D 42106 (Pages 2) Name.....

Reg. No.....

FIFTH SEMESTER B.TECH. (ENGINEERING) DEGREE EXAMINATION, DECEMBER 2007

Information Technology

IT 2K 503—INFORMATION THEORY AND CODING

Time : Three Hours Maximum : 100 Marks

I. (a) Show that for equal probability events the entropy would be maximum.

(b) Give an account on 'Lempel ziv coding'.

(c) What is meant by standard array of linear block codes ? Explain. Give examples.

(d) A (15, 5) linear cyclic code has a generator polynomial

$$g(x) = 1 + x + x^2 + x^4 + x^5 + x^8 + x^{10}.$$

Draw block diagrams of an encoder and syndrome calculator for this code.

(e) Write the basic properties of Galois field.

(f) Explain the advantages of Reed solomon codes.

(g) What are constraint length and rate efficiency of the convolution codes ? Explain. Give examples.

(h) Construct a convolutional encoder, for N = 3 n = 3 and k = 1, and explain its operation.

(8 × 5 = 40 marks)

II. (a) (i) Derive the algorithm for Huffman coding. (8 marks)

(ii) Apply Huffman coding to the following probabilities and compute efficiency :

P = {0.4, 0.1, 0.1, 0.05, 0.05, 0.04, 0.03, 0.03, 0.2}.

(7 marks)

Or

(b) (i) Derive the expressions for channel capacities for Binary symmetric and Binary erasure channels.

(8 marks)

(ii) State and derive the properties of entropy. (7 marks)

III. (a) (i) Derive the matrix representation of Linear block codes. (8 marks)

(ii) Describe in detail the error detection and error correction capabilities of Linear block codes.

(7 marks)

Or

Turn over

(b) (i) Explain the procedure for decoding cyclic codes. (8 marks)

(ii) Design a single-error correcting code with a message block size = 11 and show by an example that the code can correct single erros. (7 marks)

IV. (a) Describe in detail the algorithm and features of BCH codes, with examples.

Or

(b) (i) Explain in detail the construction of Galois field. (8 marks)

(ii) Give an account on vector spaces and matrices. (7 marks)

V. (a) (i) Draw an enconder for N = 4, n = 4, k = 1 and explain its principle. (8 marks)

(ii) Explain sequential decoding detection of convolutional codes. (7 marks)

Or

(b) Write short notes on :

(i) Performance of convolutional codes. (8 marks)

(ii) Features of trellis code. (7 marks)

[4 × 15 = 60 marks]