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10CS/IS663

Sixth Semester B.E. Degree Examination, Dec.2015/Jan.2016

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. Explain Lossy and lossless compression Techniques with examples. **(04 Marks)**

b. For the sequence, 12323454567898910 find the entropy. Using the differences of neighboring sequences, find the entropy and give your comment. **(08 Marks)**

c. A source emits letters from an alphabet A = $\{a_1, a_2, a_3, a_4, a_5\}$ with $p(a_1) = p(a_3) = 0.2$, $p(a_2) = 0.4$, $p(a_4) = p(a_5) = 0.1$.

i) Calculate entropy of the source.

ii) Find a Huffman code for this source.

iii) Find average length of Huffman code and hence its redundancy. **(08 Marks)**

2 a. Encode the following sequence using LZW algorithm:

xyzzy␣xyzzy␣xyzzy␣xyzzy␣xll␣xll␣xll

The alphabet for the source is {␣, l, x, y, z}. The LZW dictionary initially looks as follows:

Index	1	2	3	4	5
Entry	␣	y	z	l	x

(10 Marks)

b. Write an algorithm used by CALIC to form the initial prediction and explain this algorithm. **(06 Marks)**

c. Briefly explain different groups in Facsimile encoding. **(04 Marks)**

3 a. What is distortion? Discuss different ways to measure distortion. **(06 Marks)**

b. Show that SNR of uniform quantizer of a uniformly distributed source is 6.02ndB. **(06 Marks)**

c. Write down the operation of a jayant Quantizer suppose the multiplier values are $M_0 = M_4 = 0.8$, $M_1 = M_5 = 0.9$, $M_2 = M_6 = 0.1$, $M_3 = M_7 = 1.2$. Initial value of the step size $\Delta_0 = 0.5$ and the sequence to be quantized is 0.1, - 0.2, 0.2, 0.1, -0.3, 0.1, 0.2, 0.5, 0.9, 1.5. **(08 Marks)**

4 a. What is vector quantization? Explain the vector quantization, with a block diagram. **(10 Marks)**

b. Explain the splitting technique for initializing the LBG algorithm. Training set vectors are given in Table Q 4b (i) and initial set of output points in Table Q 4b(ii). **(10 Marks)**

Height	75	65	59	64	65	57	72	44	62	60	56	70
Weight	180	120	119	150	162	88	175	41	114	110	91	172

Table 4b (i)

Height	45	75	45	80
Weight	50	117	117	180

Table 4b (ii)

PART – B

5 a. Describe the properties of a linear system. Also explain, time invariance and transfer function of the linear system. **(06 Marks)**

b. Find the inverse z – transform of the function

$$F(z) = \frac{2z^4 + 1}{2z^3 - 5z^2 + 4z - 1}$$ **(06 Marks)**

c. Explain the orthonormal transform and that orthonormal transforms are energy preserving. **(08 Marks)**

6 a. By considering the example of encoding the sequence of values $\{x_n\}$ given bellow, explain in detail how subband coding works.

10 14 10 12 14 8 14 12 10 8 10 12 **(08 Marks)**

b. What is a filter? Discuss FIR and IIR filters. **(04 Marks)**

c. Discuss coding algorithm with a suitable diagram. Also explain the frame structure of layer – II coding. **(08 Marks)**

7 a. For seven – level decomposition shown below in Table Q7 (a) obtain the bitstream generated by the EZW coder ii) Decode the bitstream generated in the previous step. Verify that you the original co-efficient values. **(12 Marks)**

Table 7 (a)

26	6	13	10
-7	7	6	4
4	-4	4	-3
2	-2	-2	0

b. Explain multiresolution analysis and scaling function with an example. **(08 Marks)**

8 a. With a neat block diagram, Explain ITU – T recommendation H. 261. **(10 Marks)**

b. Explain with diagram MPEG – 1 video standard. **(06 Marks)**

c. Using H .262, derive an error factors for the set of co – efficient.

29.75 6.1 -6.03 1.93 -2.01 1.23 -0.95 2.11 **(04 Marks)**

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