

**B.E. Information Technology**  
**Third Year Second Semester Examination 2023**  
**Subject: Multimedia Coding & Communications**

Time: 3 hours

Full Marks: 100

***Different parts under the same CO should be answered together.***

|             |   |  |
|-------------|---|--|
| CO1<br>[27] | <p>1.</p> <p>a. What are the different video transition schemes? Explain any 4 of them in detail. 9</p> <p>b. Explain the difference between Vector image and Raster Image with suitable diagram. 4</p> <p>c. Describe 8-bit Gray Level Images. 5</p> <p>d. What do you know about synthetic sound. 3</p> <p>e. What is multimedia authoring? Mention different multimedia authoring metaphors and explain each of them in brief. 2 + 4 = 6</p> <p>OR</p> <p>2.</p> <p>a. Explain GIF 87 file format in detail with suitable diagrams. 9</p> <p>b. What is Dithering and what is the relation of it with half-tone printing. 4</p> <p>c. Write short note on MIDI Messages. 5</p> <p>d. Differentiate between Multimedia Programming and Multimedia Authoring. 3</p> <p>e. What is multimedia authoring? Mention different multimedia authoring metaphors and explain each of them in brief. 2 + 4 = 6</p>                            |  |
| CO2<br>[37] | <p>3.</p> <p>(a) Execute LZW compression and decompression algorithm on the string "MISSISSIPPI" where the value of the string table is [M-1, S-2, I-3, P-4]. 8</p> <p>(b) A 4-symbol alphabet has the following probabilities <math>P(a_1) = 0.1</math>, <math>P(a_2) = 0.5</math>, <math>P(a_3) = 0.25</math>, <math>P(a_4) = 0.15</math> and following codes are assigned to the symbols <math>a_1 = 110</math>, <math>a_2 = 0</math>, <math>a_3 = 10</math>, <math>a_4 = 111</math>. What is the average code word length for this source? 4</p> <p>OR</p> <p>Construct a Shannon-fano tree and Hauffman tree for the word "APPLE". The code in real decimal numbers for the word "APPLE" formed out of a 4-symbol alphabet – "A", "P", "L" and "E" having probabilities 0.2, 0.4, 0.2, and 0.2 respectively. Compare the codeword length, its entropy, and coding efficiency expressed for the same word by both schemes. 12</p> |  |

[ Turn over

4.  
A long sequence of symbols generated from a source is seen to have the following occurrences.

| Symbol | Occurrences |
|--------|-------------|
| a1     | 3003        |
| a2     | 996         |
| a3     | 2017        |
| a4     | 1487        |
| a5     | 2497        |

15

- (a) Assign Huffman codes to the above symbols, following a convention that the group/symbol with higher probability is assigned a “0” and that with lower probability is assigned a “1”.
- (b) Calculate the entropy of the source.
- (c) Calculate the average code word length obtained from Huffman coding.
- (d) Calculate the coding efficiency.

5.  
Show the step-by-step execution of encoding and decoding of the Arithmetic coding algorithm on the string “EAOU” where the probability distribution of the symbols are given the following table:

| Symbol | Probability |
|--------|-------------|
| A      | 0.12        |
| E      | 0.42        |
| I      | 0.09        |
| O      | 0.3         |
| U      | 0.07        |

10

7.  
A given 4 x 4 image array and its corresponding reconstructed image array obtained through a lossy compression scheme are given below:

|   |   |     |     |    |  |                     |     |     |    |                 |   |
|---|---|-----|-----|----|--|---------------------|-----|-----|----|-----------------|---|
| CO3<br>[14]   | 148   | 129 | 133 | 89 |  | 146                 | 130 | 133 | 85 | 9               |   |
|   | 153   | 138 | 103 | 84 |  | 155                 | 139 | 105 | 84 |                 |   |
|   | 155   | 141 | 92  | 78 |  | 154                 | 142 | 98  | 80 |                 |   |
|   | 162   | 139 | 86  | 81 |  | 162                 | 139 | 84  | 78 |                 |   |
|   | Original Image  |     |     |    |  | Reconstructed Image |     |     |    |                 |   |
| <p>Calculate the (a) <i>MSE</i>, (b) <i>SNR</i> and (c) <i>PSNR</i> of the reconstructed image array.</p> <p>8.</p> <p>(a) What is quantization? What are the different forms of quantization in lossy compression?</p> <p>OR</p> <p>(b) Explain Rate-Distortion Theory and mention why it plays an important role in lossy compression techniques.</p> |   |     |     |    |  |                     |     |     |    |                 | 5 |
| CO4<br>[12]   | <p>9. Differentiate between the following (Any three):</p> <ol style="list-style-type: none"> <li>Frequency Masking vs Temporal Masking</li> <li>MP3 vs MPEG</li> <li>JPEG - LS Standard vs JPEG - 2000 Standard</li> <li>Motion Compensation vs Motion Estimation</li> <li>MPEG 4 vs MPEG 7</li> </ol> |     |     |    |  |                     |     |     |    | 3 x 4 =<br>12   |   |
| CO5<br>[10]   | <p>10. Write short note on:</p> <ol style="list-style-type: none"> <li>Distributed Multimedia Application</li> <li>Multimedia Database System</li> <li>Multimedia Feature Extraction</li> <li>Multimedia Playback System</li> <li>Multimedia Data Transmission Network</li> </ol>                       |     |     |    |  |                     |     |     |    | 2.5 x 4 =<br>10 |   |