

GANPAT UNIVERSITY
B. Tech Sem. VII (Computer Engineering / Information Technology)
Regular Examination NOV/DEC – 2013

2CE704 / 2IT704 : FUNDAMENTALS OF IMAGE PROCESSING

Total Marks: 70

Total Time: 3 hours

- Instructions:** 1. Write each section in separate answer sheet.
 2. Figure to the right indicates full marks.
 3. Assume suitable data wherever necessary.

SECTION – I

- Q – 1 (a)** Discuss the following terms with necessary example: [6]
 (1) 4 - neighbor (2) 8 - adjacency (3) m - adjacency
 (4) Digital path (5) Connected component (6) Region
(b) Explain the process of sampling and quantization. [4]
(c) What is the requirement of log transformation? [2]

OR

- Q – 1 (a)** Explain the process of image sensing and acquisition with proper image formation model. [6]
(b) Discuss the following terms: [4]
 1. False contouring
 2. Image interpolation
(c) Discuss any one piece-wise linear transformation. [2]
- Q – 2 (a)** Perform histogram equalization on 8x8, 4-bit image shown in fig. (A) on page 2. [6]
(b) Discuss the following first order derivative filters: [5]
 1. Prewitt operator
 2. Sobel operator

OR

- Q – 2 (a)** Apply -4 centered laplacian mask on the image shown in fig. (B). [6]
(b) Discuss the following terms: [5]
 1. Histogram
 2. Normalized histogram
 3. Histogram equalization
 4. Average intensity (using histogram)
 5. Intensity variance (using histogram)
- Q – 3 (a)** Discuss at least one application of image processing for each band of electro magnetic spectrum. [6]
(b) Explain box filter. [3]
(c) Show all the pixel positions whose D_4 distance is less than or equal to 3, from the given central pixel. Also state the distance value along with position. [3]

SECTION - II

Q - 4 (a) State the morphological equation to derive convex hull. Derive convex hull for the image shown in fig. (C) on page 2. [6]

(b) Write the morphological equation for Hit-or-Miss transformation. State the use of it. [2]

(c) Discuss signatures as a tool to represent boundaries. [4]

OR

Q - 4 (a) Discuss opening and closing operations with proper example. [4]

(b) Explain the hole filling algorithm. [4]

(c) Discuss the merging and splitting technique for polygon approximation. [4]

Q - 5 (a) Explain the method to detect the line in which polar form of the line equation is used. [6]

(b) Discuss the DoG operator. [5]

OR

Q - 5 (a) Explain the entire process of canny's edge detection. [6]

(b) What do you mean by multiple thresholding? Discuss the basic global thresholding algorithm. [5]

Q - 6 (a) Perform the following steps on the image shown in fig (D): [4]

Step - 1: Apply dilation with structuring element shown in fig. (E).

Step - 2: Apply erosion on the result of step - 1 with structuring element: [1 1 1; 1 1 1; 1 1 1]

(b) Plot the values of first order and second order derivatives for the following intensity profiles: [4]

Profile - 1 :

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

Profile - 2:

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

(c) Discuss chain codes for boundary representation. [4]

4	4	5	5	5	5	5	5
4	7	7	7	7	7	7	5
6	8	9	10	10	10	7	5
6	8	9	11	11	10	7	5
6	8	9	11	11	10	7	5
6	8	9	9	9	9	7	5
6	8	8	8	8	8	7	4
6	6	6	6	6	6	4	4

Fig. (A)

0	0	0	5	5
0	0	5	5	1
0	5	5	1	1
5	5	1	1	6
5	1	1	6	6

Fig. (B)

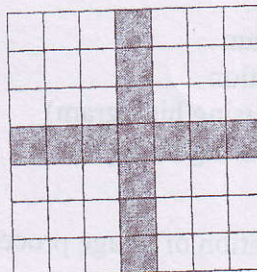


Fig. (C)

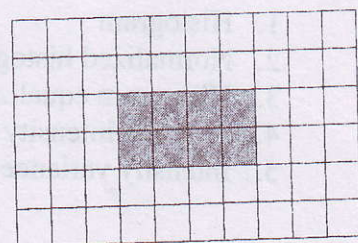


Fig. (D)

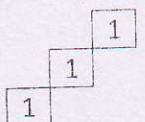


Fig. (E)

END OF PAPER