Roll No. .....

22144

M. E. 1st Semester
(Electronics & Communication Engg.)
Examination – January, 2012

INFORMATION & COMMUNICATION THEORY

Paper : MEEC-505

Time : Three hours] *[Maximum Marks : 100*

Before answering the questions, candidates should ensure that they have been supplied the correct and complete question paper. No complaint in this regard, will be entertained after examination.

Note : Attempt any ***five*** questions. All questions carry equal marks.

UNIT – I

1. (a) Discuss and explain the concept of information and entropy. State the important properties of entropy. 8

   (b) State and explain Shannon-Hartley theorem and discuss its importance. 12

2. (a) Prove that $H(xy) = H(y/x) + H(x)$

where $H(xy)$ joint entropy

$H(x)$ = Marginal entropy of x

$H(y/x)$ = Conditional entropy 10

(b) Discuss the use of syndromes. Explain the syndrome decoding. 10

3. (a) Explain with the help of an example Shannon-Fano algorithm. 10

(b) Explain and discuss Viterbi algorithm for decoding of convolutional codes. 10

4. (a) A source transmits two independent messages with probability of P and $(1 - P)$ respectively. Prove that entropy is maximum when both messages are equally likely. Plot the variation of H as a function of probability P of the messages. 10

(b) Define channel capacity and calculate channel capacity of Binary Symmetric and Binary Erasure channel. 10

5. (a) Apply the Shannon-Fano coding procedure for the following message ensemble : 10

$[X] = [X_1, X_2, X_3, X_4, X_5, X_6, X_7]$

$[P] = [0.4\ 0.2\ 0.12\ 0.08\ 0.08\ 0.08\ 0.04]$

Take $M = 3$

(b) Repeat for the Huffman code and compare the results for $M = 3$. 10

6. (a) Explain the encoding and decoding methods for cyclic codes with the help of proper diagrams. 10

(b) Compare the performance of linear block codes and convolutional codes : 10

7. Explain the following terms : 20

(i) Hamming distance,

(ii) Hamming bound,

(iii) Code rate,

(iv) Free distance,

(v) Coding gain,

(vi) Coding efficiency.

8. Discuss any *four* of the following : 20

(i) BCH Codes,

(ii) Continuous entropy,

(iii) Optimum Coding,

(iv) Rate distortion functions,

(v) Kraft in equality.
