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**INSTITUTE OF AERONAUTICAL ENGINEERING****(Autonomous)**

Four Year B.Tech V Semester End Examinations (Regular) - November, 2018

Regulation: IARE – R16**DIGITAL COMMUNICATIONS****Time: 3 Hours****(ECE)****Max Marks: 70****Answer ONE Question from each Unit****All Questions Carry Equal Marks****All parts of the question must be answered in one place only****UNIT – I**

1. (a) Define Quantization. What is the need for Companding in PCM system and show that the mean square quantization error in PCM is $\Delta^2/12$. [7M]
(b) Illustrate with waveforms, how PPM is generated using PWM. [7M]
2. (a) Explain the encoding scheme used in DPCM scheme with block diagram description and mathematical modeling. [7M]
(b) What are the noise present in Delta Modulation. Explain the modulation scheme to avoid these noise effects [7M]

UNIT – II

3. (a) Explain the generation of QPSK modulation scheme using constellation diagram. [7M]
(b) Determine the amount of probability of error in matched filter Receiver. [7M]
4. (a) How does the phase of the carrier vary for message $m(n)=\{1,0,1,1,0,1,\dots\}$ in BPSK and DPSK. Draw the block diagram of QPSK receiver. [7M]
(b) A binary data has to be transmitted over a telephone link that has a usable bandwidth of 3000Hz and a maximum achievable signal to noise power of 6dB at its output. [7M]
(i) Determine the maximum signaling rate and probability of error if a coherent ASK is used for transmitting binary data through this channel
(ii) if the data rate is maintained at 300 bits/sec. Find the error probability.

UNIT – III

5. (a) Write down the Unipolar, Polar and Bipolar Line Coding Schemes. [7M]
(b) Explain Eye Diagram with neat diagram and how to draw eye diagram for ASK. [7M]
6. (a) What is pulse shaping? Why it is useful in baseband transmission? Explain in detail. [7M]
(b) A line coding scheme uses Unipolar NRZ encoding with rectangular pulses. Sketch the signal corresponding to the bit sequence "101100". Compute its Power spectral density. [7M]

UNIT – IV

7. (a) Define Mutual Information and Prove the relation $I(X:Y) = H(X) + H(Y) - H(X,Y)$. [7M]
(b) A Gaussian channel has 5MHz bandwidth. Calculate the channel capacity if the signal power to noise spectral density ratio is 10^6 Hz. Discuss the trade off between bandwidth and S/N ratio. [7M]
8. (a) Describe spread spectrum modulation techniques in detail. [7M]
(b) A source emits letters from an alphabet $A = \{a_1, a_2, a_3, a_4, a_5, a_6\}$ with probabilities $P(a_1) = 0.1$, $P(a_2) = 0.4$, $P(a_3) = 0.06$, $P(a_4) = 0.1$, $P(a_5) = 0.04$ and $P(a_6) = 0.3$ [7M]
(i) Find a Huffman code for this source.
(ii) Find the average length of the code.

UNIT – V

9. (a) What is a convolutional code? How it is different from a block code? [7M]
(b) Show that if c_i and c_j are two code vectors in an (n,k) linear block code, then their sum is also a code vector. [7M]
10. (a) Explain how generator and parity matrices are obtained for cyclic codes with an example. [7M]
(b) Decode the Received code word $[10 \ 11 \ 10]$ using viterbi algorithm and find the correct transmitted code word using the given convolutional encoder. [7M]

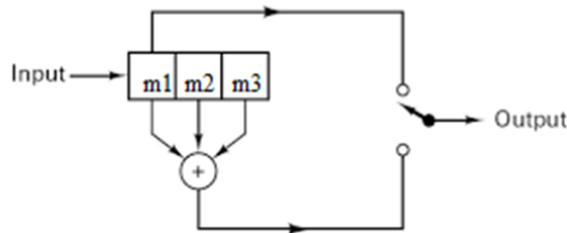


Figure 1