Hall Ticket No | | | | | | | | | | | Question Paper Code: AECC56

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)
Dundigal-500043, Hyderabad

B.Tech VII SEMESTER END EXAMINATIONS (REGULAR) - DECEMBER 2023
Regulation: UG-20
DIGITAL IMAGE PROCESSING

Time: 3 Hours **(ELECTRONICS AND COMMUNICATION ENGINEERING)** **Max Marks: 70**

Answer ALL questions in Module I and II
Answer ONE out of two questions in Modules III, IV and V
All Questions Carry Equal Marks
All parts of the question must be answered in one place only

MODULE – I

1. (a) Summarize image transform and illustrate the Hadamard transform with its properties. [BL: Understand| CO: 2|Marks: 7]

   (b) The image $f(x, y) = 4cos2\pi(2x + y)$ is to be sampled such that one can reconstruct the signal from its samples without errors. Suggest a sampling scheme. [BL: Apply| CO: 1|Marks: 7]

MODULE – II

2. (a) Classify the image-enhancement techniques and discuss about image enhancement in spatial domain. [BL: Understand| CO: 3|Marks: 7]

   (b) Filter the image shown in Figure 1 using a 3X3 neighborhood averaging by assuming zero padding. [BL: Apply| CO: 3|Marks: 7]

$$\begin{bmatrix} 1 & 2 & 3 & 2 \\ 4 & 2 & 5 & 1 \\ 1 & 2 & 6 & 3 \\ 2 & 6 & 4 & 7 \end{bmatrix}$$

Figure 1

MODULE – III

3. (a) List the steps involved in region splitting and merging. Mention the principles of region based image segmentation. [BL: Understand| CO: 4|Marks: 7]

   (b) Apply the split-and-merge technique for the given image shown in Figure 2. [BL: Apply| CO: 4|Marks: 7]

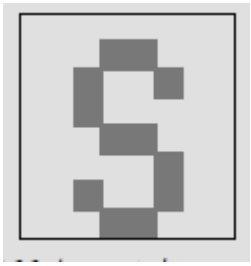

Figure 2

4. (a) Explain the morphological image processing dilation and erosion with neat sketch. [BL: Understand| CO: 4|Marks: 7]

   (b) The input image and structuring element are given in Figure 3. Find the eroded version of the input image. [BL: Apply| CO: 4|Marks: 7]

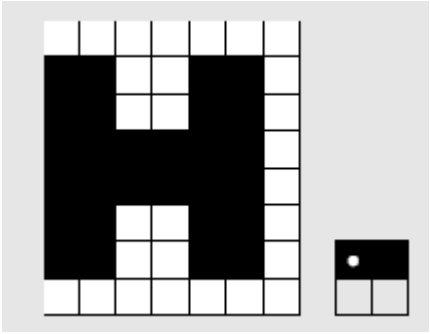

Figure 3

MODULE – IV

5. (a) What is the purpose of image restoration? Demonstrate the model of image degradation and restoration process using suitable block diagram. [BL: Understand| CO: 5|Marks: 7]

   (b) Filter the 4 × 4 image given in Figure 4a using a median filter with the filter maskgiven in Figure 4b. Assume replicate padding. [BL: Apply| CO: 5|Marks: 7]

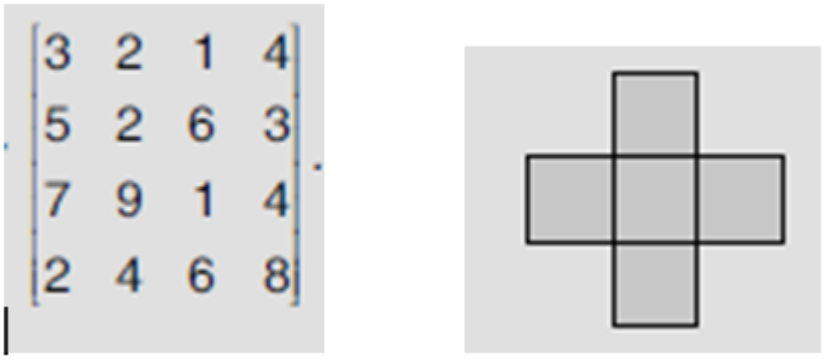

Figure 4

6. (a) Summarize the various noise models and its probability density functions used in digital image processing techniques. [BL: Understand| CO: 5|Marks: 7]

(b) A blur filter is given by h(m, n). Find the deblur filter using Weiner filter approach with $\sigma_x^2 =$ 200 and $\sigma_w^2 =$100. [BL: Apply| CO: 5|Marks: 7]

MODULE – V

7. (a) Classify the data redundancies in digital images with suitable examples and explain fidelity criteria. [BL: Understand| CO: 6|Marks: 7]

   (b) Elaborate the 2D continuous wavelet transform (CWT) with relevant expressions. Also compare CWT with discrete wavelet transform (DWT). [BL: Apply| CO: 6|Marks: 7]

8. (a) With neat sketch explain the function block diagram of general image compression systems. [BL: Understand| CO: 6|Marks: 7]

   (b) Develop Huffman code and Shanon–Fano code for the word 'COMMITTEE'. [BL: Apply| CO: 6|Marks: 7]

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