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Name..

Reg. No.......................................
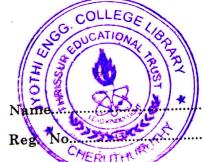
FIFTH SEMESTER B.TECH. (ENGINEERING) DEGREE EXAMINATION, DECEMBER 2007

IT 04 504—INFORMATION THEORY AND CODING

(2004 Admissions)

Time : Three Hours

Maximum : 100 Marks

Answer all questions.

Part A

I. (a) Explain the concept of extension of a discrete source.

(b) State channel coding theorem and explain.

(c) Define Linear block code and explain.

(d) Find the parity polynomial of a (7, 4) cyclic code with generator polynomial $g(X) = 1 + X + X^3$.

(e) Show that the characteristic of a finite field is prime.

(f) Define Binary primitive BCH codes and explain the procedure specified for determining its generator matrix.

(g) What is meant by catastrophic code ? Explain.

(h) Explain about interleaved convolutional code.

$(8 \times 5 = 40 \text{ marks})$

Part B

(7 marks)

II. (a) (i) Explain about Lempel zir coding procedure.

(ii) Find the channel capacity of binary symmetric channel with error probability 0.1.

(8 marks)

Or

(b) Construct binary optimal code for the following symbol probabilities using Huffman procedure and calculate its coding efficiency 0.3, 0.2, 0.15, 0.12, 0.10, 0.07, 0.04, .02.

III. (a) Explain the construction of standard and syndrome decoding procedure for linear block code.

Or

(b) (i) Show that the generator polynomial of an (n, k) cyclic code is a factor of $X^n + 1$..

(8 marks)

(7 marks)

(ii) Explain the encoding of a cyclic codes in systematic form.

IV. (a) Construct a table for the Galois field GF(2^4), based on the primitive polynomial P(X) = 1 + X + X^4. Display the power, polynomial and vector representation of each element. Determine the order of each element.

Turn over

Or

(b) Explain the Berlakamp's iterative algorithm for finding the error-location polynomial.

V. (a) Consider the (3, 1, 2) convolutional code with generator sequences :

$$g^{(1)} = (110) \qquad g^{(2)} = 101$$
$$g^{(3)} = (111)$$

   (i) Draw the encoder diagram.

   (ii) Find the code corresponding to the information sequence $y = (11101)$.

   (iii) Find the generator matrix in both time domain and transform domain.

$$(4 + 4 + 7 = 15 \text{ marks})$$

Or

(b) Explain (i) ML decoding and (ii) Viterbi decoding for convolutional encoder.

$$(7 + 8 = 15 \text{ marks})$$
$$[4 \times 15 = 60 \text{ marks}]$$