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BTECH
(SEM VI) THEORY EXAMINATION 2021-22
DATA COMPRESSION

Time: 3 Hours**Total Marks: 100****Note:** Attempt all Sections. If you require any missing data, then choose suitably.**SECTION A****1. Attempt all questions in brief.****2*10 = 20**

Qno	Questions	CO
(a)	Differentiate between Fidelity and quality.	1
(b)	How to calculate kth order Markov model of compression	1
(c)	What are the limitations of Huffman Coding? Explain.	2
(d)	Explain the difference between Huffman and adaptive Huffman coding technique.	2
(e)	Explain CALIC.	3
(f)	Define the term PPM.	3
(g)	What are the various distortion criteria?	4
(h)	What do you understand by Quantization? Describe its types.	4
(i)	Write advantages of Tree structured vector quantization.	5
(j)	Differentiate between scalar and vector quantization	5

SECTION B**2. Attempt any three of the following:****10*3 = 30**

Qno	Questions	CO
(a)	Prove that the average codeword length I of an optimal code for a source S is greater than or equal to entropy $H(s)$.	1
(b)	For an alphabet $A=\{a_1,a_2,a_3,a_4,a_5\}$ with probabilities $P(a_1)=0.15$, $P(a_2)=0.04$, $P(a_3)=0.26$, $P(a_4)=0.05$ and $P(a_5)=0.50$ (i) Calculate the entropy of this source (ii) Find a Huffman Code for this source. (iii) Find the average length of the code	2
(c)	Explain various types of dictionary-based coding techniques in detail.	3
(d)	Describe Adaptive Quantization in detail and how it is different from uniform Quantization technique.	4
(e)	What is Vector Quantization? Explain procedure for vector Quantization.	5

SECTION C**3. Attempt any one part of the following:****10*1 = 10**

Qno	Questions	CO
(a)	What is data compression and why we need it? Describe various models of data compression.	1
(b)	What do you mean by Uniquely Decodable code? Determine whether the following codes are uniquely decodable or not: (i) $\{0,01,11,111\}$ (ii) $\{0,01,110,111\}$ (iii) $\{1,10,110,111\}$ (iv) $\{0,01,10\}$	1



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4. Attempt any *one* part of the following: 10 *1 = 10

Qno	Questions	CO
(a)	Draw the Huffman tree for the following symbols whose frequency occurrence in a message text is started along with their symbol below: A:15, B:6, C:7, D:12, E:25, F:4, G:6, H:10, I: 15 Decode the message 1110100010111011	2
(b)	Design 3-bit Tunstall code for a memory less source with the following alphabet: S= {A,B,C} with their P(A)=0.6, P(B)= 0.3 , P(C)= 0.1	2

5. Attempt any *one* part of the following: 10*1 = 10

Qno	Questions	CO										
(a)	<p>A sequence is encoded using LZW algorithm and the initial dictionary shown in the table.</p> <table><tr><th>Index</th><th>Entry</th></tr><tr><td>1</td><td>a</td></tr><tr><td>2</td><td>b</td></tr><tr><td>3</td><td>r</td></tr><tr><td>4</td><td>t</td></tr></table> <p>The output of LZW encoder is the following sequence: 3 1 4 6 8 4 2 1 2 5 10 6 11 13 6 Decode this sequence. Discuss relative advantages of LZ77, LZ78 and LZW Compression schemes.</p>	Index	Entry	1	a	2	b	3	r	4	t	3
Index	Entry											
1	a											
2	b											
3	r											
4	t											
(b)	<p>What is Facsimile Encoding? Explain Run-Length Coding technique used earlier for Facsimile. Describe BWT with the help of an example.</p>	3										

6. Attempt any *one* part of the following: 10*1 = 10

Qno	Questions	CO
(a)	Describe the steps involved in Basic Algorithm for Prediction with Partial Match (PPM).	4
(b)	What do you mean by Quantization? Describe Uniform quantization with its types in detail.	4

7. Attempt any *one* part of the following: 10*1 = 10

Qno	Questions	CO
(a)	Explain the steps of Lingo-Buzo-Gray algorithm.	5
(b)	Write short notes on any two : (I) Structure vector quantization (II) Pyramid vector quantization (III) Advantages of Vector quantization	5