Hall Ticket No | | | | | | | | | | | Question Paper Code: AEC009

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Four Year B.Tech V Semester End Examinations (Supplementary) - January, 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) State and prove sampling theorem and explain various types of sampling techniques. **[7M]**
   (b) Determine the processing gain of a DPCM system with a first order predictor, if the message signal has a normalized auto-correlation function of 0.8 for a lag of one period, assuming that the predictor is designed to minimize the mean square value of the prediction error. **[7M]**

2. (a) Explain PCM modulation and demodulation system with neat sketches. Describe the quantization noise in PCM. **[7M]**
   (b) Find the maximum amplitude of a 1 KHz sinusoidal signal input to a delta modulator that will prevent slope overload, when the sampling rate is 10,000 samples/sec and the step size is $\Delta = 0.1$ **[7M]**

UNIT – II

3. (a) Explain binary PSK and QPSK with corresponding equations and constellation diagrams. **[7M]**
   (b) For the signals, the given bit rate is 10Kbps. Estimate the bandwidth for Amplitude Shift Keying and Frequency Shift Keying signals. **[7M]**

4. (a) Explain the Non-coherent detection of FSK modulation scheme. **[7M]**
   (b) The bit stream 11011100101 is to be transmitted using DPSK. Determine the encoded sequence and the transmitted phase sequence. **[7M]**

UNIT – III

5. (a) Describe the scrambling coding scheme HDB3 and Sketch the signal corresponding to the bit sequence "01100000000100001100" using rectangular pulses. **[7M]**
   (b) Define roll off factor and describe the Nyquist bandwidth requirement of raised cosine filter for distortion less transmission. **[7M]**

6. (a) What is pulse shaping? Why it is useful in baseband transmission? Explain in detail. **[7M]**
   (b) Draw and explain the block diagram of modified duo-binary signaling scheme consider the binary sequence b_k= "01001101" applied to the input of a precoded modified duo-binary sequence. Determine the sequence a_k at the pre-coder output. **[7M]**

UNIT – IV

7. (a) Calculate the Conditional entropy, mutual information and channel capacity using channel matrix for a noise free channel. **[7M]**

   (b) Illustrate the principle of Frequency hopped spread spectrum. What is the minimum number of bits in a PN sequence if we use FHSS with a channel bandwidth of B =4 KHz and Bss=100 KHz? **[7M]**

8. (a) Describe Code Division Multiple Access(CDMA) in detail. **[7M]**

   (b) Apply Shannon fano coding for the 5 messages with probabilities 0.4, 0.15, 0.15, 0.15, 0.15 and find the coding efficiency. **[7M]**

UNIT – V

9. (a) Define the following terms **[7M]**
   (i) Code word
   (ii) Block length
   (iii) Code rate
   (iv) Channel data rate
   (v) Code vector
   (vi) Hamming distance
   (vii) Minimum distance

   (b) Determine the generator polynomial g(X) for A (7, 4) cyclic code and find the code vector for the following data vector 1010, 1111 and 1000. **[7M]**

10. (a) Explain how generator and parity matrices are obtained for cyclic codes with an example. **[7M]**

    (b) Decode the given sequence 11 01 01 10 01 of a convolutional code with a code rate of r=1/2 and constraint length K=3, using viterbi decoding algorithm. **[7M]**