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

Paper ID : 110702 Roll No. | | | | | | | | | |

B. Tech.

(SEM. VII) THEORY EXAMINATION, 2015-16

DIGITAL IMAGE PROCESSING

[Time:3 hours] **[MaximumMarks:100]**

Section - A

1. Attempt all parts. All parts carry equal marks. Write answer of each part in short : (2x10=20)

   (a) What do you understand by Weber Ratio ? What does a low value for Weber Ratio indicate ?

   (b) Consider the following two 8-bit images;

   Each of these images has dimensions 20x20. Show the histograms of these images. Please note that the borders of the images shown in black are just to highlight the boundaries. The border is not a part of the image.

(c) What would happen to the dynamic range of an image if all the slopes in the contrast stretched algorithm (l, m, n) are less than one.

(d) Write down the filter mask for Sobel and Prewitt fliters.

(e) What are the different approaches for segmentation ?

(f) In which situation we use region merging and region spliting ?

(g) Derive, why we multiply with $(-1)^{x+y}$ in case of frequency domain filtering ?

(h) What steps are related with high level processing in digital image processing ?

(i) Draw the graph for Power law (Gamma) transformation (for gamma > 1).

(j) What are the issues involved for stereo imaging problem ?

Section - B

Note:Attempt any five questions from this section :(5x10=50)

2. What do you understand by digital image processing ? Explain the components of an image processing system.

3. Given the image A :

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

And structuring element B :

Compute (i) A dilated by B

(ii) A^c eroded by B

4. Consider the image segment :

3	4	1	2	0
0	1	0	4	2(q)
2	2	3	1	4
3(p)	0	4	2	1
1	2	0	3	4

Let V = {2, 3, 4}. Compute the lengths of the shortest-8 and path between p and q. If a particular path does not exist between these two points, explain why ? What is the significance of 'm' path ?

5. Derive the frequency domain transformation function H(u, v) for the following spatial domain filter h(x, y).

0	-1	0
-1	8	-1
0	-1	0

How homomorphic filtering is implemented ?

6. Draw the diagram for image resoration / degradation process. Explain the linear, position invariant property of degradation function.

7. Explain periodic noise reduction using band reject filter.

8. Explain convex hull with the help of an example.

9. State and explain various approaches used for edge detection.

Section - C

Note: Attempt any two questions from this section : (15x2=30)

10. What are the linear and non-linear smoothing filters in spatial domain ? Compute the new pixel values after applying the 3*3 box filter on the following 5*5 matrix of an 8-bit iamge.

139	128	237	126	129
145	129	123	89	132
146	122	128	87	135
141	125	134	131	139
112	127	138	133	142

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1	1	1
1	1	1
1	1	1

11. Write the procedures for boundary extraction and region filling. Mention atleast one real life application of both. What is the result of applying successive opening on the same set with the same structuring element ?

12. Write short notes on :

    (a) Chain code

    (b) Skeletons / MAT

    (c) Hough transform for boundary shape detection.

—x—