

GUJARAT TECHNOLOGICAL UNIVERSITY**ME Semester –I Examination Feb. - 2012****Subject code: 710402****Date: 13/02/2012****Subject Name: Information Theory and Coding****Time: 10.30 am – 01.00 pm****Total Marks: 60****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q.1** (a) State and prove Macmillan's theorem **06**
 (b) Define entropy and discuss the conditions for maximum and minimum entropy. **06**

- Q.2** (a) State and prove Shannon's Noiseless coding Theorem. **06**
 (b) Briefly Describe: **06**
 (1) Binary symmetric Channels.
 (2) Information rate.
 (3) Hamming Distance.

OR

- (b) A zero memory source emits six messages with probabilities 0.3, 0.25, 0.15, 0.12, 0.1 and 0.08. Find the 4-ary (quaternary) Huffman code. Determine its average word length, the efficiency and the redundancy. **06**

- Q.3** (a) Write a short note on Hamming codes-perfect codes for single errors. Draw and explain the diagram of an encoder for the Hamming code of length 7. **06**
 (b) Derive the equation for channel capacity of a discrete memory less channel. **06**

OR

- Q.3** (a) Write a short note on Golay code-A perfect code for triple errors. **06**
 (b) Find a generator polynomial $g(x)$ for a (7,4) cyclic code and find code vectors for the following data vectors: 1010, 1111, 0001, and 1000. **06**

- Q.4** (a) Briefly explain Burst error detecting and correcting codes. **06**
 (b) Briefly explain secret key encryption. **06**

OR

- Q.4** (a) Briefly explain public key encryption. **06**
 (b) With neat figure explain Data encryption standard. **06**

- Q.5** (a) For convolutional code describe: Maximum-likelihood decoding (Viterbi's Algorithm). What are its advantages? **06**
 (b) A zero memory source emits messages m_1 and m_2 with probabilities 0.8 and 0.2 respectively. Find the optimum (Huffman) binary code for this source as well as for its second and third order extensions (that is for $N=2$ and 3). Determine the code efficiency in each case. **06**

OR

- Q.5** (a) For convolutional code describe sequential decoding briefly. What are its disadvantages? **06**
 (b) Draw the diagram of an encoder for systematic cyclic code and explain cyclic code generation in detail. Also explain the decoding procedure. **06**
