



Time: 3 hrs.

Max. Marks:100

Seventh Semester B.E. Degree Examination, June/July 2019
Image Processing

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

PART - A

- 1 a. With a neat block diagram, explain the components of a general purpose image processing system. (10 Marks)
- b. Explain the following terms as applicable to image processing with necessary graphs.
- c. i) Brightness adaptation
ii) Weber ratio
iii) Mach bands. (10 Marks)
- 2 a. Explain the concept of image sampling and quantization in image processing with an example. (08 Marks)
- b. Consider the image segment given in Fig.Q2(b). Let $v = \{2, 3, 4\}$, compute the lengths of the shortest 4, 8 and m path between 'p' and 'q'. If path does not exists explain why? (06 Marks)

	3	4	1	2	0	
	0	1	0	4	2	(q)
	2	2	3	1	4	
(p)	3	0	4	2	1	
	1	2	0	3	4	

Fig.Q2(b)

- c. Let p and q are the two pixels at co-ordinates (100, 200) and (150, 190) respectively. Compute :
i) Euclidean distance ii) city block distance iii) chessboard distance. (06 Marks)
- 3 a. For the 2×2 transform A and the image U,

$$A = \frac{1}{2} \begin{bmatrix} \sqrt{3} & 1 \\ -1 & \sqrt{3} \end{bmatrix} \quad U = \begin{bmatrix} 2 & 3 \\ 1 & 2 \end{bmatrix}$$
Calculate the transformed image V and the basis image. Also reconstruct the original image. (10 Marks)
- b. Explain any three properties of two dimensional Discrete Fourier transform. (06 Marks)
- c. Write a note on separable unitary transforms. (04 Marks)
- 4 a. Give an expression for 2D discrete sine transform and discuss its properties. (10 Marks)
- b. Generate Hadamard transform matrix H_n for $n = 2, 3$ for the given core matrix :

$$H_1 = \frac{1}{\sqrt{2}} \begin{bmatrix} 1 & -1 \\ -1 & 1 \end{bmatrix}. \quad (08 \text{ Marks})$$

- c. State any two properties of SLANT transform. (02 Marks)

PART – B

- 5 a. Explain the following with applications :
- Contrast stretching
 - Bit plane slicing
 - Grey level slicing
 - AND operation.
- (10 Marks)
- b. For the image shown in Fig. Q5(b), plot the histograms before and after the histogram equalization. (10 Marks)

$$\begin{bmatrix} 2 & 3 & 3 & 2 \\ 4 & 2 & 4 & 3 \\ 3 & 2 & 3 & 5 \\ 2 & 4 & 2 & 4 \end{bmatrix}$$

Fig. Q5(b)

- 6 a. Explain the following smoothing frequency domain filters and compare.
- Ideal lowpass filter
 - Gaussian pass filter.
- (10 Marks)
- b. Illustrate homomorphism filtering process in image enhancement and derive the suitable result. (10 Marks)
- 7 a. Write a note on the following noise probability density functions :
- Gaussian noise
 - Rayleigh noise
 - Erlang noise
 - Exponential noise.
- (12 Marks)
- b. Derive an expression of the linear degradation model in presence of additive noise. (08 Marks)
- 8 a. Explain the procedure for converting colors form (RGB) to HSI and vice-versa. (10 Marks)
- b. What is pseudo color image processing? Explain gray level to color transformations. (10 Marks)
