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MANIPAL INSTITUTE OF TECHNOLOGY



## SECOND SEMESTER M.Tech. (DEAC/ME) DEGREE END SEMESTER EXAMINATION APRIL 2018 SUBJECT: DICITAL IMAGE PROCESSING (ECE 5230)

## SUBJECT: DIGITAL IMAGE PROCESSING (ECE - 5239)

## TIME: 3 HOURS

MAX. MARKS: 50

- Instructions to candidatesAnswer ALL questions.
  - Missing data may be suitably assumed.
- 1A. Perform the histogram specification for the given image of size 8x8 pixels and desired histogram shown below. Sketch the output histogram.

## Original Image



1B. What is point processing? In the image given, compute the  $D_4$  and  $D_8$  distances between the two points marked with the rectangles. Also compute the  $D_m$  distance, given  $V = \{1\}$ .

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

1C. Write the result of median filter of 3 X 3 mask for given sub image.

8	9	10	11	12	
12	8	9	10	11	
13	12	8	9	10	
14	13	12	8	9	
15	14	13	12	8	

(5+3+2)

- 2A. Draw a neat diagram of model of the restoration process. Explain three principal ways of estimating the degradation function with suitable expressions.
- 2B. When will Wiener filter reduces to an inverse filter. Illustrate with the frequency domain representation. Mention the advantages and disadvantages of these filters?
- 2C. Show that a two-dimensional Gaussian is separable, while the Laplacian of a Gaussian operator (LOG) is not separable.

(5+3+2)

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3A. (i) Illustrate region filling algorithm for the following object. (A: Object, B: Structuring element, P: initial point). Mention the number of iterations taken by the algorithm.



(ii) Given the symbol probabilities, g0 = 0.07, g1 = 0.23, g2 = 0.07, g3 = 0.38, g4 = 0.13 and g5 = 0.12. Perform encoding for the symbols using Huffman's encoding. What's the average length of the bits?

- 3B. Based on the equation g(x, y) = f(x + 1, y) f(x, y) + f(x, y + 1) f(x, y)
  - (a) Find the equivalent filter H(u,v), in the frequency domain.
  - (b) Show that result obtained is a highpass filter.
- 3C. Prove that Erosion and dilation are duals of each other.

(5+3+2)

4A. Give the algorithm for region splitting and merging technique. Segment the image shown by using the split and merge procedure. Also show the quadtree corresponding to your segmentation.



- 4B. Define
  - a) Coding redundancy
  - b) Lossless and Lossy Compression
  - c) Compression Ratio
- 4C. Derive the CMY intensity mapping function from its RGB intensity mapping function.

(5+3+2)

- 5A. Define Wavelet transform. With a neat diagram explain analysis and synthesis filters of wavelet transformation.
- 5B. Explain
  - a) Color Slicing
    - b) Intensity slicing in color image
    - c) Full color image processing
- 5C. Draw the JPEG encoder and decoder structure.

(5+3+2)