**Module -1**

|  |  |
| --- | --- |
| 1 | Explain the advantages of digital communication systems over analog systems |
| 2 | With neat block diagram, explain pulse code modulation and demodulation system |
| 3 | 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. |
| 4 | What is slope overload distortion and granular noise in delta modulation and how can it be reduced? |
| 5 | Explain the principle of quantization and obtain the expression for the signal to quantization noise for the case of a uniform quantizer. |
| 7 | Determine the power spectral density for NRZ bipolar data formats. Assume that 1s and 0s in the input binary data occur with equal probability. |
| 8 | Explain HDB3 Signaling .Sketch HDB3 Signaling format for the binary stream 1100001000000000. |
| 9 | For the given data stream 11011100. Sketch the line code Polar NRZ im Unipolar RZiv) Bipolar NRZ |
| 10 | For the given data stream 11011100. Sketch the line code   1. Unipolar NRZ 2. Polar NRZ 3. Unipolar RZ 4. Bipolar NRZ |
| 11 | Write a note on HDB3 signaling |
| 12 | Compare the performance of DM with ADM |
| 13 | Explain the techniques: Quantization and encoding in PCM system |
| 14 | Draw the block diagram of DPCM systems and explain its operation |
| 15 | Draw the block diagram of a ADM system? Explain each block |
| 16 | What are the noises in PCM? Derive an expression for quantization in noise in PCM |
| 17 | Describe the µ-Law and A-Law in PCM |
| 18 | Consider a DM system designed to accommodate analog message signals limited to a bandwidth w=5KHz. A sinusoidal test signal of amplitude A=1 volt and frequency fm=1KHz is applied to the system. The sampling rate of the system is 50KHz.   1. Calculate the step size ∆required to minimize slope overload. 2. Calculate the signal to quantization noise ratio of the system for the specified sinusoidal test signal |
| 19 | Draw the block diagram of M-arry PSK system and explain its operations. |
| 20 | A DM system is tested with a 10 KHz sinusoidal signal with 1 V p-p at the input. It is sampled at 10 times the nyquist rate. What is the step size required to prevent sloapoverload? |
| 21 | What are the drawbacks of DM? Explain in detail How can you overcome by using ADM. |
| 22 | A telephone signal band limited to 4 KHZ is to be transmitted by PCM. The signal to quantization noise power ratio is to be at least 40db. Find the number of levels in to which the signal has to be. Also find the transmission Band Width. |
| 23 | What is the Significance of Companding? Explain Companding in PCM systems |

**Module -2**

|  |  |
| --- | --- |
| 1 | Explain Gram-Schmidt Orthogonalization procedure. |
| 2 | 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 |
| 3 | Explain the matched filter receiver with the relevant mathematically  theory |
| 4 | Briefly describe the conversion of continuous AWGN channel in to a vector channel. |
| 5 | Explain correlation receiver |
| 6 | Explain the geometric representation of signals. Show that energy of the signal is equal to the squared length of the vector representing it |
| 7 | Obtain the decision rule for maximum likelihood decoding and explain the correlation receiver |
| 8 | Explain the correlation receiver using product integrator and matched filter |
| 9 | Derive the expressions for mean and variance of the correlator outputs. Also show that the correlator outputs are statistically independent. |
| 10 | Obtain the decision rule for maximum likelihood decoding and explain the correlation receiver |
| 11 | Apply Gram Schmidt procedure to obtain an orthonormal basis for the signals. Express signals s1(t), s2(t) and s3(t) in terms of in terms of orthonormal basis functions |

**Module -3**

|  |  |
| --- | --- |
| 1 | With a block diagram, explain coherent QPSK transmitter and receiver and derive the expression for probability of error |
| 2 | 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 |
| 3 | For the binary sequence given by 10010011, illustrate the operation of DPSK |
|  |
| 4 | Explain the generation and detection of binary PSK. Also derive the probability of error for PSK |
| 5 | Describe with diagrams the generation and detection of non-coherent BFSK. |
| 6 | Differentiate coherent and non-coherent detection |
| 7 | With block diagram explain generation and detection of DPSK. |
| 8 | With necessary diagrams, explain the generation and reception of BPSK signal |
| 9 | Given the binary data 10010011, draw the BPSK and DPSK waveforms. |
| 10 | Derive the expression for error probability of BFSK |
| 11 | With block diagram explain generation and detection of DPSK. |
| 12 | For the binary sequence given by 10010011, illustrate the operation of DPSK |
| 13 | Determine the bandwidth required for M-ary FSK. Draw the geometrical representation of M-ary FSK signal. |
| 14 | Explain the concept of M-ary Keying in detail |
| 15 | Explain the advantages of digital communication systems over analog systems |
| 16 | For the binary input pattern 1010100110, draw the waveforms for i) ASK, ii) FSK, and iii) PSK. |
| 17 | Given the binary data 100100 l l, draw the BPSK and DPSK waveforms. |

**Module -4**

|  |  |
| --- | --- |
| 1 | With neat diagram, explain the timing features pertaining to eye diagram and it interpretation for baseband binary data transmission system |
| 2 | With a neat block diagram, explain the digital PAM transmission through band limited baseband channels Also obtain the expression for inter symbol interference |
| 3 | State Nyquist’s pulse shape criterion for zero ISI and explain |
| 4 | Explain the following terms with related diagrams respect to base band transmission,  i) Partial response signals  ii) Modified duo binary Signal |
| 5 | What is ISI? Obtain the expression of output of a filter with intersymbol interference |
| 6 | With neat sketches and expressions, explain raised cosine spectrum solution |
| 7 | Explain the Nyquist criterion for distortionless baseband binary transmission and obtain the ideal solution for zero ISI |
| 8 | Draw and explain the time-domain and frequency domain of duobinary and modified duobinarysignal |

**Module -5**

|  |  |
| --- | --- |
| 1 | Explain the working of Direct Sequence Spread Spectrum transmitter and receiver with neat diagram, waveform and expressions. |
| 2 | 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 |
| 3 | List and briefly explain any 3 applications of direct sequence spread spectrum |
| 5 | With a neat block diagram, explain frequency Hopped spread spectrum technique. Explain the terms chip rate, Jamming Margin and  Processing gain. |
| 6 | 4-Stage linear feedback shift register, if the initial stage is 1111, find the output sequence of the shift register |
| 7 | What are PN sequences, Explain using relevant example why it is  called maximum length sequence and list out its properties |
| 8 | Draw the 4 stage linear feedback shift register with 1st and 4th state is connected to Modulo-2  adder. Output of Modulo-2 is connected to 1ststage input. Find the output PN sequence and  write the autocorrelation function with initial state 1000 |
| 9 | Explain the generation of direct sequence spread spectrum with relevant waveforms |
| 10 | With a neat block diagram. explain the CDMA system based on IS-95. |
| 11 | Write a short note on application of spread spectrum in wireless LAN'S |
| 12 | Explain the model of a spread spectrum digital communication system |
| 13 | Write a note on code division multiple access as an application of direct sequence spread |