Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

ME - SEMESTER–I(New course)• EXAMINATION – WINTER- 2015

Subject Code: 2714104 **Date: 04/01/2016**

Subject Name: Digital Image Processing

Time:2:30 pm to 5:00 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)** Answer the following Questions: **07**

1. The minimum D4 and D8 distances between the distances between the marked pixels 1 and 5 are _____and _____. Consider V= { 1,2,4,5,6}.

1	2	4	8
2	6	4	2
1	3	4	5
2	2	1	5

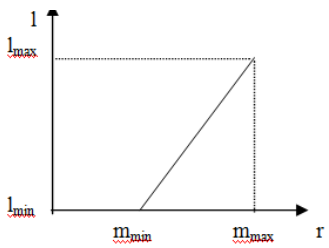
Fig : 4 X 4 Image Segment

2. Classify the image enhancement process.
3. Define: contrast stretching.
4. Explain: zooming.
5. What is meant by low pass filtering: smoothing?
6. What is Image Negative operation? Explain with suitable equations.

(b) Define: Connectivity, Adjacency and Distance between the pixels *p* and *q* with the spatial locations *(x,y)* and *(s,t)*. **07**

Q.2 **(a)** Define: Histogram of an image, Explain Histogram Equalization with suitable mathematical steps. **07**

(b) Given below (Fig.) are the slope transformation and the image. Draw the histogram for original image and new image. Assume l_{min}=0 and l_{max}=7. **07**



2	3	4	2
5	5	2	4
3	6	3	5
6	3	5	5

Fig : (a) Gray-level Transformation function ,(b) 4X4 image

OR

(b) What are blurring and ringing defect? How can they be avoided? **07**

Q.3 **(a)** Explain Adaptive Median Filtering in detail. **07**

(b) A 2-dimensitonal DFT can be obtained using a 1-dimensional DFT algorithm twice Explain. **07**

OR

Q.3 **(a)** A 4X4 image is given by **07**

2	4	8	7
0	6	9	8
13	7	255	3
255	12	4	9

Filter the above image using (a) MIN filter, (b) MAX filter and (c) MID-POINT filter. Assume replicate padding of the input image.

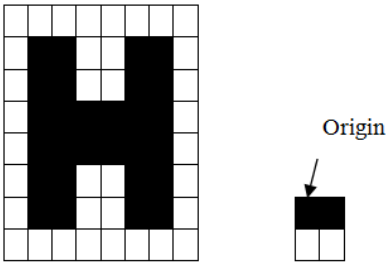
(b) Define 1D Fourier Transform pair, 2D Fourier Transform pair, Fourier spectrum and power spectrum for 2D signal with equations. **07**

Q.4 **(a)** Explain Homomorphic Filtering in detail with suitable mathematics. **07**

(b) Explain Inverse Filtering. What are the drawbacks of Inverse filtering? How Wiener Filter recovers these drawbacks? **07**

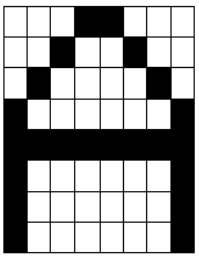
OR

Q.4 **(a)** Define the basic morphological operation "erosion" for a binary image. Using the input image shown in following fig. and structuring element , find the erosion version of the input image. **07**



(b) What is an "edge" in an image? What is the difference between an "edge" and a "line" in an image? Explain simple Hough Transform technique of line detection. **07**

Q.5 **(a)** Explain region splitting and merging technique for image segmentation. Apply the split-and-merge technique for the given image shown in Fig below. **07**



(b) Explain the optimum global thresholding using Otsu's method in detail with suitable derivations. **07**

OR

Q.5 **(a)** Explain the basic Morphological Algorithms: (1) Boundary Extraction and (2) Skeletons in detail. **07**

(b) List out the different applications of Digital Image Processing. Explain any one application in detail. **07**

****