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P.E.S. College of Engineering, Mandya - 571 401

(An Autonomous Institution affiliated to VTU, Belagavi)

Seventh Semester, B.E. - Electronics and Communication Engineering

Semester End Examination; Dec. - 2019

Digital Image Processing

Time: 3 hrs *Max. Marks: 100*

***Note**: Answer **FIVE** full questions, selecting **ONE** full question from each unit.*

UNIT - I

1 a. Define spatial and gray level resolution. Briefly discuss the effects resulting from a reduction in number of pixels and gray levels. 6

b. A Gray scale image of size 5 inches by 6 inches scanned at the rate of 300 dpi. Find;

i) Number of bits required to represent the image

ii) Time required to transmit the image using 28 kbps modem 6

iii) Time required to transmit the binary image using 10 kbps modem for the same size and scanned rate

c. What is digital processing? Explain the fundamental steps in digital image processing. 8

2 a. Assume the image $F = \begin{bmatrix} 0 & 7 \\ 3 & 15 \end{bmatrix}$ apply linear interpolation. 6

b. Explain the process of image quantization with example. 6

c. Explain the components of a digital imaging system along with associated block diagram. 8

UNIT - II

3 a. Apply the Histogram equalization technique to 4×4 image given by,

$$f(x, y) = \begin{bmatrix} 1 & 2 & 3 & 4 \\ 5 & 5 & 6 & 6 \\ 6 & 7 & 6 & 6 \\ 6 & 7 & 2 & 3 \end{bmatrix}$$ 10

and obtain the final image.

b. Explain how Log, Exponential and Power law transformations are used for spatial image enhancement? 10

4 a. Explain image sharpening in spatial domain using second order Laplacian derivative. 8

b. A gray- level image $g(x, y) = \begin{bmatrix} 10 & 15 \\ 20 & 50 \end{bmatrix}$ whose range is 10 - 60. What should be the requried gray-level transformation to get the image with range 120 - 180? 4

c. Explain Smoothing of images in frequency domain using one dimension and two dimension ideal LPF. 8

Contd…2

UNIT - III

5 a. Discuss the various filters for restoration in the presence of noise. 10

b. Explain the important noise proability density functions. 10

6 a. Discuss the various filters used to remove the periodic noise present in an image. 10

b. What is the issue with inverse filtering for restoring image? Explain with appropriate equations how Wiener filter takes care of these? 10

UNIT - IV

7 a. Mention different edges encountered in image processing and also explain the process of edge detection. 10

b. Explain derivative types of edge detection operation. 10

8 a. For the image A and B obtain the result of gray scale dilation and erosion,

$$A = \begin{bmatrix} 7 & 8 & 2 & 4 \\ 6 & 4 & 3 & 3 \\ 7 & 3 & 6 & 6 \\ 4 & 4 & 2 & 3 \end{bmatrix}; \qquad B = \begin{bmatrix} 1 & 1 & 1 \\ 1 & 2 & 1 \\ 1 & 1 & 1 \end{bmatrix}$$ 8

b. Explain properties of opening and closing operations. 8

c. Discuss the following morphological algorithms:

i) Boundary Extraction 4

ii) Thinning

UNIT - V

9 a. Explain the procedure for converting RGB to HSI Colour model and Vice-Versa? 10

b. What is pseudo color image processing? Explain intensity slicing as applied to pseudo color image processing. 10

10 a. Differentiate lossy compression with lossless compression techniques. 4

b. Discuss the different types of image compression techniques. 10

c. Determine HSV equipment of RGB for the points RGB = (0.4, 0.6, 0 8). 6

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