Printed Pages : 7

ECS-702

(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 110702

Roll No.

B.Tech.

(SEM. VII) (ODD SEM.) THEORY EXAMINATION, 2014-15

DIGITAL IMAGE PROCESSING

Time : **3** Hours] [Total Marks : **100**

Note : Attempt all questions.

1 Attempt any **four** parts of the following : **(5×4=20)**

a. What is Digital Image Processing ? Discuss some of its major applications.

b. Consider two image subsets S_1 & S_2 as shown in the following figure. For V={0} determine whether the regions are: i) 4-Adjacent ii) 8-Adjacent iii) m-Adjacent . Give reasons for your answer.

S_1				S_2			
1	1	1	1	1	1	0	0
1	1	0	1	1	0	1	1
1	1	0	1	0	0	1	1
1	0	0	0	1	1	1	1

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c. Write short notes on :

i. Sampling and Quantization

ii. Homomorphic filtering.

d. Given h(u, v) as follows, discuss its frequency response.

	$\frac{1}{6}$	
$\frac{1}{6}$	$\frac{1}{3}$	$\frac{1}{6}$
	$\frac{1}{6}$	

e. Find the DFT of f(x) = {0, 1, 2, 1}.

2 Attempt any **four** parts of the following : **(5×4=20)**

a. What is Bit-plane Slicing ? Given the following 3×3 image, find its bit planes.

1	2	3
4	5	0
7	2	1

b. Write short notes on the following :

i. Gamma correction

ii. Piece-wise linear transformation.

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c. Consider the following image. What will be the new value of the pixel (2, 2) if smoothing is done using a 3×3 :

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

i. Mean filter

ii. Weighted average filter

iii. Median filter

iv. Min filter

v. Max filter.

d. Briefly explain the working of a Laplacian mask. What will be the effect of applying the filter (a) on the image (b) ?

1	1	1
1	-8	1
1	1	1

(a)

50	50	50	50	50	50
50	50	50	50	50	50
50	50	50	50	50	50
100	100	100	100	100	100
100	100	100	100	100	100
100	100	100	100	100	100

(b)

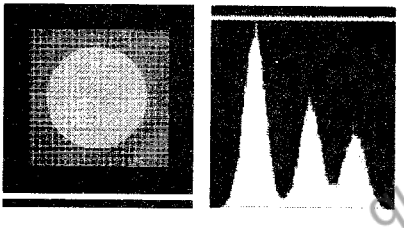
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e. Perform histogram equalization on the following 8×8 image. The gray level distribution of the image is given below :

Gray levels (r_k)	0	1	2	3	4	5	6	7
Number of pixels (p_k)	8	10	10	2	12	16	4	2

3 Attempt any **four** parts of the following : **(5×4=20)**

a. In an image the gray scale spans from black to near white in only three increments. A certain noise has corrupted the image. The image and its histogram are as follows. What type of mean filters can you use to eliminate the noise? Explain.



b. Give a model for image Degradation/Restoration Process.

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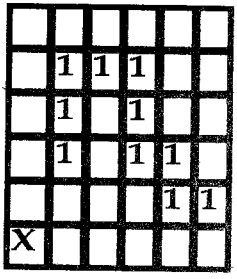
c. What is the difference between image enhancement and image restoration ? Mention some important causes of image degradation.

d. Explain any two noise models in detail.

e. What are order-statistic filters ?

4 Attempt any **four** parts of the following : **(5×4=20)**

a. Let A be an image and B a structuring element, given as follows. Find $A \oplus B$ and $A \ominus B$. Note: X denotes the origin, which is not part of the structuring element.

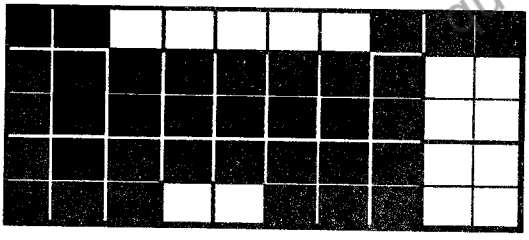


A



B

b. Thin the following image. Show the image after each step.



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c. Extract the connected component from the following image.

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

d. Explain the procedure of Region Filling with an example.

e. Prove that Opening and Closing are Dual Transformations.

5 Attempt any **four** parts of the following : **(5×4=20)**

a. Prove that rotation and translation are not commutative operations.

b. What is shearing? Give the transformation matrix and its inverse to carry out shearing in both x- and y-directions with shearing factors 10 and 30.

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c. Find a matrix to perform the following transformations to an object:

i. Scale in the x-direction using a scale factor 10.

ii. Followed by a rotation about z-axis 30 degree

d. Explain the process of image segmentation using region growing.

e. Describe the technique of thresholding for image segmentation.

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