



UNIVERSITY OF RUHUNA

Faculty of Engineering

Mid-Semester 7 Examination in Engineering: June 2015

Module Number: EE7239 Module Name: Computer Vision and Image Processing

[Two Hours]

[Answer all questions, each question carries 5 marks]

Q1. a) Digital image processing has a very wide application range. State two applications of digital image processing. [1 Mark]

b) Why boundary information is an important measure in image processing? [1 Mark]

c) Apply pixel replication for the image given in Figure Q1 (c) to enlarge the size of the image by four times. [1 Mark]

25	28	40
30	35	57

Figure Q1 (c)

d) i) Geometric transformations have two basic operations, spatial transformation of coordinates and intensity interpolation. State two problems of forward mapping intensity interpolation technique.

ii) Explain one situation where geometric transformations are useful in image processing. [2 Marks]

- Q2. a) i) Assume 4-connectivity, scan pixels from left to right from top to bottom to perform component labeling for Figure Q2 (a) 1 to identify the connected components in the given 10x10 pixel image. Use Figure Q2 (a) 2 and Figure Q2 (a) 3 in last page of this paper to perform component labeling. Indicate a black pixel with a clear cross (⊠) sign. Detach the last page of the paper with Figure Q2 (a) 2 and Figure Q2 (a) 3 and attach it to your answer script.
- ii) What difference would it make for the answer to question Q2 (a) (i) if you used 8-connectivity?

[3 Marks]

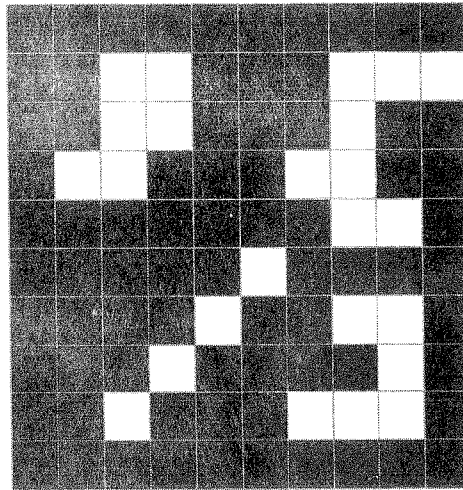


Figure Q2 (a) 1

- b) Assume image A is a grayscale image and it has intensity values from 100 to 200. For a better output, contrast stretching was performed on image A and now it has intensity values from 0 to 255. Plot the transformation function of the performed contrast stretching operation.
- c) Apply a 3x3 median filter to the image given in Figure Q2 (c). Assume zero padding.

[1 Mark]

[1 Mark]

20	22	25	24
21	0	25	24
22	250	20	25

Figure Q2 (c)

- Q3. a) What is a histogram of a gray scale image?
- b) Histogram sliding is an operation where we shift the complete histogram rightwards or leftwards. Explain how to use histogram sliding to change brightness of a grayscale image.

[1 Mark]

[1 Mark]

- c) Consider the image given in Figure Q3 (c). Assume this image uses three bits to represent each gray level.
- Draw the histogram of the image.
 - Perform Histogram equalization and give the output image.

[3 Marks]

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

Figure Q3 (c)

- Q4. a) i) Describe Hue and Saturation in HSI colour model.
 ii) Why HSI is said to be a perception oriented colour model?

[2 Marks]

- b) Assume you need to decrease the intensity of a colour image by 20%. Plot the transformation functions for this operation in RGB and HSI colour models.

[1.5 Marks]

- c) Explain how to use Fourier transform for an image filtering operation.

[1.5 Marks]

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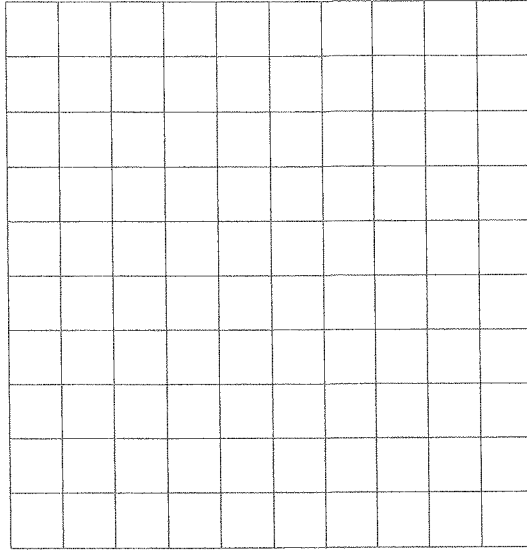


Figure Q2 (a) 2

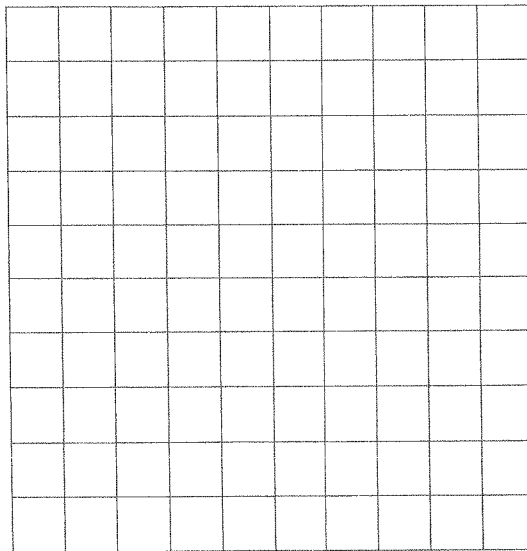


Figure Q2 (a) 3