 | M |

**Module -5**

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| 9 | a | Explain the working of Direct Sequence Spread Spectrum transmitter and receiver with neat diagram, waveform and expressions. | | 10 | M |
|  | b | A slow frequency Hopped/MFSK system has the following parameters  i) The number of bits/MFSK symbol =4  ii) The number of MFSK symbols per hop – 5  Calculate the processing gain of the system in decibels | | 4 | M |
|  | c | List and briefly explain any 3 applications of direct sequence spread spectrum | | 6 | M |
|  | Or | | | | |
| 10 | a | With a neat block diagram, explain frequency Hopped spread spectrum technique. Explain the terms chip rate, Jamming Margin and  Processing gain. | 8 | | M |
|  | b | 4-Stage linear feedback shift register, if the initial stage is 1111, find the output sequence of the shift register | 6 | | M |
|  | c | What are PN sequences, Explain using relevant example why it is  called maximum length sequence and list out its properties | 6 | | M |