Seat No.: _____   *Enrolment No._____*

GUJARAT TECHNOLOGICAL UNIVERSITY
M. E. - SEMESTER – I • EXAMINATION – WINTER • 2014

Subject code: 2714104   **Date: 12-01-2015**
Subject Name: Digital Image Processing
Time: 02:30 pm - 05:00 pm   **Total Marks: 70**
Instructions:
   1. **Attempt all questions.**
   2. **Make suitable assumptions wherever necessary.**
   3. **Figures to the right indicate full marks.**

Q.1 **(a)** Perform histogram equalization of an image shown in Figure 1 and plot histogram of the input image and resultant image. **07**

4	4	4	4	4
3	4	5	4	3
3	5	5	5	3
3	4	5	4	3
4	4	4	4	4

Figure 1:An image

(b) Explain spatial correlation and convolution with suitable example. **07**

Q.2 **(a)** Calculate median value of the marked (by double quotation marks) pixels shown in Figure 2 using a 3x3 masks. Give significance of the method related to noise. **07**

18	22	33	25	32	24
34	õ128ö	õ24ö	õ172ö	õ26ö	23
22	19	32	31	28	26

Figure 2 Input image

(b) List down different types of noises found in an image. Estimate mean and variance of a noisy image. Explain inverse filtering in detail with suitable equations. **07**

OR

(b) Explain unsharp masking and high boost filtering in detail with suitable example. **07**

Q.3 **(a)** Explain Gaussian low pass filtering technique in frequency domain. Also list out the different applications of such filtering. **07**
(b) Analyze a 3x3 mean filter in the frequency domain and prove that it behaves like a low pass filter. **07**

OR

Q.3 **(a)** Filter the following image shown in Figure 3 using a 3x3 neighborhood averaging by assuming zero padding. **07**

1	2	3	2
4	2	5	1
1	2	6	3
2	6	4	7

Figure 3 Input image

(b) Explain the histogram matching techniques in detail with suitable derivation for continuous and discrete variable. **07**

1

Q.4 **(a)** Using the input image (Figure 4) and structuring element (Figure 5) as given below, find the dilated version of the input image. **07**
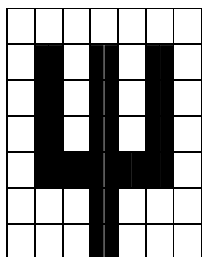

Figure 4: Input Image   Figure 5: Structuring Element

(b) Explain the morphological thinning and thickening operations with suitable mathematical equations. **07**

OR

Q.4 **(a)** The input image (Figure 6) and structuring element (Figure 7) are given below. Find the eroded version of the input image. **07**

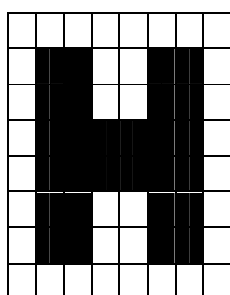
Figure 6 Input Image   Figure 7 Structuring element

(b) Discuss: Hough Transform in X-Y coordinate system. **07**

Q.5 **(a)** Explain the optimum thresholding using Ostu's method in details with suitable derivations. **07**

(b) Explain the canny edge detection algorithm in detail. **07**

OR

Q.5 **(a)** Explain the Laplacian of Gaussian (LoG) and Difference of Gaussian (DoG) edge detection techniques in details. **07**

(b) List out various applications of image processing. Explain any one in detail. **07**

****