

**Seventh Semester B.E. Degree Examination, Dec.2016/Jan.2017**  
**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 block diagram, explain the fundamental steps involved in “Digital Image Processing” (10 Marks)  
 b. Describe briefly the principle of image formation in human eye. (05 Marks)  
 c. Explain brightness adaptation with the help of suitable diagram. (05 Marks)
- 2 a. What is image sampling and quantization? (08 Marks)  
 b. Compute the lengths of the shortest 4, 8 and m-path between p and q for the following image segment with  $V = \{1, 2\}$ . (06 Marks)

5 4 3 1 1 (q)

5 4 0 2 0

3 2 0 2 4

2 1 1 3 5

(p) 1 3 5 1 3

- c. What is a distance function? Give the formula for calculating Euclidean distance and chessboard distance. (06 Marks)
- 3 a. Explain the properties of unitary transforms. (06 Marks)  
 b. Calculate the transformed image V and the basis images for orthogonal matrix A and image U. (06 Marks)
- $$A = \frac{1}{\sqrt{2}} \begin{bmatrix} 1 & 1 \\ 1 & -1 \end{bmatrix}, \quad U = \begin{bmatrix} 2 & 3 \\ 1 & 2 \end{bmatrix}$$
- c. Construct  $4 \times 4$  DFT matrix. Discuss the following properties of 2 dimensional DFT:  
 (i) Fast transform (ii) Conjugate symmetry (08 Marks)
- 4 a. Explain Haar transformation with its properties, compute the Haar transformation of  $2 \times 2$  image  $F = \begin{bmatrix} 3 & -1 \\ 6 & 2 \end{bmatrix}$ . (10 Marks)  
 b. Determine  $4 \times 4$  Slant transform matrix. List its properties. (10 Marks)

**PART – B**

- 5 a. Explain the following:  
 (i) Contrast stretching.  
 (ii) Bit plane slicing.  
 (iii) Gray level slicing. (10 Marks)
- b. Perform histogram equalization of  $5 \times 5$  image whose data is shown in Table Q5 (b) and draw the histogram of image before and after equalization. (10 Marks)

Gray level	0	1	2	3	4	5	6	7
Number of pixels	0	0	0	6	14	5	0	0

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. Explain with a block diagram, the basic steps for image filtering in frequency domain. (10 Marks)  
b. Discuss homomorphic filtering. (10 Marks)
- 7 a. Explain the model of image degradation / restoration. (10 Marks)  
b. Explain observation and experimentation ways to estimate the degradation function. (10 Marks)
- 8 a. Explain RGB and HSI colour models. (10 Marks)  
b. What is pseudo colour image processing? Explain intensity level slicing of assigning pseudo colours. (10 Marks)

\* \* \* \* \*

CMRIT Library