



CBCS SCHEME

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15MT754

Seventh Semester B.E. Degree Examination, July/August 2021 Digital Image Processing

Time: 3 hrs.

Max. Marks: 80

Note: Answer any FIVE full questions.

- 1 a. What are the fundamental steps of digital image processing? Explain with a neat sketch. (08 Marks)
- b. Explain with neat diagram, the structure of human eye. (08 Marks)
- 2 a. Explain the following terms as applicable to image processing with necessary graphs/sketch. (08 Marks)
 - i) Brightness adaptation
 - ii) Mach band effect.
- b. Write a short note on image formation in the eye. (04 Marks)
- c. List and explain four application of image processing. (04 Marks)
- 3 a. Explain the concept of sampling and quantization in image processing. (08 Marks)
- b. Briefly explain the following terms : (08 Marks)
 - i) Neighbors
 - ii) Path
 - iii) Connectivity of pixels.
- 4 a. Explain about the following terms related to image processing. (08 Marks)
 - i) City block distance
 - ii) Chessboard distance
 - iii) Image interpolation.
- b. Consider the image segment given in Fig.Q4(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 exist explain why?

	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.4(b)

(08 Marks)

- 5 a. List and prove the following properties of discrete Fourier transform. (08 Marks)
 - i) Periodicity
 - ii) Convolution.
- b. If $A = \frac{1}{\sqrt{2}} \begin{bmatrix} 1 & 1 \\ 1 & -1 \end{bmatrix}$ is unitary matrix, $u = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$ an image, determine the unitary transformed image and find the basis image of 'A' also find the original image form transformed image. (08 Marks)
- 6 a. Define Hadamard transform, generate 4×4 Hadamard matrix. Also list any four properties of Hadamard transforms. (08 Marks)
- b. Compute the Haar basis for $N = 4$. (08 Marks)

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.

- 7 a. Explain the following linear transformation functions :
 i) Contrast stretching
 ii) Intensity level slicing. (08 Marks)
- b. Perform histogram equalization of an image whose pixel intensity distribution is given in table. It's a 3 bit image of size 64×64 pixels.

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. (08 Marks)

- 8 a. Explain the smoothing of images in frequency domain using
 i) Ideal lowpass filter
 ii) Butterworth lowpass filter. (08 Marks)
- b. With the help of block diagram, explain homomorphic filter approach for image enhancement. (08 Marks)
- 9 a. Explain about RGB color model. (08 Marks)
- b. Define the process of image restoration. Explain any two important noise probabilities density functions. (08 Marks)
- 10 a. Explain with relevant mathematical model band reject filters and bandpass filters used in periodic noise reduction. (08 Marks)
- b. Explain Weiner filtering in image processing with necessary mathematical models. (08 Marks)
