

**Instructions to the Students:**

1. All the questions are compulsory.
2. The level of question/expected answer as per OBE or the Course Outcome (CO) on which the question is based is mentioned in ( ) in front of the question.
3. Use of non-programmable scientific calculators is allowed.
4. Assume suitable data wherever necessary and mention it clearly.

(Level/CO) Marks

**Q. 1 Solve Any Two of the following.**

- A) 1. Define Image, Brightness, Dynamic Range, Gray level, Hue, Saturation. (L1/CO1) 6
2. Compute the Euclidean Distance (D1), City-block Distance (D2) and Chessboard distance (D3) for points p and q, where p and q be (5, 2) and (1, 5) respectively. Give answer in the form (D1, D2, D3).
- B) Draw and explain the fundamental steps in digital image processing. (L1/CO2) 6
- C) What is the need of Fourier transform? Explain all the properties of DFT with proof. (L1/CO1) 6

**Q.2 Solve Any Two of the following.**

- A) Write a short note on (L2/CO2) 6
1. Match Band Effect
  2. Simultaneous contrast point
  3. Sampling and Quantization
- B) Perform Opening and Closing morphological operations on the given image. Use without replication. (L1/CO3) 6

0	1	1	1	0
0	1	1	1	0
0	1	1	1	0
0	1	1	1	0
0	1	1	1	0

Image

0	1	0
1	1	1
0	1	0

Mask

- C) Explain CMY model and the HSI colour image model in detail. (L1/CO1) 6

**Q. 3 Solve Any Two of the following.**

- A) Write a note on Max Lyod quantizer and derive the equations for decision and reconstruction level. (L2/CO2) 6
- B) Explain Hit-Miss algorithm. Solve the following using Hit-Miss algorithm. (L2/CO3) 6

Image= 

1	1	1	0
1	1	0	1
1	1	0	0

    B= 

①	0
0	1

    W= 

1	1
1	1

- C) Write short notes on Thinning, Thickening and Region filling morphological operations. (L1/CO1) **6**

**Q.4 Solve Any Two of the following.**

- A) Compute Discrete Cosine Transform matrix for N=4. (L1/CO2) **6**  
 B) For a given 2x2 image U and 2x2 transformation matrix A. Find the transformed matrix and reconstruct the given image using  $A_{00}$  and  $A_{01}$  only. (L3/CO3) **6**

$$A = \frac{1}{2} \begin{bmatrix} \sqrt{3} & 1 \\ -1 & \sqrt{3} \end{bmatrix}, \quad U = \begin{bmatrix} 2 & 3 \\ 1 & 2 \end{bmatrix}$$

- C) Write notes on Walsh Transform and Hadamard Transform for 1D and 2D. (L1/CO1) **6**

**Q. 5 Solve Any Two of the following.**

- A) Explain in detail types of Smoothing filters and Sharpening filters. (L2/CO2) **6**  
 B) 1. What is meant by Image Restoration? Draw the degradation model and explain. (L2/CO3) **6**  
     2. Write short note on Wiener Filtering.  
 C) For the one-dimensional function  $f(x)$ , given below. Using modified cubic interpolation, find out the value at location  $x = 6.3$ . (L2/CO2) **6**

<b>x</b>	1	2	3	4	5	6	7	8	9	10
<b>F(x)</b>	1.5	2.5	3	2.5	3	2.4	2	2.5	1	2.4

\*\*\* End \*\*\*