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B. TECH.

EIGHTH SEMESTER EXAMINATION, 2003-2004

DATA COMPRESSION

Time : 3 Hours

Total Marks : 100

Note :(i) Attempt ALL questions.

(ii) All questions carry equal marks.

- 1. Attempt any FOUR of the following :--- (5×4)
 - (a) What do you understand by Compression Ratio ? What is the need for it ?
 - (b) Give two examples of different areas where lossless compression technique is necessary for data compression. Explain the reason, why.
 - (c) Give two applications where lossy compression can be used for data compression. Comment upon the tolerance limit factor.
 - (d) Explain the terms, Fidelity and Quality in reference to the difference between the Reconstruction and Original data.
 - (e) Explain redundancy that exists in the data and state how it is related with the model.
 - (f) Comment upon the statement —

"Compression is still largely an art and to gain proficiency in an art, you need to get it a feel for the process."

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2.

(5×4)

- Explain 'Self-information' defined by *(a)* Shannon.
- How are probability models useful in data (b) compression ?
- What is Zero-frequency model in Markov (c) models in text compression ?
- Consider source alphabet $A = \{a_1, a_2, a_3, a_4\}$ (d)

with probabilities $P(a_1) = \frac{1}{2}$, $P(a_2) = \frac{1}{4}$,

$$P(a_3) = P(a_4) = \frac{1}{8}.$$

The entropy for this source is 1.75 bits / symbol. Consider the codes for this source as follows :---

Letters Probability Code 1 Code 2 Code 3 Code 4

a ₁ a ₂ a ₃ a ₄	0.5 0.25 0.125 0.125	0 0 1 10	0 1 00 11	0 10 110 111 1.75	0 01 011 0111 1.875
age length		1.125	1.25	1.75	10/0

Average length

Explain which code is the best and why.

- Explain minimum variance Huffman coding (e) and encoding procedures with the help of examples.
- Explain in brief : (f)
 - (i) Optimality of Huffman code
 - (ii) Length of Huffman code

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3. Attempt any FOUR of the following :---

(5×4)

- (a) Explain Extended Huffman code with the help of example. Describe where it is useful.
- (b) Explain the concept of Adaptive Huffman coding.
- (c) Explain Golomb code with the help of example.
- (d) Explain Tunstall code with the help of example.
- (e) How is lossless Image Compression achieved ?
- (f) How is Audio Compression done ?
- 4. Attempt any TWO of the following :---

(10×2)

- (a) How is Binary code generated ? What do you understand by uniqueness and efficiency of the Arithmetic code ? What are the steps for algorithm implementation of the arithmetic code ?
- (b) Describe at least two applications, in detail of the arithmetic coding for each lossless and lossy compression.
- (c) Discuss the role of Dictionary Techniques.
 Explain the concept of
 - (i) Static Dictionary
 - (ii) Adaptive Dictionary and Building Approach of LZ 77 (or LZ 1) & LZ 78 (or LZ 2).

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Turn Over

(10×2)

Attempt any TWO of the following :---5.

- (a) What do you understand by Predictive coding ? Discuss multi-resolution approaches.
- (b) (i) What are the steps for Facsimile encoding?
 - (ii) Discuss the concept of Runlength coding.
- (c) (i) Explain Additive Noise model of a quantizer.

(*ii*) Discuss the role of Quantization in image compression.

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