Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY
MANIPAL
A Constituent Institution of Manipal University

SEVENTH SEMESTER B.Tech. (E & C) DEGREE END SEMESTER EXAMINATION
NOV/DEC 2017
SUBJECT: INFORMATION THEORY AND CODING (ECE - 4009)

TIME: 3 HOURS **MAX. MARKS: 50**

Instructions to candidates
- Answer **ALL** questions.
- Missing data may be suitably assumed.

1A. Compute the entropy of a DMS with source probabilities: {0.30 0.25 0.20 0.15 0.10}. Also find the entropy of the 3rd extension of the source. Derive the equation used

1B. Four cards are drawn at random from a deck of cards. What is the probability that all four cards drawn are of same colour. Also compute the information.

1C. List the properties of entropy of a source.

(5+3+2)

2A. For the given Markov source given in Figure Q2A determine the state probabilities. Determine the entropy of the source and its adjoint.

2B. A zero memory DMS has probability of symbol occurrence $P(S_i) = p(1-p)^{i-1}$. Compute the entropy of this source in terms of *p*. If *p*=0.5, find H(S)

2C. State Shannon's Noiseless theorem

(5+3+2)

3A. A source S consists of symbols as 26 English alphabets and symbols { . (dot), ' ' (blank)}. Generate a NYT list that is used by adaptive Huffman coding.

3B. Consider the message ensemble S with probabilities P = {0.4, 0.3, 0.2 0.1}. Construct compact binary codes using Shannon and Shanno- Fano coding. Find the coding efficiency.

3C. Perform step by step uniquely decodable test for the code { 1, 10, 01} and state whether is it uniquely decodable.

(5+3+2)

4A. Determine the capacity of channel of BSC and BEC channel. Assume *p* as bit transition probability

4B. Generate a quaternary (*r* = 4) compact code for the source S with probabilities as {1/3, ¼, 1/8, 1/8, 1/12, 1/12}. Find the code efficiency

4C. A channel has is characterized by the noise matrix $P(Y/X) = \begin{bmatrix} 2/3 & 1/3 \\ 1/3 & 2/3 \end{bmatrix}$. Find H(X), H(Y), H(Y/X), H(X,Y), H(X/Y).

(5+3+2)

5A. A linear block code has parity matrix $P = \begin{bmatrix} (1 & 1 & 1) \\ (1 & 1 & 0) \\ (1 & 0 & 1) \\ (0 & 1 & 1) \end{bmatrix}$,

Determine

(i) The parity check matrix, Generator matrix,

(ii) Encode message (1 1 1 1), and (1 0 0 1) .

(ii) Decode the received message (1 1 1 1 1 0 1).

5B. Discuss the characteristics and capabilities of cyclic redundant codes.

5C. Encode the message (010101010) using non-systematic Hamming code

(5+3+2)

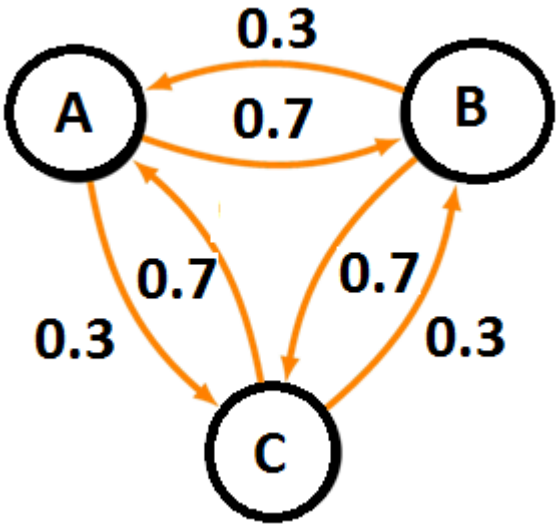

Figure Q2A