CBCS SCHEME

USN | | | | | | | | | | |

21CS732

Seventh Semester B.E./B.Tech. Degree Examination, June/July 2025
Digital Image Processing

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Explain the fundamental steps in Digital Image Processing. **(10 Marks)**

b. Outline the basic concepts of Image Sampling and Quantization. **(10 Marks)**

OR

2 a. Describe the following terms with proper examples:
- i) Neighbors of a pixel
- ii) Adjacency, connectivity of pixels
- iii) Different distance measures
- iv) Regions and boundaries
- v) Application of digital image processing. **(10 Marks)**

b. Consider the two image subsets S1 and S2 shown in Fig.Q.2(b). For V → {1}, find if two subsets S1 and S2 are i) 4-adjacent ii) 8-adjacent iii) m-adjacent

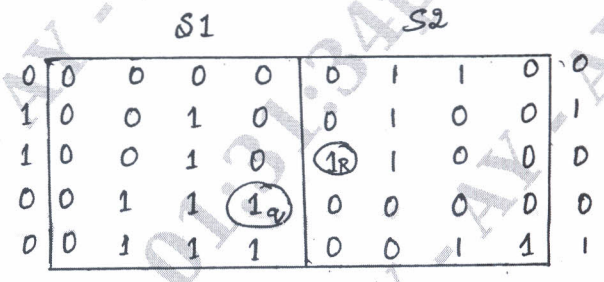

Fig.Q.2(b)

(05 Marks)

c. Let P and Q be two pixels at co-ordinates (10, 15) and (15, 25) respectively. Find out which distance measure gives the minimum distance between pixels. **(05 Marks)**

Module-2

3 a. Explain the following with proper examples with neat diagram:
- i) Piece-wise linear contrast stretching
- ii) Grey level slicing
- iii) Histogram processing
- iv) Histogram equalization
- v) Histogram matching specification. **(10 Marks)**

b. Let Image F be F = {0, 0, 1, 0, 0} and the Kernel be {1, 2, 3, 2, 8}. Compute the result of image convolution and correlation applied on the given image using kernel. **(10 Marks)**

OR

4 a. State and explain 2D discrete Fourier transform properties and obtain equation for 2D DFT and its inverse from the continuous transform of sampled function of one variable. **(10 Marks)**

b. Explain the steps involved in image filtering in frequency domain. **(05 Marks)**

c. Define the following sharpening frequency domain filters:
   i) Ideal lowpass filter
   ii) Butterworth lowpass filter
   iii) Gaussian lowpass filter. **(05 Marks)**

Module-3

5 a. Briefly explain the different noise probability density functions with proper equation and graphs. **(10 Marks)**

b. Explain the different types of mean filter and order statistic filters. **(10 Marks)**

OR

6 a. Explain in detail about the Wiener filter approach. **(10 Marks)**

b. Discuss the algebraic approach of constrained least square filter restoration. **(10 Marks)**

Module-4

7 a. Describe in detail the HSI color models. **(10 Marks)**

b. Explain in detail about image pyramids and the Haar transform. **(10 Marks)**

OR

8 a. Explain the process of image erosion and dilation, image opening and image closing with proper example. **(10 Marks)**

b. Discuss the following morphological algorithms:
   i) Bounding extraction
   ii) Hole filling
   iii) Convex hull
   iv) Thinning
   v) Thickening. **(10 Marks)**

Module-5

9 a. Explain the concept of image segmentation, detetion of discontinuities and the different steps in edge detection. **(10 Marks)**

b. Discuss the following:
   i) Canny edge detection
   ii) Global thresholding algorithm
   iii) Otsu algorithm. **(10 Marks)**

OR

10 a. Illustrate, the following representation approaches with proper examples:
   i) Boundary (Border) following
   ii) Chain Codes **(10 Marks)**

b. Explain in detail about boundary descriptors. **(10 Marks)**

* * * * *