K·T·EXAM.

Con. 2121-05. AM-8422

(REVISED COURSE)

(3 Hours) [Total Marks : 100

N.B. : (1) Question No. **1** is **compulsory**.
(2) Attempt any **four** out of remaining **six** questions.

1. (a) Draw block diagrams of encoder and decoder of DEPSK. The bit stream d(t) is to be transmitted using DEPSK. If d(t) is 001010011010, determine b(t) which is output of encoder, show that decoder recovers d(t). Show that if the fourth bit in b(t) is in error, then fourth and fifth data bits of d(t) will also be in error. 10
(b) What is Intersymbol Interference ? Explain methods to reduce it. 10

2. (a) Prove that distances for QPSK and for BPSK are same. 6
(b) Draw block diagram of BFSK transmitter and receiver. The bit stream 001010011010 is to be transmitted using BFSK. Sketch transmitted wave form. 10
(c) Show that correlative coding introduces controlled amount of ISI. 4

3. (a) Derive expression for the probability of error of the matched filter. Prove that an integrator is a matched filter. 10
(b) Draw and explain decision feedback equalizer. Show how it overcomes drawbacks of transversal equalizer. 10

4. (a) The generator matirx of a linear binary code is— 8

$$G = \begin{bmatrix} 0 & 0 & 1 & 1 & 1 & 0 & 1 \\ 0 & 1 & 0 & 0 & 1 & 1 & 1 \\ 1 & 0 & 0 & 1 & 1 & 1 & 0 \end{bmatrix}$$

(i) Express G in systematic form.
(ii) Determine parity check matrix for the code.
(iii) Construct syndrome table.
(iv) Determine minimum distance of the code.

(b) Construct generator matrix and parity check matrix for a (7, 4) cyclic code with generator polynomial $g(x) = x^3 + x + 1$. Draw its encoder using shift registers. Determine code word if message vector is (0110) using (i) encoder and (ii) generator matrix. 12

5. (a) Generator vectors for a rate 1/3 convolutional encoder are— 10

$g_1 = (100), \quad g_2 = (101), \quad g_3 = 111)$

(i) Draw encoder diagram
(ii) Draw trellis diagram
(iii) Using trellis find code vector if message vector is (101100)
(iv) Using trellis, find message vector if third bit of code vector in Q.5(iii) is in error.

(b) Find the average capacity in bits per second that would be required to transmit a TV signal at the rate of 32 pictures per second. Each picture is made up of 2×10^6 picture elements and 16 different brightness levels. All picture elements are independent and all levels have equal probability of occurence. 5
(c) A given source alphabet consists of 300 words, of which 15 occur with probability 0·06 each and remaining words occur with probability 0·00035 each. If 1000 words are transmitted each second, what is the average rate of information transmission ? 5

6. (a) Consider a systematic bnlock code whose parity check equations are— 10

$P_1 = m_1 + m_2 + m_4$
$P_2 = m_1 + m_3 + m_4$
$P_3 = m_1 + m_2 + m_3$
$P_4 = m_2 + m_3 + m_4$

where m_i are message bits and P_i are check bits.
(i) Find generator matrix and parity check matrix for this code.
(ii) Find how many errors, the code can correct.
(iii) Is the vector 10101010 a code word ?
(iv) is the vector 01011100 a code word ?

(b) Expalin with waveforms, slow frequency hopping and fast frequency hopping. Compare their merits and demerits. 10

7. (a) Draw and explain transmitter and receiver of 16 ary PSK. Derive expression for Band width and distance for it. 10
(b) Compare— 10
(i) BPSK and QPSK
(ii) Systematic and non-systematic codes
(iii) Coherent and non-coherent codes detection.

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