D 8524   (Pages : 2)   Name....................................
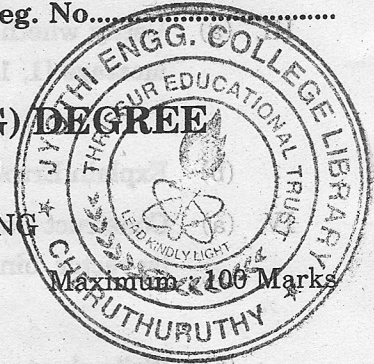
Reg. No..............................

FIFTH SEMESTER B.TECH. (ENGINEERING) DEGREE EXAMINATION, DECEMBER 2010

IT 04 504 – INFORMATION THEORY AND CODING

Time : Three Hours   Maximum : 100 Marks

Answer **all** *questions.*

Part A

I. (a) Discuss on mutual information.

(b) Explain the entropy of binary memory less source.

(c) Compare and contrast cyclic codes with convolutional codes.

(d) Explain the principles of parity check with an example.

(e) Discuss on reed solomon codes.

(f) Write short notes on vector spaces.

(g) Explain the free distance of convolutional codes.

(h) Explain the principle of sequential decoding.

$(8 \times 5 = 40$ marks)

Part B

II. (a) A discrete memory less source has an alphabet of five symbols with their probabilities for its output as given here.

$[X]$ $= [X_1, X_2, X_3, X_4, X_5]$

$P[X]$ $= [0.45, 0.15, 0.15, 0.10, 0.15]$

Compute two different Huffman codes for this source. For these two fields find.

(i) Average code word length.

(ii) Variance of the average code word length over the ensemble of source signals.

Or

(b) Consider the following binary sequence.

(i) 11101 0011 00010 1110100. Use the Lempel Ziv algorithm to encode this sequence. Assume that the binary symbols a and o are already on the code book.

(ii) What are the advantages of Lempel-Ziv encoding algorithm over Huffman coding.

Turn over

III. (a) Verify whether $g(x) = 1 + x + x^2 + x^4$ is a valid polynomial for generating a cyclic code for message [1, 1, 1].

Or

(b) Explain Error correction and error detection in detail

IV. (a) Construct Galois field, GF (2^4) using the primitive polynomial $P(x) = 1 + x + x^3$. Represent it by vector, binary and polynomial form.

Or

(b) Write short notes on:

(i) Transform demain representation.

(ii) Interleaved convolutional codes.

V. (a) A Convolution encodes is defined by the following generator polynomials.

(i) $g_0(x) = 1 + x + x^2 + x^3 + x^4$

(ii) $g_1(x) = 1 + x + x^3 + x^4$

(iii) $g_2(x) = 1 + x^2 + x^4$

1. What is the constraint length of this code?

2. How many states are in the trellis diagram of this code?

3. What is the code rate of this code.

Or

(b) Explain viterbi decoding algorithm for convolutional code.

(4 × 15 = 60 marks)