Hall Ticket No | | | | | | | | | | | Question Paper Code: ACS511

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Four Year B.Tech V Semester End Examinations (Supplementary) - January, 2019

Regulation: IARE – R16

IMAGE PROCESSING

Time: 3 Hours **(CSE)** **Max Marks: 70**

Answer ONE Question from each Unit
All Questions Carry Equal Marks
All parts of the question must be answered in one place only

UNIT – I

1. (a) Explain the various elements used in digital image processing with diagram **[7M]**

   (b) Find the relation among p and q in the given image segment and V={1,2,3} shown in Table 1.
   i. Neighbors of pixel p **[7M]**
   ii. Adjacency, Connectivity, and Boundaries

Table 1

1	2^p	3
2	4	5^q
2	3	5

2. (a) Define the following terms.
   i) Spatial resolution ii) Gray level resolution iii) Gray scale iv) Pixel. **[7M]**

   (b) Consider the two image subsets S1 and S2 shown below. For V = {1}, determine how many 4-connected, 8-connected and m-connected. Components there are in S1 and S2. Are S1 and S2 adjacent? **[7M]**

	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

Figure 1

UNIT – II

3. (a) Define histogram. Discuss the algorithm of histogram equalization. **[7M]**

   (b) Discuss about the basic intensity transformation functions and plot the intensity transformations i) Linear ii) Log iii) Power- law **[7M]**

4. (a) Apply the low pass filters on the given image S shown in Table 2 to perform the smoothing. **[7M]**

Table 2

7	7	4
6	4	3
1	0	7

   (b) Specify the objectives of image enhancement technique. What are the different domains to enhance the image? **[7M]**

UNIT – III

5. (a) Discuss the model of image degradation process with a neat sketch. **[7M]**

   (b) Describe inverse filtering for removal of blur caused by any motion and describe how it restore the image. **[7M]**

6. (a) Explain the adaptive filters used when the image degradation is due to noise only. **[7M]**

   (b) Apply Arithmetic, Geometric, Median filters of various sizes on image and analyze the result. **[7M]**

UNIT – IV

7. (a) What do you mean by error free compression? Explain variable length coding method used in error free compression. **[7M]**

   (b) Specify the purpose of the color model and discuss a RGB color model in detail. **[7M]**

8. (a) Describe Huffman coding for the following symbol and probabilities a_1= 0.4, a_2= 0.3, a_3=0.1, a_4=0.1, a_5=0.06 and a_6=0.04 and calculate the entropy. **[7M]**

   (b) On which type of images can we expect that run-length coding gives high compression. Discuss the degree of compression when using JPEG. **[7M]**

UNIT – V

9. (a) What is the need of morphological image processing? Mention and explain applications of morphological image processing. **[7M]**

   (b) One category of image segmentation is referred to as edge-based segmentation. Describe how the first and second order derivatives can be used to detect edges, how they differ from each other, how they are affected by noise, and which filter masks can be used. **[7M]**

10. (a) Explain Hit-Miss morphological algorithm with an example. **[7M]**

    (b) Explain about basic adaptive thresholding process used in image segmentation. **[7M]**

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Regulation: IARE – R16

IMAGE PROCESSING

Time: 3 Hours **(CSE)** **Max Marks: 70**

Answer ONE Question from each Unit
All Questions Carry Equal Marks
All parts of the question must be answered in one place only

UNIT – I

1. (a) What are the fundamental steps in digital image processing? **[7M]**
   (b) Write the expression to find the number of bits to store a digital image? Find the number of bits required to store a 256 X 256 image with 32 gray levels? **[7M]**

2. (a) Describe the process of image acquisition using different types of sensors. **[7M]**
   (b) Consider image segment shown in Figure 1: **[7M]**

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

Figure 1

Let V = {0, 1} and compute the lengths of shortest 4, 8 and m-path between p and q. If a particular path does not exist between p and q, explain why?

UNIT – II

3. (a) Define histogram equalization. Discuss about contrast stretching with a neat sketch. **[7M]**
   (b) Discuss smoothing spatial filters with a neat sketch. **[7M]**

4. (a) Explain image smoothening in frequency domain **[7M]**
   (b) Apply the low pass filters on the given image S shown in Table 1 to perform the smoothing. **[7M]**

Table 1

7	7	4
6	4	3
1	0	7

UNIT – III

5. (a) What are the different types of mean filters used in image restoration? **[7M]**

   (b) Explain notch reject filters. How can we obtain the notch filter that pass rather than suppressing the frequency in notcharea? **[7M]**

6. (a) Illustrate periodic noise reduction by frequency domain filtering. **[7M]**

   (b) Discuss the estimation of various degradation function. **[7M]**

UNIT – IV

7. (a) Explain about pseudocolor image processing. **[7M]**

   (b) Explain the procedure of the Huffman coding for the following:
   {a1, a2, a3, a4, a5, a6 } = {0.1, 0.4, 0.06, 0.1, 0.04, 0.3} **[7M]**

8. (a) Explain two dimensional four filter bank for sub band encoding. **[7M]**

   (b) What is image compression? Explain any four variable length coding compression schemes. **[7M]**

UNIT – V

9. (a) Explain about region based segmentation and its basic formulation. Explain detection of discontinuities in point detection. **[7M]**

   (b) Consider two structuring elements s_1 and s_2, where s1 is a disc of radius r and s_2 is a circle with radius r. The center of the disc and circle respectively is the origin. Will dilation and erosion using s_1 or s_2 yield the same results with any set? Justify your answers. **[7M]**

10. (a) Explain the following
    i) Thinning
    ii) Thickening **[7M]**

    (b) Describe at least three different morphological set operations (except erosion and dilation). What in the image disappears when it is eroded and dilated, respectively **[7M]**

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