

Total No. of Questions : 12]

SEAT No. :

P830

[Total No. of Pages :4

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B.E. (E & TC) (Semester - I)

DIGITAL IMAGE PROCESSING

(404184) (Elective - I) (2008 Pattern)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) *Answer any 3 questions from each section.*
- 2) *Figures to the right indicate full marks.*
- 3) *Assume suitable data, if necessary.*
- 4) *Write prescriptions where indicated and in the use of drugs their doses should be given.*

SECTION - I

- Q1) a)** Explain with neat diagrams, the various mechanisms for image acquisition. **[8]**
- b) Explain the following in context of human vision.
- i) Luminance & Brightness
 - ii) MTF **[8]**

OR

- Q2) a)** Explain the following w.r.t. digital image. **[8]**
- i) Spatial and Gray level resolution.
 - ii) Profile and standard deviation.
- b) Given below is 5×5 image. Find out distance between p and q by methods: **[8]**
- i) City Block
 - ii) Chess Board

	2	3	4	2	①q
	1	4	3	2	4
	3	2	1	0	2
	2	2	2	2	2
p②	1	1	3	4	

- Q3) a)** Briefly explain the following image enhancement methods with their applications: **[8]**
- i) Power law transform
 - ii) Unsharp Masking

P.T.O.

b)

[10]

- i) Determine the third bit plane of the image $\begin{bmatrix} 3 & 4 \\ 1 & 5 \end{bmatrix}$.
- ii) Can two different images have the same histogram? Justify your answer with example.
- iii) A 2×2 image $f(m,n) = \begin{bmatrix} 4 & 2 \\ 5 & 8 \end{bmatrix}$ is passed through the linear filter

$$h(m,n) = \frac{1}{2} \begin{bmatrix} 0 & 0 & 0 \\ 1 & 0 & 1 \\ 0 & 0 & 0 \end{bmatrix}, \text{ what is the resultant image?}$$

(Assume zero padding).

- iv) What should be the value of 'X' if the following mask is used as high pass filter.

$$\begin{array}{ccccc} -1 & -1 & -1 & -1 & -1 \\ -1 & -1 & -1 & -1 & -1 \\ -1 & -1 & X & -1 & -1 \\ -1 & -1 & -1 & -1 & -1 \\ -1 & -1 & -1 & -1 & -1 \end{array}$$

- v) Below are the pixel values in a 5×5 gray level image:

11	11	12	13	15
12	12	10	11	12
14	15	85	10	11
11	12	10	11	12
12	13	10	11	13

What is value of the masked pixel after applying 3×3 Median filter.

OR

- Q4) a)** Explain how image smoothing can be achieved using frequency domain filtering. [8]

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- b) Image 1 is an image with gray levels in the range 0 to 7. Plot the histogram of the Image1. Equalize the histogram and plot the equalized histogram and give equalized image. Comment on the results. [10]

Image.1

5	5	3	4	4
4	4	4	4	4
4	4	3	3	3
4	4	3	3	3
5	5	5	3	3

- Q5) a)** Compute DCT of the following 2×2 image: [8]

$$\begin{bmatrix} 8 & 4 \\ 2 & 1 \end{bmatrix}$$

- b) Explain the following properties of 2D Fourier Transform: [8]
- i) Translation
 - ii) Rotation & scaling
 - iii) Convolution

OR

- Q6) a)** Compute DFT of the following 2×2 image. [8]

$$\begin{bmatrix} 1 & 4 \\ 2 & 8 \end{bmatrix}$$

- b) Compare following image transformation techniques on the basis of energy compaction, simplicity, computational efforts and applications. [8]
- i) DFT
 - ii) DCT

SECTION - II

- Q7) a)** What is RLC? Which type of redundancy is explicated by RLC? Derive RLC codes considering an 4×4 binary Image. [9]
- b) Calculate the efficiency of Huffman code for the following symbols whose probability of occurrence is given below. [9]

Symbol	Probability
a_1	0.9
a_2	0.06
a_3	0.02
a_4	0.02

OR

- Q8)** a) What is redundancy? How can redundancy be an effective tool for image compression? Explain any one redundancy. [9]
b) Explain arithmetic coding with example? Compare it with Huffman coding. [9]

- Q9)** a) A pseudo binary Image X and the structuring element B are given as below: [8]

$$X = \begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 1 & 1 & 1 & 0 & 0 \\ 0 & 1 & 1 & 1 & 0 & 0 \\ 0 & 0 & 1 & 1 & 1 & 0 \\ 0 & 0 & 1 & 1 & 1 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix} \quad B = \begin{bmatrix} 0 & 1 & 0 \\ 1 & 1 & 0 \\ 0 & 1 & 0 \end{bmatrix}$$

Perform : $Y_1 = X \ominus B$ and $Y_2 = X \oplus B$.

- b) Explain Gradient & Laplacian operators for edge detection? Derive the mask for Laplacian edge detector. [8]

OR

- Q10)** a) Write the algorithm for finding chain codes in 4 - direction & 8 - direction. [8]
b) Explain morphological operations. [8]
i) Thinning ii) Opening & closing

- Q11)** a) Write short note on Gaussian Low pass filtering for images. [8]
b) With relevant block diagram, explain the steps required for Finger Print recognition system. [8]

OR

- Q12)** a) Explain the Image degradation model in detail. [8]
b) Explain 'Wiener Filter' with reference to Image restoration. [8]

