C 5445

(Pages 2)

SEVENTH SEMESTER B.TECH. (ENGINEERING) DEGREE EXAMINATION, JUNE 2010

EC 04 701—INFORMATION THEORY AND CODING

Time : Three Hours   Maximum : 100 Marks

Part A

*Answer **all** questions.*

I. (a) Code the following message using Shannon Fano coding :—

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

$$P(X) = \{ 0.3, 0.1, 0.05, 0.28, 0.27 \}$$

(b) Define the terms :

(i) Mutual information.

(ii) Channel capacity.

(iii) Binary symmetric channel.

(c) Explain the terms with example :

(i) Hamming distance.

(ii) Hamming weight.

(iii) Syndrome vector.

(d) Give an example of a linear block coder. Draw a circuit of the same.

(e) What is Golois field ? Discuss its basic properties.

(f) Explain about minimal polynomial.

(g) Write notes on interleaved convolutional codes.

(h) Assume a convolutional coder. Draw its state diagram.

(8 × 5 = 40 marks)

Part B

II. (a) (i) State and prove any *four* properties of entropy.   (10 marks)

(ii) Write notes on Lempel Ziv coding.   (5 marks)

Or

Turn over

(b) (i) State and prove source coding theorem. (10 marks)

(ii) Code the following source using Huffmann coding :—

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

$$P(X) = \{ 0 \cdot 2, 0 \cdot 25, 0 \cdot 35, 0 \cdot 15, 0 \cdot 05 \}.$$

III. (a) (i) Discuss the error correction and detection capabilities of a linear block code. (5 marks)

(ii) Explain the method of error detection and correction for systematic and non-systematic linear block codes using appropriate examples.
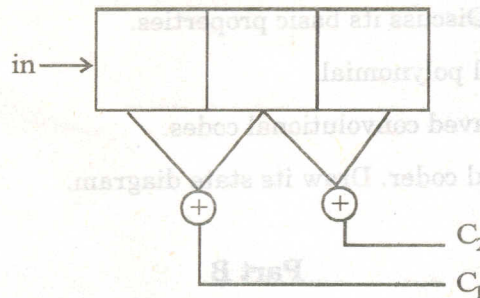
(10 marks)

Or

(b) (i) Assume a (7, 4) cyclic coder with a generator polynomial $x^3 + x + 1$. Find the systematic and non-systematic code words corresponding to a data word 1010.

(8 marks)

(ii) Explain the decoding of a cyclic coded word. (7 marks)

IV. (a) (i) Construct a group under modulo-1 addition and multiplication. (8 marks)

(ii) Discuss about field. (7 marks)

Or

(b) Write notes on :

(i) BCH codes.   (ii) Read Solomon codes.

V. (a) Draw the Trellis diagram of the following convolutional coder. Decode 1100111010 using Viterbi algorithm.

Or

(b) (i) Discuss the sequential decoding of 1100111010 using the convolution coder of question V (a).

(10 marks)

(ii) Write notes on Turbo coding. (5 marks)

[4 × 15 = 60 marks]