7E7078

B.Tech VII - Semester (Main & Back) Examination, Nov. - 2019
Electronics & Comm. Engg.
7EC3A Digital Image Processing
Common for EC, EIC

Time : 3 Hours

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Maximum Marks : 80
Min. Passing Marks : 26

Instructions to Candidates:

Attempt any five questions, selecting one question from each unit. All questions carry equal marks. (Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly). Units of quantities used / calculated must be stated clearly.

UNIT - I

1. a) For a 24-bit color image of size 5 inches by 6 inches, scanning is done at the rate of 300 dots per inches. Calculate the total number of bits required to represent the image. How much time is required to transmit the image if the available data rate is 100 kbps.? [8]

    b) Discuss down sampling (or subsampling) and upsampling of an image with suitable example. [8]

(OR)

a) Consider Me image $F = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$. Apply image rotation by rotation matrix

$$R = \begin{bmatrix} \cos\theta & -\sin\theta \\ \sin\theta & \cos\theta \end{bmatrix} \text{ choose } \theta = 45° \qquad [8]$$

b) Discuss working of image acquisition system by using CCD sensors. [8]

UNIT- II
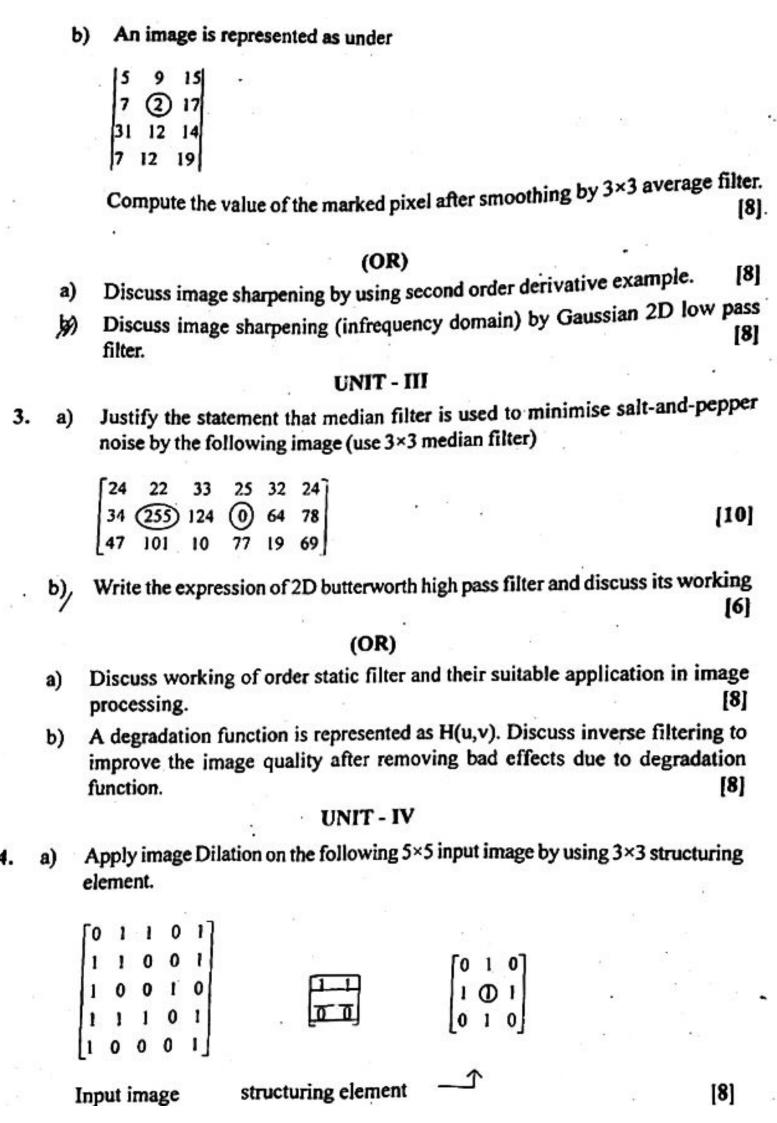
2. a) Apply histogram, equalisation to the following 4×4 image I_1 and show the resultant image I_2

$I_1 =$

1	3	4	5
5	6	6	6
7	7	7	7
5	5	5	5

Assume image as a 3-bit image. [8]

b) An image is represented as under

$$\begin{vmatrix} 5 & 9 & 15 \\ 7 & ② & 17 \\ 31 & 12 & 14 \\ 7 & 12 & 19 \end{vmatrix}$$

Compute the value of the marked pixel after smoothing by 3×3 average filter. [8]

(OR)

a) Discuss image sharpening by using second order derivative example. [8]

b) Discuss image sharpening (infrequency domain) by Gaussian 2D low pass filter. [8]

UNIT - III

3. a) Justify the statement that median filter is used to minimise salt-and-pepper noise by the following image (use 3×3 median filter)

$$\begin{bmatrix} 24 & 22 & 33 & 25 & 32 & 24 \\ 34 & ㉕㉕ & 124 & ⓪ & 64 & 78 \\ 47 & 101 & 10 & 77 & 19 & 69 \end{bmatrix}$$ [10]

b) Write the expression of 2D butterworth high pass filter and discuss its working [6]

(OR)

a) Discuss working of order static filter and their suitable application in image processing. [8]

b) A degradation function is represented as H(u,v). Discuss inverse filtering to improve the image quality after removing bad effects due to degradation function. [8]

UNIT - IV

4. a) Apply image Dilation on the following 5×5 input image by using 3×3 structuring element.

$$\begin{bmatrix} 0 & 1 & 1 & 0 & 1 \\ 1 & 1 & 0 & 0 & 1 \\ 1 & 0 & 0 & 1 & 0 \\ 1 & 1 & 1 & 0 & 1 \\ 1 & 0 & 0 & 0 & 1 \end{bmatrix}$$

$$\begin{bmatrix} 0 & 1 & 0 \\ 1 & ① & 1 \\ 0 & 1 & 0 \end{bmatrix}$$

Input image   structuring element [8]

b) Discuss image opening morphological operation by writing its mathematical representation. [8]

(OR)

a) Apply image erosion on the following 5×5 input image by using 3×3 structuring element.

$$\begin{bmatrix} 1 & 1 & 0 & 1 & 1 \\ 0 & 1 & 1 & 1 & 0 \\ 1 & 1 & 1 & 0 & 1 \\ 0 & 1 & 1 & 1 & 0 \\ 1 & 1 & 0 & 1 & 0 \end{bmatrix}$$

$$\begin{bmatrix} 0 & 1 & 0 \\ 1 & ① & 1 \\ 0 & 1 & 0 \end{bmatrix}$$

[8]

Input image   structuring element

b) Discuss image closing morphological operation by using its mathematical representation. [8]

UNIT - V

5. a) Discuss watershed transform along with its suitable application. [8]

   b) Discuss any one loss less compression technique and state advantages of loss less compression. [8]

(OR)

a) Edge detection mask is defined as

$$\begin{vmatrix} -1 & -1 & -1 \\ -1 & 8 & -1 \\ -1 & -1 & -1 \end{vmatrix}$$

Apply the above mask on the following image

$$\begin{vmatrix} 20 & 49 & 52 & 62 & 70 \\ 55 & 167 & 117 & 161 & 27 \\ 17 & 40 & 51 & 30 & 40 \end{vmatrix}$$

[8]

b) Discuss image segmentation based on global thresholding. [8]