# DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE

## Regular End Semester Examination – Summer 2022

**Course: B. Tech.**  **Branch : EXTC /EXTC(SANDWICH)**  **Semester :VI**

**Subject Code & Name:  BTETC603 Digital Image Processing**

**Max Marks: 60**  **Date:23/08/2022**  **Duration: 3.45  Hr.**

*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**

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

**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 Smoothening 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**

| x | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|------|-----|-----|---|-----|---|-----|---|-----|---|-----|
| F(x) | 1.5 | 2.5 | 3 | 2.5 | 3 | 2.4 | 2 | 2.5 | 1 | 2.4 |

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