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B. Sc. in CSE Semester Final Examination, Autumn 2021
Course Code: CSE-4875 Course Title: Pattern Recognition and Image Processing
Total marks: 50 Time: 2.5 hours

[Answer all questions.]

Group A

1. a) "Data is a combination of information and redundant data" – do you agree? Justify your answer with proper example. 3

OR

Write the steps of JPEG algorithm.

- b) Consider the text "Dept of CSE". 4
- What is the probability of occurrence of each character?
 - Using these probabilities, construct the Huffman coding table for transmitting this text?
 - Write the encoded sequence.
 - From encoded sequence do decoding.

- c) A source contains four symbols (i, i, u, c) with the corresponding probability of 0.3, 0.2, 0.4, and 0.1 respectively. Construct arithmetic coding to encode and decode a specific word. 4

OR

Encode the following image using LZW coding.

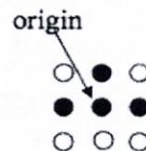
126 75 36 75
126 75 36 75
126 75 36 75
126 75 36 75

2. a) "The shape of structuring element has significant impact of every morphological operation"- Explain the statement with necessary examples. 3

OR

Explain hit or miss transformation in brief with necessary example.

- b) Binary Image X and Structuring Element B are given below. 5



B

X

Calculate $Y1 = X \circ B$ Where $\circ$ denotes morphological opening operation..

- c) Show the Histogram of a 3-bit image of the following table:

Gray level	0	1	2	3	4	5	6	7
number of pixels	5	4	3	2	1	6	3	2

Group B

3. a) "Segmentation is one of the most important steps in object recognition"-describe in brief. 3

OR

What are edges? How different types of edges can be segmented? Give necessary example.

- b) Why edge linking is important in many image processing operations? Explain local edge-linking algorithm. 4
- c) What is region? How region can be segmented? Give any algorithm for region segmentation. 3
4. a) i. Represent the boundary in Figure 1 with an eight directional chain code. 5
 ii. What does rotational invariant mean in this case? Make the chain code in a rotational invariant.

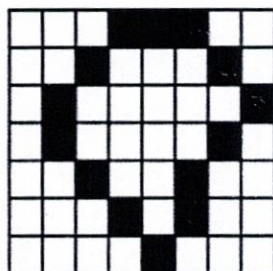


Figure 1

- b) What is LBP? Write the steps to calculate LBP. Give necessary example. 3
- OR**
- Describe your method of computing the skeleton of the images. What kind of structural elements will you be using? What happens when you change the size of the structuring element?
- c) Explain String and Tree representation of any object with example. 2
5. a) Build the decision functions and decision boundary for two pattern class w_1 and w_2 . Where two mean vectors $m_1 = [6.1, 1.6, 6]$ and $m_2 = [1.2, 0.2, 2.0]$. Find the class of an unknown pattern $X = [3.1, 0.4, 2.8]$ 3
- b) How matching by correlation works on pattern recognition? Explain with necessary example. 4
- OR**
- Explain Syntactical pattern recognition. Write the steps to recognize the string in brief.
- c) Write the applications of pattern recognition in autonomous car. 3