

# ONE TIME EXIT SCHEME

USN

--	--	--	--	--	--	--	--	--	--

**CMRIT LIBRARY**  
BANGALORE - 560 037

10EC763

## Seventh Semester B.E. Degree Examination, April 2018 Image Processing

Time: 3 hrs.

Max. Marks:100

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

### PART - A

- 1 a. With a neat block diagram, describe various components used in general purpose image processing system. (10 Marks)
- b. Describe briefly the principle of image formation in human eye. (05 Marks)
- c. Mention any five applications of image processing. (05 Marks)
  
- 2 a. Explain the process of image acquisition using single sensor. (06 Marks)
- b. Briefly explain the following relationships between the pixels. (06 Marks)
  - i) Neighbours ii) Adjacency iii) Connectivity of pixels.
- c. Consider the image segment shown in Fig.Q2(c). Compute length of the shortest 4, 8 and m paths between pixels P and Q where,  $V = \{1, 2\}$ . (08 Marks)

	4	2	3	2	(q)
	3	3	1	3	
	2	3	2	2	
(P)	2	1	2	3	

Fig.Q2(c)

**CMRIT LIBRARY**  
BANGALORE - 560 037

- 3 a. Explain the properties of unitary transform. (06 Marks)
- b. Compute 2D DFT of given  $4 \times 4$  gray scale image and corresponding inverse DFT. (08 Marks)

$$U = \begin{bmatrix} 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 \end{bmatrix}$$

- c. Explain the following properties of two dimensional Fourier transforms : (06 Marks)
  - i) Conjugate symmetry
  - ii) Scaling property
  - iii) Distributivity.
  
- 4 a. Define 2 - D forward and inverse discrete cosine transform and mention its properties. (10 Marks)
- b. 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)

**CMRIT LIBRARY**  
BANGALORE - 560 037

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.

**PART – B**

- 5 a. Perform histogram equalization for the following image data. Sketch the histogram of the original image and histogram of equalized image. (10 Marks)

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

- b. Explain intensity level slicing and Bit plane slicing. (10 Marks)
- 6 a. Explain the smoothing of images in frequency domain using :  
 i) Butterworth lowpass filter (10 Marks)  
 ii) Gaussian lowpass filter. (10 Marks)
- b. With a block dg and equations explain homomorphic filtering. (10 Marks)
- 7 a. Explain any five noise models using their probability density functions. (10 Marks)  
 b. With necessary mathematical equations, explain inverse filtering and Weiner filtering for image restoration. (10 Marks)
- 8 a. Describe RGB colour model with the help of a neat diagram. Write equations to convert RGB to HSI. (10 Marks)  
 b. Explain Gray Scale (Intensity) to colour transformation with diagrams. (10 Marks)