

**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.**

12

- A) Draw and explain the block diagram of fundamental steps in Digital Image Processing. L2 / CO1 6
- B) Differentiate 4- neighbors, diagonal neighbors & 8-neighbors of the pixel. L2 / CO1 6
- C) Describe applications of Image Processing & Computer Vision. L1 / CO1 6

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

12

- A) Compute Convolution and correlation of  $f(x, y)$  and  $w(x, y)$ . L3 / CO2 6
- $f(x, y) = \begin{bmatrix} 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{bmatrix}$  and  $w(x, y) = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{bmatrix}$
- B) Define gray-level intensity transformation. Elaborate methods of gray level intensity transformation. (Linear, Logarithmic & Power law correction). L2 / CO2 6
- C) Compute DFT on image  $f(x, y) =$  L4 / CO2 6

1	1	1	1
1	1	1	1
1	1	1	1
1	1	1	1

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

12

- A) Compute the opening and closing of A & B. L3 / CO3 6
- $A = \begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 1 & 0 & 0 \\ 0 & 1 & 1 & 1 & 1 & 0 \\ 0 & 1 & 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$  &  $B = \begin{bmatrix} 1 \\ 1 \\ 1 \\ 1 \\ 1 \end{bmatrix}$
- B) Explain the Extraction of the Connected components algorithm in brief with an example. L2 / CO3 6
- C) Perform Hit and Miss Transformation on  $f(x, y)$  with the given structuring elements. L4 / CO3 6

$$f(x,y) = \begin{matrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 1 & 1 & 1 & 1 & 0 \\ 0 & 1 & 1 & 1 & 0 & 0 \\ 0 & 1 & 1 & 1 & 0 & 0 \\ 0 & 1 & 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{matrix} \quad \& \quad B1 = \begin{matrix} \times & 1 & \times \\ 0 & 1 & 1 \\ 0 & 0 & \times \end{matrix} \quad B1 = \begin{matrix} \times & 1 & \times \\ 1 & 1 & 0 \\ \times & 0 & 0 \end{matrix}$$

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

**12**

- |   |                 |          |
|---|-----------------|----------|
| A) What is image segmentation? Explain point and line detection.      | <b>L2 / CO4</b> | <b>6</b> |
| B) Write a note on the Signature for Region or object representation. | <b>L3 / CO4</b> | <b>6</b> |
| C) Explain segmentation by region growing with an example.            | <b>L3 / CO4</b> | <b>6</b> |

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

**12**

- |  |                 |          |
|--|-----------------|----------|
| A) Explain pattern and pattern classes. (vector, string and trees)         | <b>L2 / CO5</b> | <b>6</b> |
| B) Explain Bayes statistical classifiers in the Machine Learning approach. | <b>L3 / CO5</b> | <b>6</b> |
| C) Write a note on Neural Networks and Deep Learning.                      | <b>L3 / CO5</b> | <b>6</b> |

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