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Seventh Semester B.E. Degree Examination, June/July 2013

Image Processing

Time: 3 hrs.

Max. Marks:100

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

PART – A

- 1 a. With a neat block diagram explain the fundamental steps in digital processing. (10 Marks)
- b. Consider the two image subsets S_1 and S_2 shown in Fig.Q1(b). For $V = \langle 1 \rangle$, determine whether these two subsets are: i) 4-adjacent, ii) 8-adjacent or (iii) M-adjacent. (10 Marks)

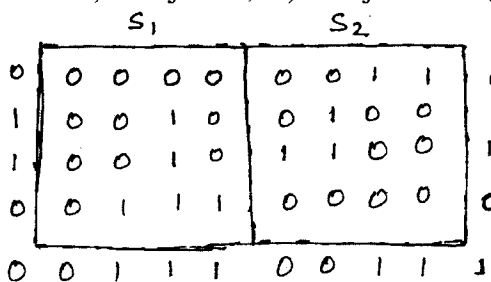


Fig.Q1(b)

- 2 a. Explain the role of sampling and quantization in image processing system. (10 Marks)
- b. What are the basic relationships between pixels? With neat diagrams and appropriate mathematical expressions, explain (i) neighbours, ii) adjacency, iii) connectivity. (10 Marks)
- 3 a. With respect to 2D discrete Fourier transform of an image, explain the following, derive suitable equations:
i) Separability ii) Transition iii) Rotation iv) Periodicity (10 Marks)
- b. Explain the homomorphic filtering approach for image enhancement. (10 Marks)
- 4 a. Give the expression for Hadamard transform and generate the corresponding 1-D Kernel for $N = 4$. Explain any two of its properties. (12 Marks)
- b. Write an explanatory note on Histogram equalization. (08 Marks)

PART – B

- 5 a. Why smoothing is needed in image processing? What is its effect on the image? Explain an ideal LPF and Butterworth LPF in the above context. (10 Marks)
- b. An image has the gray level pdf $p(r)$ shown in Fig.Q5(b)(i). It is desired to transform the gray levels of this images so that they will have the specified $p(z)$ shown in Fig.Q5(b)(ii). Assume continuous quantities and find the transformation in terms of r and z that will accomplish this. (10 Marks)

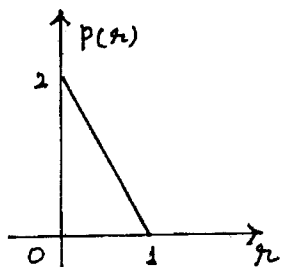


Fig.Q5(b)(i)

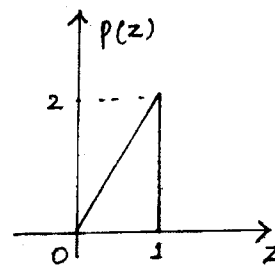


Fig.Q5(b)(ii)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and/or equations written eg, 42+8 = 50, will be treated as malpractice.

- 6** a. With the help of a neat graphical illustration, explain the power-law transformation and piecewise linear contrast stretch. **(10 Marks)**
- b. Explain how image degradation is carried out using:
- i) observation,
 - ii) experiment,
 - iii) mathematical modeling. **(10 Marks)**
- 7** a. Explain in brief the inverse filtering approach and its limitation in image restoration. **(04 Marks)**
- b. With respect to image restoration, explain:
- i) Spatial transformation
 - ii) Gray level interpolation **(06 Marks)**
- c. With relevant mathematical expression, explain how a Wiener filter achieves, restoration of a given degraded image. **(10 Marks)**
- 8** a. Discuss briefly any two colour model in colour image processing. **(10 Marks)**
- b. Explain in detail pseudo colour image processing. **(10 Marks)**

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