

GANPAT UNIVERSITY
M. Tech semester II (Computer Engineering)
Regular Examination May / June – 2014
3CE201: DIGITAL IMAGE PROCESSING

Total Time: 3 hours

Total Marks: 70

- 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 in brief: [4]
 (1) False contouring (2) Spatial resolution
 (b) Describe four basic types of images along with their histograms. [4]
 (c) Discuss Ideal and Butterworth low pass filter for frequency domain. [4]

OR

- Q – 1 (a) Discuss Chess-board distance and City block distance between two pixels. [4]
 (b) What do you mean by gradient? Discuss any two first order derivate filters. [4]
 (c) Why centering of Fourier Transform is required? How Fourier Transform can be centered? [4]

- Q – 2 (a) Show that the Laplacian filter is isotropic. You will need the following equations relating coordinates for axis rotation by an angle θ : [6]

$$x = x' \cos \theta - y' \sin \theta$$

$$y = x' \sin \theta + y' \cos \theta$$

where (x,y) are the unrotated and (x', y') are the rotated coordinates.

- (b) An automobile manufacturer is automating the placement of certain components on the bumpers of a limited-edition line of sports cars. The components are color coordinated, so the robots need to know the color of each car in order to select the appropriate bumper component. Models came in only four colors: blue, green, red and white. You are hired to propose a solution based on image processing. How would you solve the problem of automatically determining the color of each car, keeping in mind that cost is the most important consideration in your choice of components? [5]

OR

- Q – 2 (a) What do you mean by point processing and mask processing? Explain any three point processing transformations. [6]

- (b) Write the conditions for a digital path to be an m-path. Find various m-paths between P and Q in the image given in fig. (A) on page 2. Let $V=\{3,4\}$. [5]

- Q – 3 (a) Differentiate between low level and mid level process. Give at least one example of each in the context of image processing. [4]

- (b) Find out values of Average Intensity and Intensity Variance using histogram statistics for the image shown in fig. (B) on page 2 [4]

- (c) Describe basics steps for filtering in the frequency domain. [4]

SECTION – II

- Q – 4 (a) Discuss the opening and closing morphological operation with proper example. [6]
 (b) What is pruning? Explain the process of pruning with proper example. [4]
 (c) Explain band reject filter in short. [2]

OR

- Q – 4 (a) What is convex hull? Explain the procedure to derive the convex hull. [6]
 (b) Discuss hole filling morphological algorithm. [4]
 (c) Explain the notch filter in short. [2]

- 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. [3]
 (c) Discuss the splitting technique for representation. [2]

OR

- Q – 5 (a) Derive the LoG operator. Discuss the entire Marr - Hildrath edge detection algorithm. [6]
 (b) Explain working of edge linking algorithm. [3]
 (c) Discuss curvature as a descriptor. [2]

- Q – 6 (a) Discuss the basic global thresholding algorithm. [4]
 (b) Discuss freeman chain codes as boundary representators. [4]
 (c) Explain the following noise probability density functions: [4]
 1. Gaussian noise
 2. Rayleigh noise
 3. Erlang noise
 4. Exponential noise

----- X -----

	1	2	4	3	4	(Q)
	4	3	6	2	4	
	3	5	7	3	5	
	4	7	3	4	6	
(P)	3	4	1	2	7	

Fig. (A)

4	2	2	4
3	5	3	5
1	3	5	7
4	6	6	4

Fig. (B)

END OF PAPER