

1059  
M.E. (Computer Science and Engineering)  
Second Semester  
CS-8201: Digital Image Processing

Time allowed: 3 Hours

Max. Marks: 50

NOTE: Attempt five questions in all, including Question No. 1 which is compulsory and selecting two questions from each Section.

x-x-x

Q1. Attempt the following:-

- (i) How image segmentation is useful in medical image analysis.
- (ii) Why do we need different colour models?
- (iii) What is pattern classification and give its applications?
- (iv) Now a day's memory or storage has become very cheap, why do image compression is still required? Justify.
- (v) Briefly explain about image restoration. (5x2)

**SECTION - A**

- Q2. (a) Explain the steps involved in image processing. (3)
- (b) Why do we use frequency domain filtering (3)
- (c) What is histogram equalization? Perform it on following image (4)

4	1	3	2
3	1	1	1
0	1	5	2
1	1	2	2

- Q3. (a) Describe adaptive filters. Discuss adaptive median filtering. Give its applications also. (3)
- (b) Briefly explain homomorphic filtering. Discuss how is it used to correct non-uniform illumination in images. (3)
- (c) We can think of color transformations as a transformation of vectors. (4)  
 $s_i = T_i(r_1, r_2, r_3), i=1,2,3.$   
 Here  $(r_1, r_2, r_3)$  represent the color components of the input image  $f(m,n)$ , whereas  $(s_1, s_2, s_3)$  represent the color components of the output image  $g(m,n)$ .  
 Consider a simple transformation involving intensity scaling:  $g(m,n) = kf(m,n)$  where  $0 < k < 1$  is a scaling factor. Explain the transformations for various color models used to represent the color images.
- Q4. (a) Discuss the various redundancies present in an image which are exploited for image compression. (4)



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Sub. Code: 7626

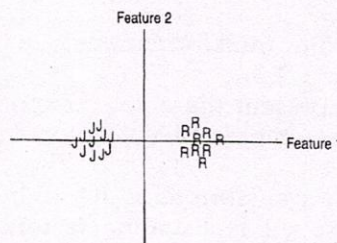
(2)

243 243 21 21 21 95 169 243  
 243 243 21 21 21 95 169 243  
 243 243 21 21 21 95 169 243  
 243 243 21 21 21 95 169 243

- (i) Compute the entropy of the image.
  - (ii) Compress the image using Huffman coding.
  - (iii) Compute the compression achieved and the effectiveness of the Huffman coding.
- (c) What is a log transformation? (2)

**SECTION-B**

- Q5. (a) Propose a morphological algorithm for converting an 8-connected binary boundary to an  $m$ -connected boundary. Assume that the boundary is fully connected and that it is one pixel thick. Does the operation of proposed algorithm require more than one iteration with each structuring element? Explain. (6)
- (b) Explain how spatial moments are used to characterize the shape of an object. (4)
- Q6. (a) Explain the polygon approximation method with suitable example. (4)
- (b) Show that the average value of the Laplacian of a Gaussian operator, is zero? (3)
- (c) Consider a three class problem and each class contains a single pattern sample. The pattern sample are class 1= {0,0}, class 2= {1,1} and class 3= {0,1}. Find the decision functions to separate the regions. (3)
- Q7. (a) Prove that the Prewitt Edge detector along horizontal direction can be obtained by convolving two one dimensional signals  $[1, 1, 1]$  and  $[-1, 0, 1]^T$  and then scaling the result by a factor of  $1/3$ . (3)
- (b) Distinguish between statistical and structural approaches to pattern recognition. (4)
- (c) Consider a two class problem which classifies the given set of flower images as either Rose or Jasmine. Two features as given in figure below are defined for this problem. Which feature has got better discrimination power and why? (In figure R-Rose, J-Jasmine). (3)



X-X-X