Enrolment No.

GUJARAT TECHNOLOGICAL UNIVERSITY ME - SEMESTER-III (NEW) • EXAMINATION - SUMMER 2017

Subject Code :2730303 **Subject Name: Image Processing for Instrumentation** Time:02:30 pm to 05:00 pm

Date : 02/05/2017

Total Marks: 70

Instructions:

- 1. Attempt all questions.
- 2. Make suitable assumptions wherever necessary and mention it clearly in your solution.
- 3. Figures to the right indicate full marks.
- 4. All symbols carry their usual meaning unless otherwise stated.
- Q.1 (a) Develop a MATLAB function named AVGFN for computing the mean of an n x n 07 neighborhood. Using this function write a program to apply 3x3 mean filter to the image I of size 64 x 64. Consider zero extended image. Write appropriate comment lines in the program.
 - (b) Find 2D convolution between x and h shown below. Show all steps of the calculations. 07

X	=

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

h=

1	2	3
4	5	6
7	8	9

Draw the histogram of the following two texture images. Both images have size 80×80 , with 07 **Q.2** (a) black (0 intensity) and white (255 intensity) pixels.

> Suppose that both images are blurred with a 3×3 smoothing mask. Would the resultant histograms still be the same? Draw the two histograms and explain your answer.



(b) The following figure shows an 8-bit image of size 4 x 4, with x and y coordinates specified. 07

x \ y->	0	1	2	3
0	110	150	54	19
1	120	115	165	65
2	220	255	187	185
3	235	184	184	56

write the kernel in all solutions and compute the following

(i) The output of a 3×3 min filter at (1,1).

- (ii) The output of a 3×3 median filter at (2,2).
- (iii) The output of a 3×3 Laplacian filter at (2,1).

OR

(b) Consider 4x4, 8-bit image shown below. Construct the dictionary for LZW coding.

40	40	150	150
40	40	150	150
40	40	150	150
40	60	150	150
40	60	150	150

Q.3 (a) Consider the image segment shown below:

3	1	2	1(q)
2	2	0	2
1	2	1	1
(p)1	0	1	2

(a) Let V={0, 1} and compute the lengths of the shortest 4-path, 8-path, m-path between p and q. If a particular path does not exist between these two points, explain why?
(b) Repeat for V={1, 2}

(b) What is the use of homomorphic filtering? With the help of neat diagram and necessary 07 equations explain it in detail.

OR

Q.3 (a) Find the set of codewords and average word length using Huffman coding scheme for a set of 07 gray levels with probabilities given below.

Input	S 1	S2	S 3	S4	S5	S 6	S7	S 8
Probability	0.04	0.05	0.02	0.15	0.05	0.15	0.24	0.3

- (b) What do you mean by separable property of DFT? Explain the same with mathematical **07** expression and figure.
- Q.4 (a) Define grayscale erosion. For the image segment of size 4x4 and operator of size 3x3 shown 07 below, find grayscale erosion output.

6	7	3	4
5	6	6	8
6	4	5	2
6	4	2	3

1	1	1
1	4	1
1	1	1

(b) Discuss region filing algorithm in detail with the help of necessary figures.

07

OR

Q.4 (a) Define grayscale dilation. For the image segment of size 4x4 and operator of size 3x3 shown 07 below, find grayscale dilation output.

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

2	2	2
2	4	2
2	2	2

07

07

- (b) What do you mean by convexity? Discuss convex hull algorithm in detail with the help of **07** necessary figures.
- Q.5 (a) Propose a morphological procedure to clear the edge artifacts of the image given in (a) such 07 that the image in (b) is obtained. Clearly state the structuring element(s) and number of iterations that you would use in your procedure.





(b) Discuss the role of thresholding in image segmentation in detail.



Q.5 (a) The histograms of three images are illustrated below. For each image, sketch a transformation 07 function in the figure below that will help to equalize the histogram.

OR

