6th Sem CS

USN | | | | | | | | | | 10CS/TS663

Sixth Semester B.E. Degree Examination, June/July 2015
Data Compression

Time: 3 hrs. Max. Marks:100

Note: *Answer any FIVE full questions, selecting atleast TWO questions from each part.*

PART – A

1 a. What is data compression? Explain different compression algorithms and their performance measurement. (05 Marks)

b. What are uniquely decodable codes? Give the procedure and determine whether following codes are uniquely decodable or not: i) {0, 01, 11} ii) {0, 01, 10}. (06 Marks)

c. A source emits letters from an alphabet A = {a_1, a_2, a_3, a_4, a_5} with probabilities $P(a_1) = 0.15$, $P(a_2) = 0.04$, $P(a_3) = 0.26$, $P(a_4) = 0.05$ and $P(a_5) = 0.50$. Entropy = 1.818 bits. Calculate: i) Huffman codes using minimum variance procedure; ii) Average length; iii) Redundancy. (09 Marks)

2 a. Given an initial dictionary consisting of letters entries (a, b, r, y, ⊬) with indices (1, 2, 3, 4, 5). Encode the following message using the LZW algorithm.
a ⊬ b a r ⊬ a r r a y ⊬ b a y ⊬ b a r r a y a r ⊬ b a y. (08 Marks)

b. Explain different coding schemes. (07 Marks)

c. Write a note on JPEG-LS standard. (05 Marks)

3 a. What is distortion? Explain the probability models of lossy compression scheme with their shapes. (10 Marks)

b. Show that SNR of a uniform quantizer for uniformly distributed source is 6.02n dB. (06 Marks)

c. Discuss different ways to measure distortion. (04 Marks)

4 a. With a neat block diagram, explain vector quantization procedure. (08 Marks)

b. Give the LBG algorithm when there are two dimensional scalars and distribution is known. (06 Marks)

c. Illustrate with a graph, the Code Excited Linear Predictive Adaptive Delta Modulation (CELP) works. (06 Marks)

PART – B

5 a. State linear system properties. (04 Marks)

b. Find the inverse Z-transform of $H(z) = \frac{3z^2 - 9z}{z^2 - 2.5z + 1}$. (06 Marks)

c. Define sampling theorem. Obtain inverse Fourier transform f(t) in ideal sampling frequency domain view. (10 Marks)

6 a. Illustrate the basic subband coding algorithm with its block diagram. (10 Marks)

b. Explain application of speech coding G.722. (06 Marks)

c. Explain frame structure for layer-II coding in MPEG audio coding algorithm. (04 Marks)

7 a. Explain how wavelets are used in image compression, with a neat sketch. (10 Marks)

b. Discuss SPIHT scheme. (10 Marks)

8 a. What is motion compensation? Draw the block diagram of H.261 video coder and illustrate the roles of motion compensation and loop filter. (10 Marks)

b. Write a note on: i) Model-based coding technique; ii) Video standard MPEG-2. (10 Marks)