Printed Pages:02 Sub Code:KCS-064

Paper Id: 236661 Roll No.

B.TECH
(SEM VI) THEORY EXAMINATION 2022-23
DATA COMPRESSION

Time: 3 Hours *Total Marks: 100*

Note: Attempt all Sections. If require any missing data; then choose suitably.

SECTION A

1. Attempt *all* questions in brief. 2 x 10 = 20

(a) What are the different measures of performance of data compression algorithm?

(b) Given an Alphabet A = {a1, a2, a3, a4}, find the first-order entropy in the following cases: P(a1) = P(a2) = P(a3) = P(a4) = ¼

(c) What are the applications of Huffman Coding?

(d) Calculate Golomb Code for n=9 and n=13 with parameter m=5.

(e) List out the applications of dictionary based data compression techniques.

(f) Compare Binary code with Huffman code.

(g) What are the various distortion criteria?

(h) Explain mismatch effect.

(i) Define Code Vectors.

(j) What is the concept of pruning?

SECTION B

2. Attempt any *three* of the following: 10x3=30

(a) How do uniquely decodable codes differ from prefix codes? Explain with example. Describe the procedure for coding a uniquely decodable code. Are the following codes {0, 10, 110, 111} {1, 10, 110, 111} uniquely decodable?

(b) Explain the difference between Minimum variance Huffman code and Huffman code with example. From 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 the Huffman Code for this source.
(iii) Find the average length of the code in (ii) and its redundancy.

(c) Explain the basic algorithm behind prediction with partial match (ppm).What is Facsimile Encoding? Explain Run-Length Coding technique used earlier for Facsimile.

(d) What do you understand by Adaptive quantization? Explain the various approaches to Adapting the Quantizer Parameters.

(e) What do understand by Vector Quantization? Discuss the advantages of vector quantization over scalar.

SECTION C

3. Attempt any *one* part of the following: 10x1=10

(a) Define two-state Markov model for binary images. Also define ignorance model and how it is related with probability models?

(b) Discuss the importance of modeling and coding in the compression process with example. How does information theory relate to lossless compression? Can you explain some key concepts in information theory and their relevance to compression?

https://quescol.com | Free PYQs, Solutions, Syllabus, Notes etc

4. **Attempt any *one* part of the following:** **10x1=10**

(a) Given an alphabet $\{a_1, a_2, \ldots, a_{26}\}$ of size 26. The letter a_k is encoded as per the following rules:

(i) a_k is encoded as 5 bit binary representation of $k-1$, if $1 \leq k \leq 20$

(ii) a_k is encoded as 4 bit binary representation of k-11 for all $k > 20$.

Decode the following string using Adaptive Huffman procedure. Show updated Huffman tree for each step.

00000101000100000110010110.

(b) 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.

5. **Attempt any *one* part of the following:** **10x1=10**

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

Index	Entry
1	a
2	¢
3	r
4	t

The output of the 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) Explain Burrows-Wheeler transform (BWT) in detail. Given the sequence: this¢is¢the Encode using the BWT and move-to-front coding.

6. **Attempt any *one* part of the following:** **10x1=10**

(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) Consider the following lossy compression scheme for binary sequences. We divide the binary sequence into blocks of size M. For each block we count the number of 0s.If this number is greater than equal to M/2, we send as 0; otherwise, we send a 1.

(i)If the sequence is random with $P(0) = 0.8$, compute the rate and distortion for $M = 1, 2, 4, 8, 16$.Compare your results with the rate distortion function for binary sources.

(ii)Repeat assuming that the output of the encoder is encoded at a rate equal to the entropy of the output.

7. **Attempt any *one* part of the following:** **10x1=10**

(a) Explain the various functions involved in the Linde-Buzo-Gray(LBG) Algorithm. Also explain the initializing of LBG algorithm.

(b) Write a short note on :

(i) Tree structured Vector Quantizers.

(ii) Lattice Vector Quantizers

https://quescol.com | Free PYQs, Solutions, Syllabus, Notes etc