

B.Tech IV Year I Semester (R13) Regular Examinations November/December 2016

DIGITAL IMAGE PROCESSING

(Electronics and Communication Engineering)

Time: 3 hours

Max. Marks: 70

PART – A

(Compulsory Question)

1 Answer the following: (10 X 02 = 20 Marks)

- (a) What do you mean by aliasing in the context of image sampling?
 (b) Define brightness adaptation.
 (c) Mention two important properties of unitary transforms.
 (d) The discrete Fourier transform performed for the image $f(m, n)$ is given below.

$$f[m, n] = \begin{bmatrix} 0 & 1 & 2 \\ 4 & 1 & 4 \\ 1 & 2 & 1 \end{bmatrix} \text{ What will be the value } F(0,0)?$$

- (e) What is image filtering?
 (f) What is the value of a marked pixel after 3x3 Median filter applied to image matrix A?

$$A = \begin{bmatrix} 2 & 1 & 3 \\ 1 & \textcircled{1} & 0 \\ 4 & 3 & 2 \end{bmatrix}$$

- (g) Give two applications of image segmentation methods.
 (h) What are the drawbacks of inverse filtering?
 (i) List two reasons why image compression is important.
 (j) What is Psychovisual redundancy?

PART – B

(Answer all five units, 5 X 10 = 50 Marks)

UNIT – I

2 Explain the fundamental steps involved in typical digital image processing.

OR

3 Explain the following relationships between pixels: Neighbors of a pixel, adjacency, connectivity and regions.

UNIT – II

4 Compute the 2D Discrete Fourier transform of the 4 x 4 gray scale image given below:

$$A = \begin{bmatrix} 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 \end{bmatrix}$$

OR5 The basis image of a 2D unitary transform of size 2 X 2 are H_1, H_2, H_3, H_4 . Determine the transform coefficients if the input image is $f(m, n)$. Also reconstruct the image using the first two largest coefficients.

$$\text{Consider } f(m, n) = \begin{bmatrix} 6 & 4 \\ 2 & 1 \end{bmatrix}, H_1 = \frac{1}{2} \begin{bmatrix} 1 & 1 \\ 1 & 1 \end{bmatrix}, H_2 = \frac{1}{2} \begin{bmatrix} 1 & -1 \\ 1 & -1 \end{bmatrix}, H_3 = \frac{1}{2} \begin{bmatrix} 1 & 1 \\ -1 & -1 \end{bmatrix}, H_4 = \frac{1}{2} \begin{bmatrix} 1 & -1 \\ -1 & 1 \end{bmatrix}.$$

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UNIT – III

6 Explain about image enhancement using frequency domain methods.

OR

7 Perform Histogram equalization of the 4 x 4 image

$$\begin{bmatrix} 4 & 4 & 4 & 3 \\ 3 & 4 & 5 & 4 \\ 3 & 5 & 5 & 5 \\ 3 & 4 & 5 & 4 \end{bmatrix}$$

UNIT – IV

8 Explain in detail about region based segmentation methods.

OR

9 Describe the gradient operators based edge detection with necessary equations and masks.

UNIT – V

10 Obtain the Huffman code for the word **COMMITTEE**.

OR

11 Draw and Explain the transform based image compression scheme.

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