B.Tech. – VIEP – ELECTRONICS AND COMMUNICATION ENGINEERING (BTECVI)

Term-End Examination

□□□27   **June, 2017**

BIEL-023 : INFORMATION THEORY AND CODING

Time : 3 hours   *Maximum Marks : 70*

Note :   *Attempt any **seven** questions. Missing data, if any, may be suitably assumed. Use of scientific calculator is permitted. All questions carry equal marks.*

1. (a) Define the term 'Entropy'. Enlist all the properties for the entropy of a source.   5

   (b) Derive an expression for the entropy of a discrete random variable.   5

2. (a) What do you understand by the term channel capacity ? Derive the expression for channel capacity for a simple channel.   5

   (b) State and prove Shannon's channel coding theorem.   5

3. (a) Explain the procedure used for the construction of finite fields.   5

   (b) List the basic properties of finite fields.   5

4. Derive the relationship between entropy and mutual information. Draw a Venn diagram to show the relation. *7+3=10*

5. For MPSK modulation scheme, the bandwidth efficiency increases with higher dimensional signalling but for MFSK scheme it decreases. Explain in detail. *10*

6. (a) What are Linear Block Codes ? For what purpose are they used ? *6*

   (b) Give the important properties of these codes. *4*

7. A source emits 7 symbols $x_1, x_2, ..., x_7$ with respective probabilities 0·005, 0·04, 0·2, 0·3, 0·1, 0·35, 0·005. Find : *10*
   (a) Huffmann codes for the given symbols
   (b) Average information

8. Prove that the code word length of any uniquely decodable code satisfies the Kraft's inequality $\sum D^{-l_1} \le 1$. *10*

9. Write short technical notes on any *two* of the following : *2×5=10*
   (a) Shannon's Source Coding Theorem
   (b) Reed-Solomon Codes
   (c) Viterbi Decoding