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**Sixth Semester B.E. Degree Examination, Dec.2013/Jan.2014**  
**Data Compression**

Time: 3 hrs.

Max. Marks:100

**Note: Answer FIVE full questions, selecting  
at least TWO questions from each part.**

**PART – A**

1.
  - a. Define the following terms with respect to data compression:
    - i) Compression ratio
    - ii) Bit rate
    - iii) Distortion
    - iv) Fidelity and quality. (08 Marks)
  - b. Determine whether the following codes are uniquely decodable:
    - i) {0, 01, 11}
    - ii) {0, 01, 11, 1}. (04 Marks)
  - c. A source emits letters from an alphabet  $A = \{a_1, a_2, a_3, a_4, a_5\}$  with probabilities  $P(a_1) = P(a_3) = 0.2$ ,  $P(a_2) = 0.4$  and  $P(a_4) = P(a_5) = 0.1$ .
    - 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. (08 Marks)
2.
  - a. A sequence a encoded using the LZW algorithm and the initial dictionary shown in table.
 

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    - i) The output of the LZW encodes is the following sequence:  
3, 1, 4, 6, 3, 4, 2, 1, 2, 5, 10. Decode the sequence.
    - ii) Encode the decoded sequence using the same initial dictionary. (10 Marks)
  - b. Describe Run-length coding technique used is facsimile encoding. (10 Marks)
3.
  - a. Describe two popular measurers of distortion. (06 Marks)
  - b. Explain the encoder and decoder mapping for a 8-level, 3-bit quantizer. (06 Marks)
  - c. Explain backward adaptive quantization with an example. (08 Marks)
4.
  - a. Write LBG algorithm. (10 Marks)
  - b. With a block diagram, describe basic differential encoding system. (10 Marks)

## PART – B

- 5 a. Find the inverse Z-transform of the function  $F(z) = \frac{2z^4 + 1}{2z^3 - 5z^2 + 4z - 1}$ . (10 Marks)
- b. Explain Discrete Walsh – Hadamard transform. (10 Marks)
- 6 a. Given an infect sequence
- $$x_n = \begin{cases} 1 & n = 0 \\ 0 & n \neq 0 \end{cases}$$
- i) Find the impulse response sequence  $\{h_n\}$  if filter coefficients are :  $a_0 = 1.25, a_1 = 0.5$ . (05 Marks)
- ii) Find the impulse response sequence  $\{h_n\}$  if filter coefficients are  $a_0 = 1$  and  $b_1 = 0.9$ . (10 Marks)
- b. Explain MPEG layer 1 coding for audio coding. (05 Marks)
- c. How basic subcoding algorithm reduces error rate compared to DPCM? Explain. (05 Marks)
- 7 a. Describe EZW algorithm. Demonstrate the various steps of EZW using seven-level decomposition shown below:
- |    |    |    |    |
|----|----|----|----|
| 26 | 6  | 13 | 10 |
| 7  | 7  | 6  | 4  |
| 4  | -4 | 4  | -3 |
| 2  | -2 | -2 | 0  |
- (12 Marks)
- b. Explain set partitioning is hierarchical trees (SPIHT) algorithm. (08 Marks)
- 8 a. Explain how video signals are re-presented. (06 Marks)
- b. What is rate control? Explain how change in rate is affected. (06 Marks)
- c. Write a note on ITU-T recommendation H.263 standard. (08 Marks)

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