

**BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION)**

CLASS: MCA
BRANCH: MCA

SEMESTER : II
SESSION : SP/2023

SUBJECT: CA439 IMAGE PROCESSING

TIME: 3 Hours

FULL MARKS: 50

INSTRUCTIONS:

1. The question paper contains 5 questions each of 10 marks and total 50 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
4. Before attempting the question paper, be sure that you have got the correct question paper.
5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.

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| | CO | BL |
| Q.1(a) Explain Spatial and Intensity resolution. Discuss the effect of reducing image spatial resolution. | [5] | 1 2 |
| Q.1(b) Consider the image segment shown below: | [5] | 1 3 |

3	4	1	2	0
0	1	0	4	2
2	2	3	1	4
3	0	4	2	1
1	2	0	3	4

Let $V = \{0,1,2\}$, and assume that the top left corner pixel is represented by (1,1) coordinates. Compute the path lengths of the shortest 4, 8, m path between p and q, where p and q are at the coordinate location (4,1) and (2,5) respectively. If a path does not exist, explain why.

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| Q.2(a) Illustrate the need for Discrete Fourier Transform in context to image processing. Highlight the image sharpening filters in the frequency domain. | [5] | 2 | 4 |
| Q.2(b) Highlight the need of histogram equalization. Perform histogram equalization for the 8 X 8 image segment shown below: | [5] | 2 | 5 |

0	1	1	2	4	4	5	5
2	1	1	0	0	1	7	7
4	1	1	2	1	1	4	4
4	5	5	6	6	1	4	5
4	5	2	2	6	6	0	5
4	0	2	2	0	5	4	4
4	5	5	5	5	5	2	0
3	3	0	5	5	5	2	2

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| Q.3(a) Differentiate between image enhancement and restoration. Explain the model of image degradation and restoration process using suitable block diagram. | [5] | 3 | 4 |
| Q.3(b) Explain about periodic noise reduction using frequency domain filtering. | [5] | 3 | 2 |
| Q.4(a) Highlight the usefulness of Image Compression. Perform image compression using vector quantization method. | [5] | 4 | 3 |
| Q.4(b) Explain the different types of redundancy that can exist in an image. Calculate the coding redundancy for the data given below: | [5] | 4 | 3 |

Symbol	1	2	3	4	5	6
Prob.	0.4	0.2	0.2	0.1	0.05	0.05
Code 1	000	001	010	011	100	101
Code 2	0	10	101	110	11110	11111

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|---|-----|---|---|
| Q.5(a) Show that erosion and dilation are dual (opposite) to each other | [5] | 5 | 5 |
| Q.5(b) Explain the Region Splitting and Merging Algorithm. | [5] | 5 | 2 |