

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**

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

- 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**

| | | | | | | | | | | |
|-------------|-----|-----|---|-----|---|-----|---|-----|---|-----|
| 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 ***