EC8395 COMMUNICATION ENGINEERING

IMPORTANT QUESTIONS AND QUESTION BANK

UNIT I ANALOG MODULATION

2-Marks

1. Discover the need modulation in communication systems?
2. Describe AM modulated wave for modulation index=0.5 and is spectra?
3. Can you formulate the theory for modulation index of an AM signal and write its classification?
4. Define Coherent Detection?
5. A carrier is amplitude modulated to a depth of 80%. evaluate the total power in the modulated wave, if the carrier is 10 watts?
6. Develop a modulation scheme for broadcast video transmission?
7. Compare AM with DSB-SC and SSB-SC?
8. Define modulation index of frequency modulation and phase modulation?
9. Show that Armstrong method is superior to reactance modulator?
10. Tell why frequency modulation is more preferred for voice transmission?

Part-B

1. Describe the concepts of AM modulation and derive the equation of an AM wave?
2. Draw the phasor diagram, spectrum and modulated AM wave for various degrees of modulation index?
3. DefineAmplitude modulation and explain its generation and detection with the help of mathematical expressions?
4. Tellhow the outputs of two amplitude modulators are combined to produce a double-sideband suppressed-carrier output?
5. Examine the function of coherent detection and squaring synchronizer with block diagram?
6. Describe a method of generating a single-sideband signal using balanced modulators and phase shifters?
7. Demonstrate how baseband recovery is achieved at the receiving end of the single-sideband communications?
8. Point out the advantages of Vestigial side band (VSB) modulation?
9. Infer the mathematical expression for VSB signal?
10. Interpret the relationship between phase and frequency For an FM modulator with a modulation index mf=1, Vm(t)=Vmsin(2pi*1000t) and an unmodulated carrier Vc(t)=15sin(2pi*500t), calculate number of set of ideband frequencies, Amplitude, Draw the frequency spectrum showing their relative amplitude modulation?

11. Analyse the working principle of FM generation by Armstrong's indirect method?
12. A 25MHz carrier is modulated by a 400Hz audio sine wave. If the carrier voltage is 4V and the maximum frequency deviation is 10kHz & phase deviation is 25radians. Formulate the equation of this modulated wave for FM & PM. If the modulating frequency is now changed to 2kHz, all else remaining constant. Invent a new equation for FM & PM?
13. Give the various parameters of super heterodyne receiver and also explain its working principle with neat block diagram?
14. Evaluate the equation of single tone amplitude modulation. Derive the Fourier transform of the signal and plot the signal in time domain and frequency domain for the modulation index lesser than unity, equal to unity and greater than unity. Also calculate power of each frequency component?
15. Explain Carson's rule to validate the bandwidth occupied by a 3kHz message signal frequency modulated with modulation index = 5?

UNIT-2 PULSE MODULATION

2-Marks

1. Collect four advantages of digital communication system?
2. Interpret the twofold effects of quantization process?
3. Formulate the concept of PCM?
4. Tabulate the advantages of delta modulator?
5. Express the pitch of the voice?
6. Tell why do we need multiplexing technique?
7. Differentiate the two basic multiplexing techniques?
8. Compare synchronous TDM with asynchronous TDM?
9. Explain the basic concept of frequency division multiplexing (FDM)?
10. Discuss the use of guard bands in FDM?

Part-B

1. Discuss an ideal sampling process and derive interpolation formula for reconstructing the original signal from the sequence of samples?
2. Identify What is the main idea of quadrature sampling of band-pass signals? Describe reconstruction of band-pass signal?
3. Analyse the types of quantizer and inspect the mid tread and midrise type characteristics of uniform quantizer with suitable diagram?
4. Describe PCM waveform coder and decoder with neat sketch and list the merits compared with analog coders?

5. Develop the block diagram of Differential Pulse Code Modulation system and elaborate the working principle of DPCM at transmitter and receiver?
6. Discover the expression for step size and signal to noise ratio (SNR) of quantization error in Delta Modulation?
7. Discover how it synthesizes the human voice signal for real time applications?
8. Summarize the types of multiplexing techniques and show the block diagram of multiplexing?
9. Demonstrate the basic concept of FDM multiplexing and Demultiplexing process with necessary diagrams?
10. Evaluate the function of Time Division multiplexing? Assess the importance of synchronizing pulse in TDM?
11. Differentiate synchronous TDM with asynchronous TDM?
12. Evaluate practical aspects of sampling and signal recovery?
13. In what situation multiplexing is used? How could you compare the performance of different multiplexing techniques??
14. Develop the block diagram of Delta Modulator (DM) and Adaptive Delta Modulator (ADM) and explain how the performance of Delta Modulator is improved by making the step size control?
15. Design a Vocoder for real-time synthesis of speech with high quality?

UNIT III DIGITAL MODULATION AND TRANSMISSION

2-Marks

1. Summarize the drawbacks of duo binary System?
2. Experiment the digitally modulated waveforms for the binary data 110101 using PSKFSK?
3. Invent eye pattern and state any 2 applications of eye pattern?
4. Differentiate BPSK and DPSK?
5. Conclude Equalization?
6. Discuss QAM?
7. Describe bit rate and baud rate?
8. Point out four applications of eye pattern?
9. Develop the Nyquist criterion for zero ISI?
10. Express Bandwidth Efficiency?

Part-B

1. If a digital message input data rate is 8Kbps and average energy per bit is 0.01 unit. Solve the bandwidth required for transmission of the message through BPSKQPSK and 16 PSK?
2. Demonstrate the various digital modulation schemes?
3. Discuss the operation of a QPSK modulator with neat diagram. Draw its phasor and constellation diagram?

4. Experiment the transmitter, receiver and signal space diagram of Quadrature Amplitude Modulation?
5. Show the power spectral density and bandwidth of QAM signal with neat diagrams?
6. Describe how Nyquist criterion eliminates interference in the absence of noise for distortion less baseband binary transmission?
7. Describe how eye pattern illustrates the performance of data transmission system with respect to Inter Symbol Interference with neat sketch?
8. Analyze Duo binary signaling scheme with and without precoder and explain?
9. Explain the operation of QPSK transmitter with necessary diagrams?
10. Generalize how ISI occurs in base-band binary data transmission system?
11. Define Binary phase shift keying. Discuss in detail the BPSK transmitter and Receiver and also obtain the minimum double sided Nyquist bandwidth?
12. For a BPSK modulator with a Carrier frequency of 70 MHz and an input bit rate of 10 Mbps, find the maximum and minimum upper and lower side frequencies, draw the output spectrum, identify the minimum Nyquist bandwidth, and calculate the baud (Assume f= 5MHz)?
13. In digital CW communication system, the bit rate of NRZ data streaming 1 Mbps and carrier frequency is 100 MHz.Evaluate the symbol rate of transmission and bandwidth requirement of the channel in the following cases of different techniques used. (i) BPSK system (ii) QPSK system (iii)16ary PSK system?
14. Explain inter symbol interference (ISI) and the Nyquist criterion for minimizing ISI. Elaborate the difficulties in implementing it in a practical system?
15. Design the categorization of equalization. (i) MSE (ii)Using filters?

UNIT-IV INFORMATION THEORY AND CODING

2-Marks

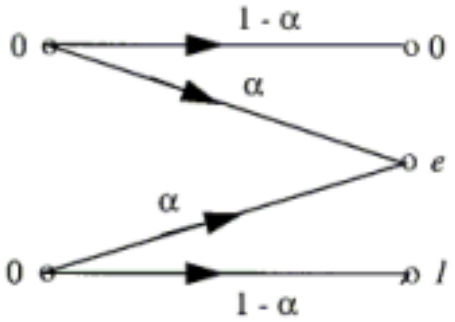
1. Express measure of information?
2. CIdentify the entropy of the system for an event that has six possible outcomes with probabilities 1/2, 1/4, 1/8, 1/16, 1/32?
3. Estimate channel capacity of a discrete memory less channel?
4. Illustrate Viterbi decoding?
5. Discuss the concept of Lempel-Ziv algorithm?
6. Define entropy?

7. Show the operation of convolution coding with an example?
8. Conclude the properties of cyclic codes?
9. Quote the properties of entropy?
10. Summarize the features of Syndrome calculation?

Part-B

1. Express the expression for channel capacity of continuous channel? Discuss about the trade-off between SNR and capacity?
2. Consider a systematic block code whose parity check equation are P1=m1+m2+m4, P2=m1+m3+m4, P3=m1+m2+m3, P4=m2+m3+m4 Where mi is the message digits and Pi are the parity digits (i) Identify the generator matrix and parity check matrix for this code? (ii) Tell how many errors can be detected and corrected?
3. Analyze a syndrome calculator for a (7,4) cyclic code generated by the polynomial $G(x) = X^3 + X + 1$. Test the syndrome for the received vector 1001101?
4. Inquire a cyclic encoder for the same (7,4) cyclic code and obtain the code vector for the message vector 1100?
5. Consider a discrete memoryless source with source alphabets S = S0, S1, S2 and their probabilities P0 = 1/4, P1 = 1/4, P2 =1/4. Examine the entropy of the source H(X) & $H(X^2)$. Also prove that the entropy of the extended source is equal to n times H(X) i.e., $H(X^2) = 2*H(X)$?
6. Explain how Viterbi procedure is used for decoding convolution codes?
7. Summarize the functioning of convolution codes with example?
8. Explain Mutual information and its properties in detail?
9. Five source messages are probable to appear as m1=0.4, m2=0.15, m3=0.15, m4=0.15and m5=0.15. Examine coding efficiency for Shannon Fano coding and Huffman coding?
10. Discuss Error control codes with suitable examples?
11. A source generates five messages m0, m1,m2,m3 and m4 with probabilities 0.55,0.15,0.15,0.10 and 0.05 respectively. The successive messages emitted by the source are statistically independent. Deduce the code words for the messages and efficiency using Shannon Fano Algorithm?
12. The source of information A generates the symbols {A0, A1, A2, A3& A4} with the corresponding probabilities {0.4, 0.3, 0.15, 0.1 and 0.05}. Evaluate Encoding the source symbols using binary encoder and Shannon-Fano encoder and compare its efficiency?

13. The binary erasure channel has two inputs and three outputs. The inputs are labeled 0 and 1, and the outputs are labeled 0, 1 and e. A fraction α of the incoming bits are erased by the channel. Invent the



capacity of the channel?
14. Compose the main idea of Source Coding Theorem with suitable examples.?
15. The generator polynomial of a (15, 11) Hamming code is defined. Develop the encoder and syndrome calculator for this code, using systematic form for the code. Generate the code word for the message vector (1111 1111 111) using the developed encoder. Invent the output of the designed syndrome calculator for the received code word (1111 1111 1111 111)?

UNIT V INFORMATION THEORY AND CODING

2-Marks

1. Show the applications of multiple access techniques in wired communication?
2. Describe FHSS technique?
3. Explain about the working principle of TDMA?
4. Tabulate the properties of M-sequence?
5. List the applications of MLS?
6. Define PN sequence?
7. Discuss about DSSS technique?
8. List the properties of PN sequence?
9. Identify M-sequence?
10. Tell the characteristics of PN sequence?

Part-B

1. Express the Spread spectrum multiple access technique which uses the signals which have a transmission bandwidth of a magnitude greater than the minimum required RF bandwidth?

2. Examine Direct Sequence Spread Spectrum Technique?
3. Quote the advantages and applications of this technique?
4. Explain how TDMA is used in mobile communication?
5. Examine the procedures and parameters necessary for the generation?
6. Illustrate How the interference avoided by using code division multiplexing. Explain?
7. Describe the concept of M-sequence with suitable diagrams?
8. Design a PN sequence generator and evaluate the sequence length for the following (a) 4 shift registers (b) 9 shift registers (c) 23 shift registers?
9. Develop the role of processing gain in CDMA with suitable expressions?
10. Explain the reverse CDMA channel with appropriate diagrams?
11. Generalize the various multiple access schemes which is used in communication with appropriate diagrams?
12. Compare TDMA with FDMA?
13. Write the role of CDMA in wireless communication?
14. Generalize in detail DSSS and FHSS?
15. Tell the procedure to generate PN sequence (ii)Describe the properties of PN sequence?