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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; Jan. / Feb. - 2021

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. What is a digital Image? Explain the fundamental steps of digital image processing. 8

b. Explain the concept of sampling and quantization. 8

c. Explain different types of representing digital images. 4

2 a. Explain with neat diagram, how image is acquired using sensor strips? 8

b. With a neat diagram, explain the components of a general purpose image processing system. 8

c. Transmission is accomplished in a packet consisting of a start bit, a byte of information and a stop bit. Find out;

i) How many minutes would it take to transmit a 2048 × 2048 image with 256 intensity level using a 33.6 k baud modem? 4

i) What would the time be at 3000 k baud?

UNIT - II

3 a. With necessary graph, explain the log and power law transformation used for spatial image enhancement. 5

b. Explain Grey level and Bit plane slicing along with relevant transformation. 5

c. Perform histogram equalization of the given image. The grey level value range between 0 to 7.

$$\begin{bmatrix} 4 & 4 & 4 & 4 & 4 \\ 3 & 4 & 5 & 4 & 3 \\ 3 & 5 & 5 & 5 & 3 \\ 3 & 4 & 5 & 4 & 3 \\ 4 & 4 & 4 & 4 & 4 \end{bmatrix}$$ 10

4 a. Explain smoothing of images in frequency domain using ideal Butterworth LPF and Gaussian LPF (Low Pass Filter). 6

b. Explain homomorphic filtering approach for image enhancement. 8

c. For the image segment $f(x, y)$ given below, apply;

i) Smoothing filter

ii) Weighted average filter 6

iii) Median filter

Contd…2

UNIT - III

5 a. With a neat diagram, explain the model of the image degradation / restoration process. 6

b. Discuss the following noise models along with expression and response curve: 8

i) Rayleigh

ii) Erlang

iii) Salt and Pepper

c. What are order static filters? Explain any three order filter. 6

6 a. Define and write expression for the following filters: 6

i) Geometric mean

ii) Harmonic mean

Mention one application of each.

b. Describe the adaptive median filtering with necessary equation. 8

c. Define and obtain transfer function of periodic noise reduction band reject filter in frequency domain. 6

UNIT - IV

7 a. What is objective of segmentation? Explain region based segmentation. 10

b. Explain derivative type of edge detection operations. 10

8 a. Explain erosion and dilation operation used for morphologic processing. 10

b. Explain the following morphological algorithms: 10

i) Thinning ii) Thickening

UNIT - V

9 a. Suppose RGB colour triplet for a particular colour is given by (0.3, 0.5, 0.2), compute corresponding YIQ and HSI triplets. 10

b. Explain pseudo color image processing with intensity slicing technique and grey level to color transformation. 10

10 a. Explain image compression model with a block diagram. 10

b. Consider a 8-bit image, 10

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	243	243

i) Find entropy of the image

ii) Compress the image using Huffman coding

iii) Compute the compression achieved

iv) Code the difference between adjacent pixels

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