Seat No._____

GANPAT UNIVERSITY
M. Tech Sem. II Information Technology
Regular Examination   April - June 2016
3IT201: Digital Image Processing

Max Time: 3 Hours]   [Max Marks: 60

Instructions: 1. Figures to the right indicate full marks of the question.
2. All questions are compulsory.
3. Each section should be written in a separate answer book.

SECTION: I

Q:1   (a)   Perform the following of the given image using the given mask. Also   [7]
discuss on the obtained result. Assume the same neighboring pixels
beyond the border.

$$A = \begin{bmatrix} 10 & 15 & 20 & 22 \\ 18 & 16 & 30 & 24 \\ 40 & 50 & 54 & 36 \\ 44 & 48 & 56 & 48 \end{bmatrix} \quad M = \frac{1}{9}\begin{bmatrix} 1 & 1 & 1 \\ 1 & 1 & 1 \\ 1 & 1 & 1 \end{bmatrix}$$

(b)   Explain "Contrast stretching" in brief.
[3]
OR

Q:1   (a)   Perform the following of the given image using the given mask. Also   [7]
discuss on the obtained result. Assume the same neighboring pixels
beyond the border.

$$A = \begin{bmatrix} 10 & 12 & 10 & 10 \\ 70 & 72 & 70 & 74 \\ 14 & 12 & 12 & 14 \\ 20 & 20 & 22 & 22 \end{bmatrix} \quad M = \begin{bmatrix} -1 & -1 & -1 \\ 0 & 0 & 0 \\ 1 & 1 & 1 \end{bmatrix}$$

(b)   Explain Bit plane slicing in brief.
[3]

Q:2   (a)   Consider the following binary image segment. Show all possible 4-   [8]
path, 8-path and m-path between the shaded pixels. Also Show the
shortest path. Compute the Euclidean and city block distance
between the shaded pixels. Assume the coordinates of top-left pixel
(1, 1) and bottom-right pixels as (5, 5).

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

(b)   Define the magnitude and power spectrum of Fourier transform.   [2]
OR

Q:2   (a)   Explain the process of filtering in frequency domain step wise.   [6]

(b)   Prove the following equality.   [4]
$$\Im\{f(t) \star h(t)\} = F(u)H(u)$$

Q:3   (a) . Perform Histogram equalization on following 5x5, 3 bit image   [7]
            segment. Also obtain the histogram of the equalized image.

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

(b)   Explain the following terms   [3]
        (i) Interpolation (ii) Intensity Resolution (iii) Convolution

Q:4 (a) Write the morphological equation for Dilation. State the use of it. [5]
Discuss duality expression of erosion and dilation.

(b) Find the Hit or Miss transformation for the given Fig. (A) using SE [5]
given in Fig. (B).

OR

Q:4 (a) Perform opening and closing morphological operations on binary [5]
image segment A given in Fig. (C) using structuring element B given
in Fig.(D).

(b) What is skeleton? Explain the procedure to derive the skeleton. [5]

Q:5 (a) Explain Otsu's method for thresholding. [5]
(b) Discuss the DoG operator. [5]

OR

Q:5 (a) Explain how edge linking algorithm works. State the importance of [5]
it.

(b) What do you mean by multiple thresholding? Discuss the basic [5]
global thresholding algorithm.

Q:6 (a) Explain following terms: [5]
1.Chain codes 2.Signatures 3. Polygonal Approximations

(b) When the gradient of an image is used to detect edges, the main [3]
problem is that differentiation enhances noise. How this problem is
generally addressed?

(c) What is the role of morphology in image processing? [2]

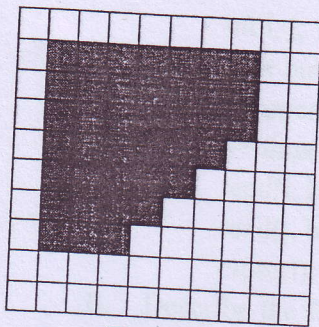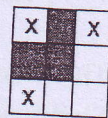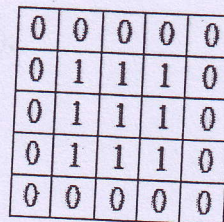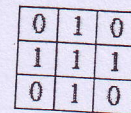Fig. (A)   Fig. (B)   Fig. (C)   Fig. (D)

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