D 90261   (Pages : 2)   Name....................

                                                     Reg. No................

SEVENTH SEMESTER B.TECH. (ENGINEERING) (09 SCHEME) DEGREE EXAMINATION, NOVEMBER 2015

EC/PTEC 09 701—INFORMATION THEORY AND CODING

Time : Three Hours   Maximum : 70 Marks

Part A

I. Answer *all* questions :

1 Find the entropy of the source of alphabet size three, emitting equal probability messages.

2 What should be the capacity of a channel connected to a binary source emitting equal probability messages ?

3 State the significance of eigen value of a matrix.

4 State the difference between syndrome vector and error vector.

5 Define hamming distance and hamming weight.

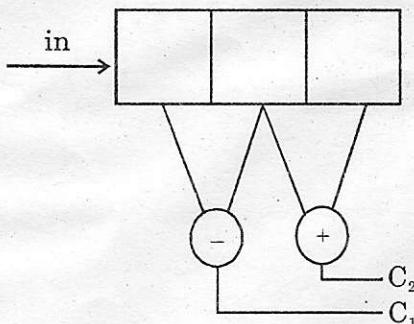   (5 × 2 = 10 marks)

Part B

II. Answer any *four* questions :

1 Encode the following source using Huffman coding :

   $P(x) = \{0.05, 0.35, 0.15, 0.2, 0.25\}$.

2 Show that capacity of a channel of infinite bandwidth is finite.

3 Explain Reed Solomon coding with an example.

4 Derive the error detection capability of a (7, 4) hamming code.

5 Consider the following convolution coder and draw its tree diagram :

6 Write notes on trellis codes.

                                                     (4 × 5 = 20 marks)

                                                     Turn over

Part C

III. Answer *all* questions :

1 (a) Derive the channel capacity of a binary symmetric channel.

(b) State and prove any two properties of mutual information.

Or

2 Consider the following joint probability matrix of a communication system. Find noise, the amount of information lost in the channel and mutual information of the system :

X\ Y

$$\begin{pmatrix} 0.21 & 0.02 & 0.08 \\ 0.09 & 0.10 & 0.06 \\ 0.04 & 0.05 & 0.35 \end{pmatrix}$$

3 Explain groups and field with an example for each. Explain binary field arithmetic.

Or

4 Explain BCH coding and decoding assuming an example.

5 Explain a hardware setup which can detect and correct an error in the cyclic code.

Or

6 Find all possible generator polynomials of a (7, 4) cyclic code.

7 Explain viterbi algorithm assuming a suitable example.

Or

8 (a) Write notes on interleaved convolutional codes.

(b) Explain sequential decoding of convolutional codes.

(4 × 10 = 40 marks)