Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

ME SEMESTER – I (OLD) EXAMINATION – SUMMER 2017

Subject Code: 714104 **Date:11/05/2017**

Subject Name: DIGITAL IMAGE PROCESSING AND APPLICATIONS

Time:02:30 P.M. to 05:00 P.M. **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: **07**

1. Adjacency
2. Neighbor of a pixel
3. Contrast
4. Histogram
5. Filtering in spatial domain
6. Noise in an image
7. Bilinear Interpolation

(b) Explain Histogram Specification technique in detail with suitable mathematical steps. **07**

Q.2 **(a)** The input image *f(x,y)* is passed through a linear shift-invariant system *h(x,y)*. determine the output image if *f(x,y)* and *h(x,y)* are given below: **07**

f(x,y) =

12	10	8	4
8	14	6	9
5	9	13	8
14	5	7	9

And $h(x,y) = \frac{1}{9}\begin{bmatrix} 1 & 1 & 1 \\ 1 & 1 & 1 \\ 1 & 1 & 1 \end{bmatrix}$

Assume zero padding of the original image.

(b) For the input image shown, obtain the output image after application of **07**

0	0	0	0	0	0	0
0	10	0	10	0	10	0
0	10	0	10	0	10	0
0	10	0	10	0	10	0
0	10	0	10	0	10	0
0	0	0	0	0	0	0

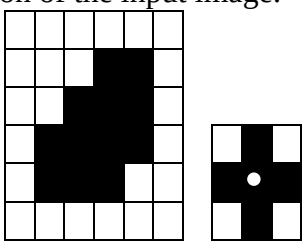
1. A 3X3 median filter?
2. A 5X5 median filter?

OR

(b) Explain Weiner Filter in detail with suitable mathematics**.** **07**

Q.3 **(a)** Explain the Homomorphic filtering in detail with suitable mathematics. **07**

(b) Using the input image and structuring element as given below, find the Morphological closing version of the input image. **07**



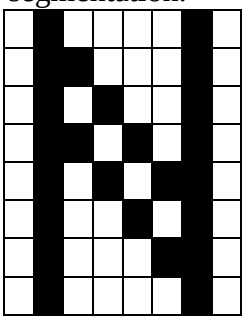
OR

Q.3 **(a)** Explain Laplacian of Gaussian Edge detector in detail with suitable mathematics. **07**

(b) Explain Gaussian Low pass filters. Explain the application of low pass filtering operations on an input image in detail. **07**

Q.4 **(a)** Explain a morphological algorithm for obtaining the thinning of the input binary object in detail with suitable mathematical steps. **07**

(b) Segment the image shown using the split-and-merge procedure. Also show the quad-tree corresponding to the segmentation. **07**



OR

Q.4 **(a)** List out the applications of Morphological Image Processing. Explain any one application in detail. **07**

(b) The input image *f(x,y)(4bits per pixel image)* is shown below. **07**

Compute the followings:

1. Compute the histogram based threshold ***"T"***.
2. Using the computed value of ***"T"***, segment the image into two regions.

f(x,y)=

12	11	11	11	1	1	0
12	12	0	0	1	13	0
13	13	13	13	13	13	13
15	15	15	15	15	15	15
10	11	12	13	14	15	15
5	6	7	8	9	10	11
1	2	3	4	5	6	7

Q.5 **(a)** Explain optimum global thresholding using Otsu's Method. **07**

(b) List out the various applications of Digital Image Processing. Explain the Fingerprint Recognition system with the help of the block diagram and major techniques. **07**

OR

Q.5 **(a)** Explain the Gradient operators with suitable mathematics. Explain the unsharpe masking technique in detail with suitable mathematics. **07**

(b) Explain digital image watermarking system in detail with suitable block diagram. **07**

****