MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL

Paper Code : OE-EE 702 B Digital Image Processing

Time Allotted : 3 Hours *Full Marks :70*

The Figures in the margin indicate full marks.
Candidate are required to give their answers in their own words as far as practicable

Group-A (Very Short Answer Type Question)

1. Answer any ten of the following : [1 x 10 = 10]

(i) _____ operation produce the binary image.

(ii) A continuous image is digitized at _____ points

(iii) Write True or False.
Fourier transform used to convert an image from spatial domain to frequency domain.

(iv) High pass filter eliminates the _____ frequency regions while retaining or enhancing _____ frequency component of an image.

(v) Histogram equalization is used for image_____.

(vi) Region growing is an example of _____ basod technique of image segmentation.

(vii) Hough transform used in image processing for edge linking.

(viii) Each color based pixel holds ___ bits of color values.

(ix) What is meant by pixel?

(x) In digital image of M rows and N columns and L discrete gray levels, calculate the bits required to store a digitized image for M=N=32 and L=16.

(xi) Find the mode value of the following image?

X/Y	0	1	2	3
0	1	2	3	4
1	5	5	6	6
2	6	7	6	6
3	6	7	3	3

(xii) Apply the Sobel operator on the following image at (2,2) coordinate and find the replaced value?

X/Y	0	1	2	3
0	1	2	3	4
1	5	5	6	6
2	6	7	6	6
3	6	7	6	7

Group-B (Short Answer Type Question)

Answer any three of the following [5 x 3 = 15]

2. What do you mean by pixel adjacency? Explain the concept of m-adjacency. [5]
3. What do you mean by histogram of an image? How its describe the global appearance of an image. [5]
4. Find the number of bits required to store a 256 X 256 image with 32 gray levels. [5]
5. What do you mean by bit plane slicing. Explain with example. [5]
6. Discuss the concept and uses of high boost filtering. [5]

Group-C (Long Answer Type Question)

Answer any three of the following [15 x 3 = 45]

7. a) What do you mean by dynamic range of an image?
b) Define the term resolution. List down the different hardware oriented color model and it's at least one application area.
c) What is meant by illumination and reflectance? Explain the Mach band effect. [3+2+4+2+4]

8. a) what are the differences between image enhancement and restoration techniques.
b) What do you mean by noise? Discuss the probability density function of Gaussian, Rayleigh and Gamma noise.
c) What do you mean by dynamic range normalization of an image? Write down the formula to change the dynamic range of an image and explain. [2+2+5+2+4]

9. a) Discuss the fundamental digital image processing steps with the help of block diagram.
b) What kind of necessary hardware devices required for image acquisition?
c) Describe the advantages of digital image over analog image briefly. [8+3+4]

10. a) Discuss the meaning of low frequency and high frequency region of an image with an example?
b) Explain the working principle and utility of low pass average and median filter in image enhancement with example.
c) Define a 3x3 high pass mask and discuss its utility in edge detection. [4+6+5]

11. Write short notes (answer any three) [5+5+5]
a) Butterworth low pass frequency domain filter
b) Gaussian High pass frequency domain filter
c) High boost frequency domain filtering
d) Homomorphic filtering
e) Huffman coding

*** END OF PAPER ***