Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

ME - SEMESTER– I (OLD course)• EXAMINATION – SUMMER 2015

Subject Code: 714104 **Date: 19/05/2015**

Subject Name: Digital Image Processing and Applications

Time: 10:30 am to 1:00 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: (a) adjacency between the pixels, (b) 4-connectivity, (c) 8-connectivity, (d) m-connectivity, (e) City-block distance, (f) Chessboard distance and (g) Euclidean distance with suitable examples. **07**

(b) Can two different images have the same histogram? Justify your answer with suitable examples. **07**

Q.2 **(a)** Explain Zooming and Shrinking. Explain the different type o Interpolation methods for zoom an image in detail. **07**

(b) Explain Contrast Stretching technique for image enhancement **07**

OR

(b) What are the differences between filtering in spatial domain and filtering in the frequency domain? Explain the basic steps involved in filtering the image in frequency domain. **07**

Q.3 **(a)** A 5 X 5 image patch is shown below (*f(m,n)*). Compute the value of all pixels if they are smoothened by a 3 X 3 average filter (Use box filter and zero padding). **07**

f(m,n)=

0	1	2	3	2
5	6	7	8	4
4	3	2	1	2
8	7	6	5	3
1	5	3	7	8

(b) Explain the algorithm for adaptive median filtering in detail. **07**

OR

Q.3 **(a)** Obtain the digital image negative of the following 8-bits per pixel- BPP image shown in Fig 1. **07**

121	205	217	156	151
139	127	157	117	125
252	117	236	138	142
227	182	178	197	242
201	106	119	251	240

Fig 1: 5X5 Image Matrix

(b) Consider the image segment shown in Fig 2. Based on the histogram, segment the image into two regions. **07**

128	128	128	64	64	32	32	8
64	64	128	128	128	8	32	32
32	8	64	128	128	64	64	64
8	128	128	64	64	8	64	64
128	64	64	64	128	128	8	8
64	64	64	128	128	128	32	32
8	128	32	64	64	128	128	128
8	8	64	64	128	128	64	64

Fig 2: 8X8 Image Matrix

Q.4 **(a)** Discuss the difference between an edge and a line. What is the difficulty involved in finding an edge of an image if the edge is corrupted by noise? Explain in detail. **07**

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

OR

Q.4 **(a)** Show that subtracting the Laplacian from an image is proportional to unsharp masking. **07**

(b) Write a short note on image segmentation using split and merge algorithm. Apply the split-and-merge technique for the given image shown in Fig. 3. **07**

1	1	1	0
1	1	0	0
1	0	0	0
0	0	0	0

Fig 3: 4X4 image

Q.5 **(a)** Explain the basic Morphological Algorithms: (1) Hit-or-Miss Transformation and (2) Thinning Operation in detail. **07**

(b) State the application fields of object recognition. As a case study explain the fingerprint identification system. **07**

OR

Q.5 **(a)** Explain the Canny Edge detector in detail with suitable mathematical equations. **07**

(b) Explain Image watermarking technique in detail. **07**

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