ROLL NO. _____

Code: CT73 **Subject: DIGITAL IMAGE PROCESSING**

ALCCS

Time: 3 Hours **FEBRUARY 2014** **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 a. A common measure of transmission for digital data is the baud rate. Generally, transmission is accomplished in packets consisting of a start bit, a byte of information and a stop bit.
(i) How many minutes would it take to transmit a 1024×1024 image with 256 gray-levels using 56k baud?
(ii) What would the time be at 750k baud?

b. Consider two image subsets S1 and S2 as bellow:

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

S1

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

S2

For V= {1}, determine whether S1 and S2 are:
(i) 4-adjacency
(ii) 8-adjacency
(iii) m-adjacency

c. Prove that:
$(A \circ B) \circ B = (A \circ B)$

d. Perform histogram stretching so that the new image has a dynamic range of [0, 7].

Gray-level	0	1	2	3	4	5	6	7
No. of pixels	0	0	50	60	50	20	10	0

e. Given a 3x3 image, plot its bit planes.

1	2	0
4	3	2
7	5	2

f. The following matrix defines a 5x5 image f(x,y). The center pixel f(2,2) is underlined.

0	1	0	6	7
2	0	1	6	5
1	1	7	5	6
1	0	6	6	5
2	5	6	7	6

Suppose smoothing is done to the image using 3x3 neighborhood in the spatial domain, then what will be the new value of f(2,2) using the:

(i) Mean filter

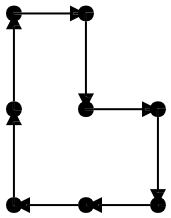
(ii) Minimum filter

(iii) Weighted filter given by the following 3x3 mask

1	2	4
3	2	1
0	4	4

g. Write down the fundamental steps in frequency domain filtering. **(7×4)**

Q.2 a. What is chain code? Find the shape number and order of the given boundary by using **(6)**



b. Suppose (R,G,B) triplet for a particular color is given by (0.3, 0.5, 0.2). Compute corresponding HSI components. **(6)**

Q.3 a. Given histogram (i) and (ii), modify histogram (i) as given by histogram (ii). **(10)**

Histogram (i)

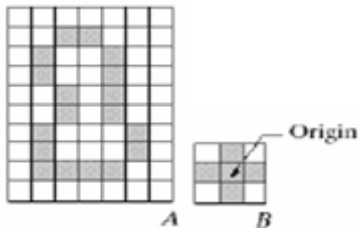
Gray-level	0	1	2	3	4	5	6	7
No. of pixels	790	1023	850	656	329	245	122	81

Histogram (ii)

Gray-level	0	1	2	3	4	5	6	7
No. of pixels	0	0	0	614	819	1230	819	614

b. What do you mean by Global Threshold value? Write an algorithm to obtain Global Threshold value. **(8)**

Q.4 a. Perform region filling on the following image with given structuring element. **(10)**



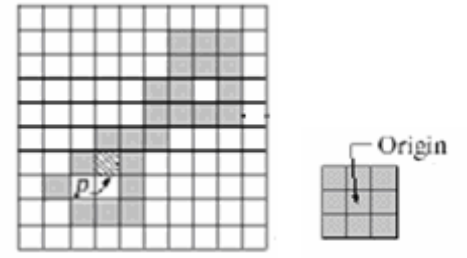
b. Explain Fundamental steps in image processing with suitable diagram. **(8)**

Q.5 a. Explain the roles of Sampling & Quantization to get digital image with diagram? **(8)**

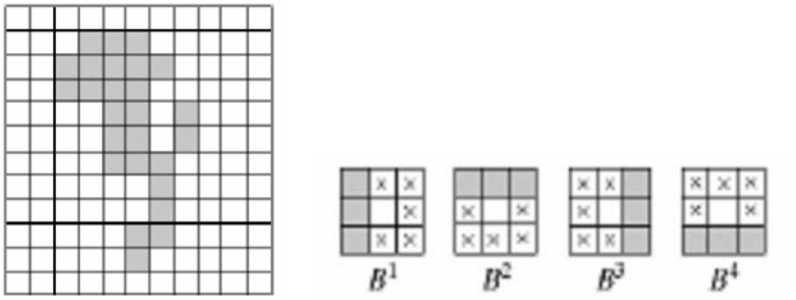
b. Write down the LZW encoding algorithm and by using this algorithm compress the following string

BABAABAAA **(10)**

Q.6 a. Extract the connected components from the following image with given structuring element. **(8)**



b. Find out the Convex Hull of the following image with the given structuring elements. **(10)**



Q.7 a. What do you mean by Grey-level slicing? Perform gray-level slicing on the 3-BPP image given bellow: Let r1=3 and r2=5. Draw the modified image using with and without background transformations. **(8)**

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

b. What is the drawback of using ILPF? Compare ILPF with BLPF using diagram. **(10)**