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**Seventh Semester B.E. Degree Examination, December 2011**

**Digital Image Processing**

Time: 3 hrs.

Max. Marks:100

**Note: Answer any FIVE full questions, selecting at least TWO questions from each part.**

**PART – A**

- 1 a. Explain the fundamental steps in digital image processing, with a neat block diagram. (03 Marks)
- b. Discuss the metric and topological properties of an image. (07 Marks)
- c. Discuss the procedure of quantization and sampling. (10 Marks)
- 2 a. Define histogram equalization. Develop an algorithm for contrast enhancement, using this technique, with a corresponding mathematical model, designed for contrast enhancement. (12 Marks)
- b. Discuss any two interpolation techniques that are used to estimate the intensity information, occurring due to geometric transformations. (08 Marks)
- 3 a. Discuss the iterative optimal threshold detection technique. Find the optimal threshold for the following  $5 \times 5$  image: (10 Marks)

25	26	24	20	160
25	32	35	158	155
24	33	36	145	154
29	32	32	142	142
28	28	29	26	118

- b. Explain how Hough transform helps in extracting line segments from an image. (10 Marks)
- 4 a. Explain inner boundary tracing and outer boundary tracing algorithms. (08 Marks)
- b. Discuss the procedure of obtaining the segmented regions, using split and merge strategy. (06 Marks)
- c. Discuss the watershed segmentation, in detail. (06 Marks)

**PART – B**

- 5 a. Devise an algorithm to smooth an image using : (08 Marks)
  - i) Image averaging
  - ii) Median filtering technique
- b. Define edge. Describe the procedure of extracting edges using canny edge detection technique. (06 Marks)
- c. Discuss Fast Fourier transform, in detail. (06 Marks)
- 6 a. Define image compression. Describe the general image compression model. (06 Marks)
- b. Devise an algorithm that encodes and decodes data using Huffman compression technique. Illustrate for the following data and compute entropy and efficiency. (10 Marks)

Data	S <sub>1</sub>	S <sub>2</sub>	S <sub>3</sub>	S <sub>4</sub>	S <sub>5</sub>	S <sub>6</sub>	S <sub>7</sub>	S <sub>8</sub>
Probability	0.2	0.05	0.01	0.04	0.1	0.3	0.15	0.15

- c. Explain in brief, seen length encoding and decoding scheme. (04 Marks)
- 7 a. Describe the procedure of region identification using 4-neighborhood and 8-neighborhood concepts. (08 Marks)
- b. Explain any three region and contour based shape representation models. (12 Marks)
- 8 a. Define morphology. Discuss binary dilation and erosion, in detail. (08 Marks)
- b. Discuss the procedure of boundary extraction, using morphological operators. (06 Marks)
- c. Explain hit-or-miss transform and region filling morphological algorithms. (06 Marks)

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