(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 2714 Roll No.

B.Tech.

(SEM. VII) ODD SEMESTER THEORY EXAMINATION 2012-13

DATA COMPRESSION

Time : 3 Hours *Total Marks : 100*

Note :– Attempt **all** questions.

1. Attempt any **two** questions from the following : **(10×2=20)**

(a) What is Data Compression and why we need it ? Explain Compression and Reconstruction with the help of block diagram. What are the measures of performance of data compression algorithms ?

(b) What do you understand by information and entropy ? Give an alphabet A = {a1, a2, a3, a4}, find the first-order entropy in the following cases :

(i) P(a1) = 1/2, P(a2) = 1/4, P(a3) = P(a4) = 1/8

(ii) P(a1) = 0.505, P(a2) = 1/4, P(a3) = 1/8 and P(a4) = 0.12

And also differentiate between static length and variable length coding schemes. Explain with the help of examples.

(c) What do you understand by Prefix Code ? Determine whether the following codes are uniquely decodable :

(i) {0, 01, 110, 111}

(ii) {1, 10, 110, 111}

And also explain Modeling and Coding with the help of suitable examples.

2. Attempt any **two** questions from the following : **(10×2=20)**

(a) How Rice code can be viewed ? Explain the implementation of the Rice code in the recommendation for lossless compression from the Consultative Committee on Space Data Standard. Explain Adaptive Huffman Coding. How is it different from Conventional Huffman Coding ?

(b) For an alphabet A = {a1, a2, a3, a4, a5} with probabilities P(a1) = 0.15, P(a2) = 0.04, P(a3) = 0.26, P(a4) = 0.05 and P(a5) = 0.50.

(i) Calculate the entropy of this source

(ii) Find a Huffman Code for this source.

(iii) Find the average length of the code in (ii) and its redundancy.

And also design a 3-bit Tunstall Code.

For an alphabet A = {a1, a2, a3} with probabilities P(a1) = 0.7, P(a2) = 0.2, P(a3) = 0.1. Design a 3-bit Tunstall Code.

(c) Explain Minimum Variance Huffman code and encoding procedure taking a suitable example. What are the various application of Huffman Coding ?

3. Attempt any **two** questions from the following : **(10×2=20)**

(a) A sequence is encoded using LZW algorithm and the initial dictionary shown in the table.

Index	Entry
1	a
2	b
3	r
4	t

The output of LZW encoder is the following sequence :

3	1	4	6	8	4	2	1	2	5	10	6	11	13	6

Decode this sequence. Discuss relative advantages of LZ77, LZ78 and LZW Compression schemes.

(b) What do you mean by Binary Code ? Compare Binary Code with Huffman Code. What are Adaptive Compression schemes ? What is the basic difference between Adaptive and Statistical Compression scheme ? Discuss with the model of Adaptive Compression.

(c) What is Facsimile Encoding ? Explain Run-Length Coding technique used earlier for Facsimile. Give a brief comparison of MH, MR, MMR and JBIG.

4. Attempt any **two** questions from the following : **(10×2=20)**

(a) What do you understand by Uniform Quantizer ? How Uniform Quantization of a uniformly distributed sources and uniform quantization of non-uniform sources is done ?

(b) What do you understand by Adaptive Quantization ? Explain the various approaches to adapting the quantizer parameters.

(c) Discuss the steps involved in basic algorithm for Prediction with Partial Match (PPM).

5. Attempt any **two** questions from the following : **(10×2=20)**

(a) What is Quantization ? Explain Additive Noise Model of a quantizer. Differentiate between Scalar Quantization and Vector Quantization. Discuss the advantages of Vector Quantization over Scalar Quantization.

(b) Discuss the Linde-Buzo-Gray algorithm in detail.

(c) Explain Uniform and Non-uniform Quantization with further classifications.