Reg.No.:												

VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN
[AUTONOMOUS INSTITUTION AFFILIATED TO ANNA UNIVERSITY, CHENNAI]
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Question Paper Code: 70058

M.E. / M.Tech. DEGREE END-SEMESTER EXAMINATIONS – JAN. / FEB. 2026
First Semester
VLSI Design
P23VDE06 - MULTIMEDIA COMPRESSION TECHNIQUES
(Regulation 2023)

Time: Three Hours | Maximum: 100 Marks

Answer ALL the questions

Knowledge Levels (KL)	K1 – Remembering	K3 – Applying	K5 - Evaluating
	K2 – Understanding	K4 – Analyzing	K6 - Creating

PART – A

(10 x 2 = 20 Marks)

Q.No.	Questions	Marks	KL	CO
1.	Mention the distinctive features that characterize multimedia systems.	2	K2	CO1
2.	State the core principles involved in the representation of text data.	2	K2	CO1
3.	Using a simple binary sequence, illustrate the process of arithmetic coding.	2	K2	CO2
4.	Show how adaptive Huffman coding modifies its tree structure after encoding a new symbol.	2	K2	CO2
5.	Compare and μ-Law and A-Law companding techniques.	2	K2	CO3
6.	What is the significance of progressive encoding in the context of audio data processing?	2	K1	CO3
7.	Give the benefits of sub-band coding algorithms in the compression of images.	2	K1	CO4
8.	Highlight the key differences of lossy and lossless image compression methods.	2	K2	CO4
9.	Why video compression is essential in multimedia communication systems?	2	K2	CO5
10.	Mention the importance of packet video in the evolution of video compression technologies.	2	K2	CO5

PART – B

(5 x 13 = 65 Marks)

Q.No.		Questions	Marks	KL	CO
11.	a)	Provide an overview of the storage requirements for different types of multimedia data and applications, supported by examples. Explain the necessity of employing compression techniques in multimedia systems.	13	K2	CO1
		(OR)			
	b)	Differentiate between lossless (error-free) and lossy compression methods, providing appropriate examples. Present a classification of multimedia compression techniques and describe the key characteristics of each category.	13	K2	CO1
12.	a)	Construct a Huffman code for a source emitting symbols from the 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 $P(a_4) = P(a_5) = 0.1$.	13	K3	CO2
		(OR)			
	b)	How do the LZ77 and LZ78 dictionary-based compression algorithms operate on an input, and how does the dictionary evolve throughout the encoding process? Illustrate with an example.	13	K3	CO2
13.	a)	Analyze the core operational structure of a Basic Sub-band Coding (SBC) system and differentiate the function of filter banks in SBC from that of single-stage Frequency Domain Filtering.	13	K4	CO3
		(OR)			
	b)	Discuss the reasons behind categorizing G.722 as a speech-specific standard and explain the significance of progressive encoding in the MPEG audio standard.	13	K4	CO3
14.	a)	Compare the bit stream generation strategies of the JPEG standard with those of EZW and SPIHT coders. Analyze how the progressive nature of the EZW/SPIHT bitstream offers a significant advantage in network transmission scenarios.	13	K4	CO4
		(OR)			
	b)	Describe the functions of the Quantization step and the Tier-I Coder in producing the compressed bitstream. Additionally, analyze the key features and differences among various MPEG standards.	13	K4	CO4
15.	a)	Describe the frame types and temporal coding structures employed in the MPEG-1 and MPEG-2 video coding standards. Additionally, explain the key encoding stages of the H.261 standard encoder.	13	K2	CO5

(OR)

b)	Provide a detailed explanation of the full block diagram of the H.261 video encoder, thoroughly describing the role and interaction of each major component—particularly focusing on the Discrete Cosine Transform (DCT) and the Quantization process within the feedback loop.	13	K2	CO5

PART – C

(1 x 15 = 15 Marks)

Q.No.		Questions	Marks	KL	CO
16.	a)	A studio opts for a state-of-the-art MPEG video standard to optimize final content distribution. Critically analyze the function of Motion Compensation within the MPEG framework, detailing its algorithmic role in temporal redundancy reduction. Furthermore, discuss how Motion Compensation synergizes with the principle of Error-Free Compression (lossless coding techniques) to maximize compression efficiency. In your explanation, evaluate how this combination maintains visual fidelity despite aggressive data reduction, and identify the trade-offs involved in balancing compression ratio, computational complexity, and perceptual quality in practical implementations.	15	K2	CO5
		(OR)			
	b)	A new messaging app aims to optimize bandwidth by compressing message data using LZW (Lempel-Ziv-Welch) compression. Given the sample message sequence below: ABABABAABABAB Demonstrate the step-by-step LZW compression process on this message sequence, showing how the dictionary evolves, what codes are output at each step, and the final compressed output. Explain how the dictionary-based nature of LZW compression is particularly advantageous for dynamic text data such as chat messages, considering both compression efficiency and computational overhead.	15	K3	CO2