

M 22235

Reg. No. :

VII Semester B.Tech. Degree (Reg./Supple./Improv. – Including Part Time) Examination, November 2012 (2007 Admn. Onwards) PT2K6/2K6 EC 703 : INFORMATION THEORY AND CODING

Time : 3 Hours

Max. Marks: 100

Instruction : Answer all questions.

- 1. a) Define mutual information. List its properties.
 - b) State and prove Kraft's Mc Millan inequality.
 - c) Define primitive polynomials and irreducible polynomials. Give examples.
 - d) Make Mod 7 addition and multiplication table.
 - e) Define hamming weight and hamming distance of (7, 4) linear block code. Define its minimum distance.
 - f) Give the condition to be satisfied by a polynomial to be the generator polynomial of a cyclic code. Hence find the generator polynomial for a (7, 4) cyclic code.
 - g) Explain how a maximum likelihood decoder becomes a minimum distance decoder in a BSC using convolution codes.
 - h) What are Turbo codes ? With block diagram, explain the working of a Turbo encoder. (8×5=40)

P.T.O.

15

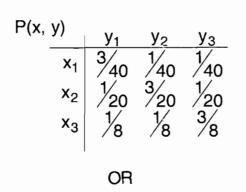
5

8

7

M 22235

a) Consider two sources S₁ and S₂ emits messages x₁, x₂, x₃ and y₁, y₂, y₃ with joint probabilities p(x,y) as given in matrix below. Calculate H(x), H(y) H(x/y), H(y/x) and I(x, y).



- b) i) State and prove maximal property and additive property of entropy.
 - ii) Encode the following source symbols using Shannon Faro code and Huffmann code.

$$X = \{x_1, x_2, x_3, x_4, x_5\}$$

 $p(x) = \{0.2, 0.1, 0.05, 0.05, 0.6\}$

Find efficiency of this code in both methods. Compare performance of the coding methods. 10

- 3. a) i) Construct a table of $GF(2^3)$ based on the primitive polynomial $p(x) = 1 + x + x^{3}$. Determine the order of each element.
 - ii) What is minimal polynomial. Find minimal polynomials of the elements of GF(2³).

OR

- b) i) Show that $x^5 + x^3 + 1$ is irreducible over GF(2). 10
 - ii) Let V be a vector space over a field F. Prove that for any scalar 'a' in F, and any vector v is V,

$$(-a).v = a.(-v) = -(a.v).$$
 5

4. a) Consider (6,3) linear block code generated by

$$\mathbf{G} = \begin{bmatrix} 0 & 1 & 1 & 1 & 0 & 0 \\ 1 & 0 & 1 & 0 & 1 & 0 \\ 1 & 1 & 0 & 0 & 0 & 1 \end{bmatrix}, \text{ then give its}$$

- i) Parity check matrix H
- ii) Encoder diagram
- iii) Standard array
- iv) Decoder block diagram.

OR

b) Describe the characteristics and encoding principle of RS codes. 15

-3-

5. a) Construct rate $\frac{1}{3}$, K=3, convolution encoder.

Given

 $g_1 = [100], g_2 = [101], g_3 = [111]$

Sketch tree diagram and trellis diagram of this encoder. 15

ī

ι

OR

- b) Write notes on the following :
 - i) Golay codes
 - ii) Trellis coded modulation
 - iii) Puncturing of a code.

15

15