USN | | | | | | | | | | 10EC763

Seventh Semester B.E. Degree Examination, Dec.2017/Jan.2018
Image Processing

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. With the help of neat block diagram, explain the components of a general purpose image processing system. **(08 Marks)**

b. With a neat block diagram explain the fundamental steps involved in digital image processing. **(12 Marks)**

2 a. Explain the image acquisition using single sensor. **(06 Marks)**

b. Consider the image segment shown in Fig.Q2(b). Set V = {0, 1}, compute the lengths of shortest 4, 8 and m – path between p and q. If path does not exists between p and q, explain why?

	3	1	2	1 (q)
	2	2	0	2
	1	2	1	1
(p)	1	0	1	2

Fig.Q2(b). **(06 Marks)**

c. Explain the role of sampling and quantization with an example. **(08 Marks)**

3 a. For the 2 × 2 orthogonal matrix A and image U obtain the transformed image and basis images and inverse transformation.

$$A = \frac{1}{\sqrt{2}}\begin{bmatrix} 1 & 1 \\ 1 & -1 \end{bmatrix} \qquad U = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}.$$ **(06 Marks)**

b. Explain the following properties of unitary transform.
i) Energy conservation
ii) Decorrelation. **(06 Marks)**

c. Define 2-D forward and inverse discrete cosine transform and mention its properties. **(08 Marks)**

4 a. Using the core matrix H_1 generate hadamard transform matrix H_3 and explain 4 properties of hadamard transform. **(10 Marks)**

b. Define slant transform. Obtain 4 × 4 slant transformation matrix. Explain any four properties of slant transform. **(10 Marks)**

PART – B

5 a. Explain the following intensity transformation functions with necessary graphs.
   i) Image negatives
   ii) Log transformations
   iii) Power law (Gamma) transformations. **(10 Marks)**

b. Perform histogram equalization of an image whose pixel intensity distribution is given in table :

Gray levels	0	1	2	3	4	5	6	7
Number of Pixels	790	1023	850	656	329	245	122	81

Construct the histogram of the image before and after equalization. **(10 Marks)**

6 a. Explain the smoothing of images in frequency domain using :
   i) Ideal lowpass filter
   ii) Butterworth lowpass filter. **(10 Marks)**

b. With the help of a block diagram, explain the homomorphic filtering approach for image enhancement. **(10 Marks)**

7 a. Explain the model of image degradation/restoration. List all noise probability density functions and explain any three with necessary equations and graphs. **(10 Marks)**

b. Explain inverse filtering and Weiner filtering in image processing. **(10 Marks)**

8 a. Explain briefly any two color models. Write equations for converting RGB to HSI. **(10 Marks)**

b. Write a note on Pseudo color image processing. Explain intensity slicing as applied to pseudo color image processing. **(10 Marks)**

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