GUJARAT TECHNOLOGICAL UNIVERSITY
ME - SEMESTER I - EXAMINATION – SUMMER 2017

Subject Code: 2714104   **Date:11/05/2017**
Subject Name: Digital Image Processing
Time:02:30 pm to 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)** Explain the following with suitable example.   **07**
   1. 8-Connectivity.
   2. Euclidean Distance.
   3. Nearest Neighbor Interpolation
   4. Log Transformation

(b) Explain Bit-Plane Slicing Technique in detail with suitable example.   **07**

Q.2 **(a)** Explain spatial filtering technique in detail. Apply the box filter of size 3X3 on   **07**
the input image shown in Fig 1.

0	0	0	0	0	0
0	1	1	1	1	0
0	1	2	2	1	0
0	1	2	2	1	0
0	1	1	1	1	0
0	0	0	0	0	0

Fig 1: 6 X 6 Image segment

(b) What do you mean by "Salt & Pepper" Noise? Explain the Median filtering in   **07**
detail with suitable example.

OR

(b) Compare median filtering and a low pass filtering on a noisy image. Which   **07**
performs best (i.e. removal of most noise with least blurring)? How? Explain
with suitable example.

Q.3 **(a)** Explain the steps for Filtering of image in Frequency Domain. Perform Fourier   **07**
Transform on the following 2 X 2 image shown in Fig 2.

2   2
2   2
Fig 2: image segment of 2 X 2

(b) Explain the Wiener Filtering for image Restoration and discuss the problems   **07**
associated with it. Also discuss the remedy available in the form of Constrained
Least Square Filtering Technique.

OR

Q.3 **(a)** Apply the high pass mask (Laplacian operator of size 3X 3) on the image shown in Fig 3**.** Conclude about the result. **07**

20	20	20	20	20
20	30	30	30	20
20	30	60	30	20
20	30	30	30	20
20	20	20	20	20

Fig 3 : Image segment of 5 * 5

(b) Explain the Image Thinning algorithm in detail with suitable mathematical equations. **07**

Q.4 **(a)** Using the input image and structuring element as given below in Fig 4, find the opening operation of the input image. **07**
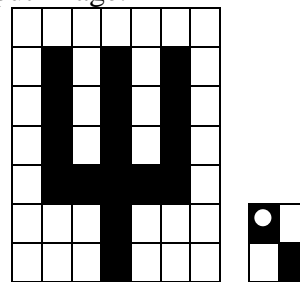

Fig 4: 7 X 7 Image Segment , Structuring Element

(b) Explain the simple Hough Transform technique of line detection. **07**

OR

Q.4 **(a)** Explain the following edge detection techniques in detail with suitable mathematics: **07**
1. Gradient Operation,
2. Laplacian of Gaussian (LoG), and
3. Difference of Gaussian (DoG).

(b) Explain the region growing technique for region based image segmentation with suitable example. **07**

Q.5 **(a)** Explain the *Canny* edge detector in detail with suitable mathematical equations. **07**
(b) Explain the optimum global thresholding using *Otsu's* method in detail with suitable derivations. **07**

OR

Q.5 **(a)** List out the various applications of image processing. Explain any one application in detail. **07**
(b) Compare the *Canny* edge detector with the *Laplacian* edge detector. **07**

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