

ALCCS – NEW SCHEME

Time: 3 Hours

AUGUST 2012

Max. Marks: 100

PLEASE WRITE YOUR ROLL NO. AT THE SPACE PROVIDED ON EACH PAGE IMMEDIATELY AFTER RECEIVING THE QUESTION PAPER.

NOTE:

- Question 1 is compulsory and carries 28 marks. Answer any FOUR questions from the rest. Marks are indicated against each question.
- Parts of a question should be answered at the same place.

- Q.1**
- Using 256 gray level shades to represent an image, draw two histogram shapes, one to represent an image which appears very dark and another to represent a bright image.
 - How many bits would be required to store an image of size 240×320 and 64 levels of gray shades? How many bits would be required to store a colored image with same number of levels for each color component?
 - Here is an image segment

12	13	13	9
10	11	8	13
53	55	57	57
59	56	58	61
59	62	60	60

Convolve it with the following mask and indicate the output for the pixels with intensity values 55 and 56.

- 1	0	1
- 2	0	2
- 1	0	1

- Is it possible for two different images to have the same histogram? Justify your answer.
- How do you detect lines in an image? Indicate suitable masks for detecting lines.
- Name 4 statistical properties used on gray level co-occurrence matrices to quantify texture of an image segment.
- How is the chain code used for image description? (7×4)

Q.2 a. Describe an ideal smoothing frequency domain filter $H(u,v)$. If $F(u,v)$ is the Fourier transform of an image which is subjected to a smoothing filter, work out the Fourier transform of the smoothed image. (6)

b. A 128×128 image has 8 gray levels with the following distribution of pixels.

level	0	1	2	3	4	5	6	7
no. of pixels	34	50	500	1500	2700	4500	4000	3100

Draw a rough sketch of the histogram by taking 8 gray levels on x-axis. On the y-axis take probability in the range 0 to 0.3 in steps of 0.05. Apply discrete histogram equalization on this image and indicate the new intensity values obtained for each of the indicated pixel sets. Draw a rough sketch of the new histogram. (12)

Q.3 a. An image contains only 4 circles in black color against a white background. The circles have the same radius but are located at different portions of the image. Show how the Hough transform could be used to detect these circles. (10)

b. Indicate how an image is segmented using region based segmentation. (8)

Q.4 a. Consider the following image segment which has 3 gray levels

0	0	0	1	2
1	1	0	1	1
2	2	1	0	0
1	1	2	2	0
0	0	1	2	2

Compute the gray level co-occurrence matrix for this image, by choosing the position operator P as “one pixel to the right and one pixel below”. How many point pairs in the image satisfy P ? Work out the numerical value of the texture in terms of maximum probability criterion. (10)

b. What do you understand by a sharpening filter? Indicate any one of the sharpening filter that could be used on a gray level image. (8)

Q.5 a. Explain the Haar transform used for wavelet coding. (8)

b. Define the transformation used for scaling and rotating an image about the origin. (10)

Q.6 a. A gray scale image containing a single object has been converted into a binary image. Indicate how “thinning” operation can be carried out on the object. (10)

b. Derive the Laplacian of Gaussian (LoG) filter. What purpose does it serve? (8)

- Q.7** a. Explain the LZW coding scheme by using the following image segment (8)

123	123	82	82
123	123	82	82
123	123	82	82
123	123	82	82

- b. Show how the “hit or miss transformation” operation is carried out by taking an example. What is the use of this morphological operation? (10)