INSTITUTE OF AERONAUTICAL ENGINEERING
(Autonomous)
Four Year B.Tech V Semester End Examinations (Regular) - November, 2019
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) Describe the elements of digital communication systems with neat diagrams. **[7M]**

   (b) Compare digital pulse modulation techniques. List the applications of Pulse Code Modulation. **[7M]**

2. (a) Explain about DPCM technique with block diagram and explain each block. **[7M]**

   (b) The telemetry signals, each of bandwidth 2 kHz, are to be transmitted simultaneously by binary PCM. The maximum tolerable error in sample amplitudes is 0.2% of the peak signal amplitude. The signals must be sampled at least 20% above the Nyquist rate. Find the minimum possible date rate , minimum transmission bandwidth. **[7M]**

UNIT – II

3. (a) Explain Differential Phase Shift Keying (DPSK) modulation and demodulation with an example. **[7M]**

   (b) Compare different types of digital modulation techniques and compare the bandwidth of Binary Phase Shift Keying (BPSK) and Quadrature Phase Shift Keying (QPSK). **[7M]**

4. (a) How does the phase of the carrier vary for message m(n)={1,0,1,1,0,1…} 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.
   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. **[7M]**

UNIT – III

5. (a) Define eye diagram. Draw the eye diagram for PSK. What does the width of the eye define? **[7M]**

   (b) What is meant by cross talk? Explain in detail about the causes for cross talk in base band transmission. **[7M]**

6. (a) What is the need of scrambling. Explain B8ZS and HDB3 techniques in detail. **[7M]**

   (b) A communication channel of bandwidth 75 KHz is required to transmit binary data at a rate of 0.1Mb/s using raised cosine pulses. Determine the roll off factor α. **[7M]**

UNIT – IV

7. (a) Show that the entropy for a discrete source is a maximum when the output symbols are equally probable. **[7M]**

   (b) What is source coding? Explain the lossy source coding with an example. **[7M]**

8. (a) State the Shannon-fano algorithm. Explain Shannon fano coding algorithm with an example. **[7M]**

   (b) Consider a discrete memory less source with source alphabet S={s0, s1, s2, s3, s4} and source statistics {0.7,0.15,0.15, 02, 04}.Calculate the Entropy of source. **[7M]**

UNIT – V

9. (a) Explain how parity checking can be used for error detection or error correction. **[7M]**

   (b) The parity check bits of (8,4) block code are C5=d1+d2+d4 C6=d1+d2+d3 C7=d1+d3+d4 C8=d2+d3+d4 where d1, d2, d3, d4 are message bits. Calculate
   i)Generator matrix
   ii) Parity matrix **[7M]**

10. (a) Demonstrate the Viterbi algorithm for maximum-likelihood decoding of convolutional codes. **[7M]**

   (b) Calculate all code vectors for a (6, 3) linear block code whose generator matrix is given below

$$\begin{bmatrix} 1 & 0 & 0 & 1 & 1 & 0 \\ 0 & 1 & 0 & 0 & 1 & 1 \\ 0 & 0 & 1 & 1 & 0 & 1 \end{bmatrix}$$
[7M]