

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

**Term-End Examination**

**00264**

**June, 2017**

**BIELE-010 : SIGNAL COMPRESSION**

*Time : 3 hours*

*Maximum Marks : 70*

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

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1. (a) Explain the types of compression techniques with suitable example and diagram. 5
- (b) Differentiate between Lossless and Lossy compression. 5
2. (a) Suppose X is a random variable that takes on values for an M-letter alphabet, show that  $0 \leq H(X) \leq \log_2 M$ . 5
- (b) Show that for the case where the elements of an observed sequence are iid, the entropy is equal to the first-order entropy. 5

3. (a) Describe Markov models of compression. 5
- (b) Explain the Huffman coding algorithm and the optimality of Huffman codes. 5
4. (a) Design a 3-bit Tunstall code for a memoryless source with the following alphabet : 5
- $A = \{A, B, C\}$   
 $P(A) = 0.6, \quad P(B) = 0.3, \quad P(C) = 0.1$
- (b) Design a Golomb code for  $m = 5$ , where  $m$  is the Golomb code parameter. Show that the Golomb code is optimal for the probability model. 3
- (c) Draw the flow chart of the encoding procedure. 2
5. (a) Differentiate between extended Huffman coding and adaptive Huffman coding. 4
- (b) Differentiate between Static Dictionary and Adaptive Dictionary. 3
- (c) Explain LZ78 algorithm approach with suitable example. 3
6. (a) What do you mean by prediction with partial match ? Explain in detail. 5
- (b) Explain the principle of Burrows-Wheeler Transform. Encode the following sequence using this transform : 5

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7. (a) What is Differential Entropy ? A random variable X is uniformly distributed in the interval [a, b]. Find the differential entropy of this random variable. 5
- (b) Explain the Rate-distortion theory. 3
- (c) Define the types of probability models. 2
8. (a) Differentiate between scalar quantization and vector quantization. 5
- (b) What are the types of vector quantizations that exist ? Explain each of them with suitable example. 5
9. (a) What is the difference between subbands and wavelets ? Explain subband coding techniques and the basic subband coding algorithm. 5
- (b) Explain the wavelet based compression schemes for speech, audio, image and video signals. 3
- (c) What are the video compression standards available ? 2
10. Write short notes on any *two* of the following :  $2 \times 5 = 10$
- (a) JPEG 2000
- (b) MPEG Audio Coding
- (c) Linde-Buzo-Gray Algorithm
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