(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 2013-14

DATA COMPRESSION

Time : 3 Hours *Total Marks : 100*

Note : Attempt **ALL** questions.

1. Attempt any **FOUR** parts of the following :— **(5×4=20)**

   (a) What is data compression and why we need it ? Explain compression and reconstruction with the help of block diagram.

   (b) Explain modeling and coding with the help of suitable examples.

   (c) What do you understand by information and entropy ? Find the first order entropy over an alphabet $A = \{a_1, a_2, a_3, a_4\}$ where $P(a_1) = P(a_2) = P(a_3) = P(a_4) = 1/4$.

   (d) What is zero frequency model in Markow models in text compression ?

   (e) Determine whether the following codes are uniquely decodable :

   (i) {0, 10, 110, 111}

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

(f) What are the measures of performance of data compression algorithms ?

2. Attempt any **FOUR** parts of the following :— **(5×4=20)**

(a) What is Redundancy of code ? How it can be defined and calculated ?

(b) Design Crolomb Code for m = 5 where values of n are 0, 1, ...,10.

(c) For an alphabet A = $\{a_1, a_2, a_3\}$ with probabilities $P(a_1) = 0.7$, $P(a_2) = 0.2$, $P(a_3) = 0.1$

Design a 3-bit Tunstall Code.

(d) Prove that the average codeword length $\bar{l}$ of an optimal code for a source S is greater than or equal to entropy H(S).

(e) Write down Huffman coding algorithm. How this algorithm is used to design Huffman code for a source that takes letter from an alphabet set A = $\{a_1, a_2, a_3, a_4, a_5\}$.

(f) Write short notes on the following :—

(i) Rice code

(ii) Non binary Huffman code.

3. Answer any **TWO** parts of the following :— **(10×2=20)**

(a) (i) Where we use the dictionary techniques of Encoding ? Also explain various types of dictionary techniques.

(b) Discuss generic compression scheme with the help of block diagram. What are the distortion criteria for Lossy coding ?

(c) What is cqnditional entropy and mutual Information and Average Mutual Information ? For two Random variables X and Y show that :

(i) $H(X/Y) \leq H(X)$

(ii) $I(X : Y) = I(Y : X)$.

5. Attempt any **TWO** parts of the following :— **(10×2=20)**

(a) Explain the steps of the Linde-Buzo-Gray algorithm.

(b) What do you understand by predictive coding ? Discuss multi resolution approaches.

(c) Explain the following quantization techniques in detail :

(i) Structured vector quantization

(ii) Pyramid vector quantization.