Seat No._____

GANPAT UNIVERSITY

M. Tech Sem. III Computer Engineering/Information Technology

Regular Examination Nov-Dec 2015

3CE301/3IT301: Data Compression

Max Time: 3 Hours] **[Max Marks: 60**

Instructions: 1. Figures to the right indicate full marks of the question.
2. All questions are compulsory.
3. Each section should be written in a separate answer book.

SECTION: I

Q:1 (a) Apply arithmetic coding to encode a sequence **1 3 3 2** and Generate a tag. [6]

(b) Define the Prefix code and uniquely decodable codes with an example [4]

OR

Q:1 (a) You are required to encode a message [d e c o d e], where alphabet consists of 26 letters. Apply the adaptive Huffman procedure. [8]

(b) Briefly discuss the advantages of arithmetic coding over Huffman codes. [2]

Q:2 (a) Prove that for the iid source, [6]

$$H(S^n) = nH(s)$$

(b) Consider the source S = $\{a_1, a_2, a_3, a_4\}$ with the following probability distribution. [4]

$p(a_1)$ =0.3, $p(a_2)$= 0.3, $p(a_3)$ = 0.25 and $p(a_4)$=0.15. Calculate the entropy of the source. Also say what could be the maximum entropy of the source S under what kinds of probability distribution?

OR

Q:2 (a) Suppose that set of alphabets is {a,b,c} and probability distribution is p(a) =0.5, p(b) = 0.4 and p(c) =0.1. Let's assume that both the encoder and decoder know the length of the message is always 3. Answer the following question. [8]

1) How many bits are needed to encode a message bbb by Huffman coding and arithmetic coding?

(b) Compare LZ77 and LZ78. [2]

Q:3 (a) A sequence is encoded using the LZW algorithm and the initial dictionary is shown in table below [7]

Index	Entry
1	A
2	B
3	H
4	I
5	S
6	T

Output of the LZW encoder is the following sequence.
6 3 4 5 2 3 1 6 2 9 11 16 12 14 4 20 10 8 23 13, Decode this sequence.

(b) Define the following terms [3]
(i) Conditional Entropy (ii) Differential Entropy

SECTION: II

Q:4 (a) Briefly explain GIF and PNG graphics format [6]

(b) Discuss the property of Discrete Cosine transformation [4]

OR

Q:4 (a) Obtain the Discrete Cosine transformation of the following matrix using $V=AUA^T$ [7]

$$a = \begin{bmatrix} 2 & 2 \\ 3 & 5 \end{bmatrix}$$

(b) Briefly Explain Motion compensation H 263. [3]

Q:5 (a) Discuss the Encoder and Decoder for Hierarchical mode of JPEG [5]

(b) Prove that $R(D) = \frac{1}{2}\log\frac{\sigma^2}{D}$ $for\ \sigma^2 < D$ for the Gaussian Source [5]

OR

Q:5 (a) Explain H 261 Encoder in detail. [6]

(b) Explain the purpose of using DCT and zigzag ordering in JPEG [4]

Q:6 (a) Explain logarithmic search for extracting Motion vectors [6]

(b) Briefly Explain Lloyd-Max Quantizer. [4]

----------**END OF PAPER**----------