

B.E. Sem-7 (Rev.) Digital Communication  
(3 Hours)

[Total Marks : 100]

ETRX/EXTC

22/12/08

N.B. : (1) Question No. 1 is **compulsory**.(2) Attempt any **four** questions out of remaining **six** questions.(3) **Figures** to the **right** indicate **full** marks.(4) Assume **suitable** data wherever **necessary**.

1. (a) Define probability. Explain CDF and PDF.  
(b) Explain the Viterbi algorithm of convolutional codes.  
(c) Explain the functioning of a bit synchronizer.  
(d) Distinguish between Matched Filter and Correlator.
  2. (a) MSK is called 'Shaped QPSK'. Justify with relevant expression or waveforms. Discuss the merits and demerits of MSK as compared to QPSK.  
(b) Prove that the error probability of BPSK digital modulation technique is given by  $P_e = \frac{1}{2} \operatorname{erfc} \sqrt{\frac{E_b}{N_0}}$
  3. (a) State and prove Sampling Theorem. 5  
(b) Draw and explain decision feedback equalizer. Show how it overcomes drawbacks of transversal equalizer. 10  
(c) Show that duo-binary signalling suffers from error propagation while precoded duo-binary signalling doesnot. 5
  4. (a) Explain the following in detail with respect to a convolutional code :- 10  
(i) Code tree (ii) Trelli's diagram  
(iii) State diagram (iv) Code rate.  
(b) A message 101101 is to be transmitted in cyclic code with a generator polynomial  $G(D) = D^4 + D^3 + 1$ . Obtain the transmitted code word. How many check bits does the encoded message contain? Draw the encoding arrangement for the same.
  5. (a) Explain slow frequency hopping and fast frequency hopping with the help of waveforms. Compare their merits and demerits. 10  
(b) State the properties of Hamming codes. 10  
The Generator matrix for a (6, 3) block code is given below.  
Find all the code vectors of this code -
- $$G = \begin{bmatrix} 1 & 0 & 0 & : & 0 & 1 & 1 \\ 0 & 1 & 0 & : & 1 & 0 & 1 \\ 0 & 0 & 1 & : & 1 & 1 & 0 \end{bmatrix}$$
6. (a) Draw the transmitter and receiver block diagrams of BFSK and explain the working. 10  
(b) Compare - 10  
(i) BPSK and QPSK  
(ii) Systematic and non-systematic codes.
  7. Write short notes on any **four** :- 20  
(a) ISI and ICI  
(b) Bit synchronizer  
(c) Signal to noise ratio-Bandwidth trade off  
(d) Viterbi decoding  
(e) Huffman coding.