No. of Printed Pages : 3

BIEL-023

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

00289

Term-End Examination

December, 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. Prove the following relation for non-negative numbers : $a_1, a_2, \ldots, a_n$ and $b_1, b_2, \ldots, b_n$: *10*

$$\sum_{i=1}^{n} a_i \log_{10}\left(\frac{a_i}{b_i}\right) \geq \sum_{i=1}^{n} a_i \log_{10} \frac{\sum_{i=1}^{n} a_i}{\sum_{i=1}^{n} b_i}$$

with equality iff $\left(a_i / b_i\right)$ is a constant.

2. Prove that for any given sequence of $(2^{nR}, n)$ codes with $\lambda^{(n)} \to 0$ must have $R \leq C$, where the symbols have their usual meaning. *10*

3. Prove that, if $V_1, V_2, ..., V_n$ is a finite alphabet stochastic process which satisfies the Asymptotic Equipartition Property (AEP), then there exists a source channel code with $P_e^{(n)} \to 0$, if $H(V) \leq C$. *10*

4. (a) What is the symbol-error correcting capability of a (7, 3) R-S code ? How many bits are there per symbol ? *5*

   (b) Compute the number of rows and columns in the standard array to represent the (7, 3) R-S code. How much residual symbol error correcting capability does it have ? *5*

5. (a) Explain the concept of Lossless source coding. *5*

   (b) Differentiate between joint, conditional and relative entropy. *5*

6. What are Gaussian Channels ? Calculate the expression for mutual information and capacity for band-limited Gaussian channels. *10*

7. Explain the concept of error detection and correction codes as applicable to a Galois field. *10*

8. State and prove the Huffmann Coding technique. *10*

9. Write short technical notes on any ***two*** of the following : *2×5=10*

   (a) BCH Codes

   (b) Cyclic Codes

   (c) Linear Block Codes