| Reg.No.: | | | | | | | | | | | | |
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VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN
[AUTONOMOUS INSTITUTION AFFILIATED TO ANNA UNIVERSITY, CHENNAI]
Elayampalayam – 637 205, Tiruchengode, Namakkal Dt., Tamil Nadu.

**Question Paper Code: 70064**

M.E. / M.Tech. DEGREE END-SEMESTER EXAMINATIONS – FEB. 2025
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. | Identify communication networks available for multimedia. | 2 | K2 | CO1 |
| 2. | Distinguish between formatted text and unformatted text. | 2 | K2 | CO1 |
| 3. | How arithmetic coding is advantages over Huffman coding for text compression? | 2 | K3 | CO2 |
| 4. | Categorize the applications of LZW. | 2 | K3 | CO2 |
| 5. | What is the principle of adaptive predictive coding? | 2 | K4 | CO3 |
| 6. | If the sampling frequency is 1.5 times the true frequency then what is the alias frequency? | 2 | K4 | CO3 |
| 7. | Summarize the significance and applications of GIF and TIFF image file formats. | 2 | K4 | CO4 |
| 8. | What are the key improvements of the SPIHT coder over the EZW coder? How does SPIHT achieve progressive image transmission? | 2 | K4 | CO4 |
| 9. | How do the compression techniques used in MPEG-2 differ from those in H.261? In what scenarios would one be preferred over the other for video compression? | 2 | K2 | CO5 |
| 10. | What is digital video interactive (DVI) technology, and how does it differ from traditional analog video technologies? | 2 | K2 | CO5 |

## PART – B

(5 x 13 = 65 Marks)

| Q.No. | | Questions | Marks | KL | CO |
|---|---|---|---|---|---|
| 11. | a) | Compare the use of lossy and lossless compression techniques for image and graphics data. When would lossless compression be preferred over lossy, and what are the implications for image quality and file size in each case? | 5+4+2+2 | K2 | CO1 |
| | | (OR) | | | |
| | b) | Provide a comprehensive explanation of how text, images, graphics, video, and digital audio are represented in multimedia systems. Highlight the specific data formats used for each (e.g., ASCII for text, RGB for images, etc.) and their implications for storage and transmission. | 6+7 | K2 | CO1 |
| 12. | a) | Explain the Shannon-Fano coding technique. Compare its approach to building a codebook with that of Huffman coding. Using an example, show how Shannon-Fano coding is performed and discuss the conditions under which it is less efficient than Huffman coding. | 13 | K3 | CO2 |
| | | (OR) | | | |
| | b) | Discuss the concept of dictionary-based compression techniques. How do dictionary methods like LZ77, LZ78, and LZW work? Provide a detailed comparison of how each algorithm builds and utilizes a dictionary for compressing data streams. | 5+8 | K3 | CO2 |
| 13. | a) | Explain μ-law and A-law companding techniques used in audio compression. Compare their characteristics, focusing on how each technique compresses the dynamic range of audio signals. Discuss their relevance in telecommunication systems, particularly in relation to PCM (Pulse Code Modulation). | 5+4+4 | K4 | CO3 |
| | | (OR) | | | |
| | b) | Discuss the G.722 speech coding standard. Explain how it achieves compression for wideband speech, focusing on the techniques used (e.g., sub-band adaptive differential pulse code modulation or SB-ADPCM). What are its typical applications, and why is it suitable for wideband speech? | 4+4+5 | K4 | CO3 |
| 14. | a) | How are filters used in image compression, particularly in wavelet-based and sub-band coding techniques? Discuss how filtering helps decompose an image into its frequency components. Provide examples of commonly used filter banks, such as Daubechies wavelets. | 4+4+5 | K4 | CO4 |

(OR)

| | | | | | |
|---|---|---|---|---|---|
| | b) | Explain the JBIG and JBIG2 standards for bi-level image compression. How does JBIG2 improve upon JBIG in terms of compression efficiency? Discuss how JBIG2 utilizes pattern matching and substitution techniques to compress scanned documents and text images effectively. | 13 | K4 | CO4 |
| 15. | a) | Discuss the MPEG-4 video coding standard. Explain how MPEG-4 improves on earlier standards in terms of multimedia applications, object-based coding, and handling of low bit-rate video. Provide examples of the use of MPEG-4 in web video streaming and interactive media applications. | 13 | K2 | CO5 |
| | | (OR) | | | |
| | b) | Explain the MPEG-7 standard and how it differs from traditional video compression standards like MPEG-1 and MPEG-4. Focus on how MPEG-7 is used for content description and retrieval rather than compression, and discuss its applications in multimedia search engines, video indexing, and content-based video retrieval. | 13 (6+7) | K2 | CO5 |

## PART – C

(1 x 15 = 15 Marks)

| Q.No. | | Questions | Marks | KL | CO |
|---|---|---|---|---|---|
| 16. | a) | A telecommunications company is upgrading its system for international voice transmission, and they need to choose between μ-law and A-law companding techniques for digital audio encoding. Analyze the use of both techniques and recommend which one would be more appropriate for their needs, considering factors such as regional differences, compression efficiency, and audio quality. | 15 (6+3+ 3+3) | K4 | CO3 |
| | | (OR) | | | |
| | b) | A series of message is to be transferred between two computers. The message comprises of the characters A, B, C, D and E. The probabilities of occurrence of the above characters are 0.4. 0.19, 0.16, 0.15 and 0.1 respectively. Use Huffman coding to obtain a codeword for the above characters. Determine the average number of bits per codeword. Complete the compression ratio and entropy. | 15 (5+4+ 6) | K4 | CO4 |