Ex/IT/T/425 A/2017 (Old)

Bachelor of Engineering (Information Technology) Examination, 2017

(4^{th} year, 2^{nd} Semester)

Pattern Recognition & Image Processing

Time: Three hours **Full marks: 100**

Answer any **five (5)** questions.

1. [(2+2+6)+(3+7)]
   a. What is progressive image transmission (PIT)? What are the advantages of PIT? Give a PIT coding method for gray-scale images.
   b. How the motion compensation helps to compress a video sequence? Describe the TSS (three step search) block matching algorithm with proper diagram.

2. [(2+5+7)+6]
   a. What is medial axis transform of an object? Give a method to find the MAT of an object. Use the given method to find the MAT of the following object.

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

   b. Define the terms: i) length of boundary, ii) diameter of an object and iii) eccentricity of an object.

3. [(3+4)+(2+5)+6]
   a. Define general form of the image transform. Justify that transform based any method is a global image processing method.
   b. State and prove the separability property of 2D-Fourier transform.
   c. Let I=[3, 2, 2, 1] and find F(I).

4. [(2+5)+7+6]
   a. Define global thresholding. Write an algorithm to calculate the global threshold.
   b. How do you link edge pixels by straight lines?
   c. For an image domain D, say, R 1 , R 2 , ..., R n are the regions. What are the properties that the regions are maintained?

[P.T.O.]

5. [5+5+4+6]

a. Explain region splitting and merging with an example.
b. How can be the lines oriented around 45-degree detected?
c. Explain order-statistics filter.
d. Explain in detail the two processes that are used to convert the continuous data (respect to image) into digital form.

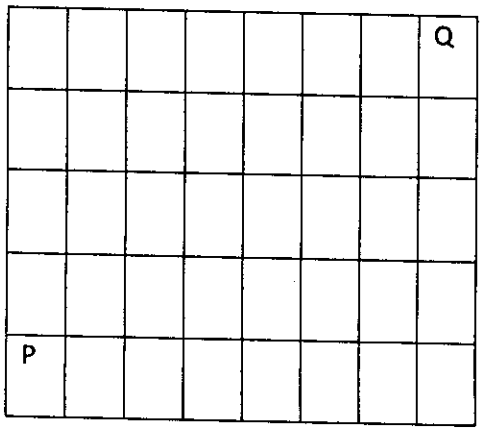
6. Describe the following algorithms and cluster the following data with the methods [10+10]

a. Maximin-distance algorithm
b. K-means algorithm

Data set is {(0,0), (5,3), (5,4), (2,2), (6,3), (6,4), (7,5), (1,1), (3,8), (4,8)} .

7. [6+4+6+4]

a. Consider the image segment shown below. Determine (i) Euclidean, (ii) city-block, (iii) chess-board distances between P and Q.



b. What linear transformation will change an image f(x,y) with gray levels ranging from 4 through 18 to an image g(x,y) with gray levels ranging from 10 through 50?
c. Suppose that a digital image is subjected to histogram equalization. Show that a second pass of histogram equalization (on the histogram-equalized image) will produce exactly the same result as the first pass.
d. If an image is processed by histogram equalization and compressed by Huffman coding. How much compression will be achieved? Explain your answer.