7. (a) Explain the region splitting and merging techniques in detail. 7

(b) Find out the signature of each of the following :

(i) Circle

(ii) Square

(iii) Equilateral triangle. 6

8. (a) State the algorithm for global thresholding. 6

(b) An image has intensity distributions given by :

$$P_1(z) = \begin{cases} 0.5(z-1) & ; 1 \le z \le 3 \\ 0 & ; \text{otherwise} \end{cases}$$

$$P_2(z) = \begin{cases} 0.5(2-z) & ; 0 \le z \le 2 \\ 0 & ; \text{otherwise} \end{cases}$$

Where $P_1(z)$ is the probability distribution function for object elements and $P_2(z)$ is the probability distribution function for the background elements. Assuming that a priori probabilities of object and background elements are same, obtain the optimal threshold for segmentation. 7

9. (a) Describe a point detection method for detection of isolated points in an image. 7

(b) Determine which bit if any in error in the Hamming encoded messages, 1100111, 1100110 and 1100010. What are the decoded values ? 6

10. Write short notes on (any **TWO**) :

(a) Global processing via Hough transform

(b) Fourier descriptor

(c) Huffman coding. 14

VRK/KS/14/3145/3223/3228/3239/3407

Faculty of Engineering & Technology

Eighth Semester B.E. (Electro/EDT/E&T/Indus Elec.) /

Seventh Semester B.E.P.T. (Electro) Examination

DIGITAL IMAGE PROCESSING

Elective—II

Sections—A & B

Time—Three Hours] [Maximum Marks—80

INSTRUCTIONS TO CANDIDATES

(1) All questions carry marks as indicated.

(2) Answer **THREE** questions from Section A and **THREE** questions from Section B.

(3) Due credit will be given to neatness and adequate dimensions.

(4) Assume suitable data wherever necessary.

(5) Illustrate your answers wherever necessary with the help of neat sketches.

SECTION—A

1. (a) Discuss the fundamental steps in digital image processing. 7

(b) Consider the image segment shown, let V = [0, 1] and V = [1, 2]. Compute the length of the shortest 4–, 8– and m-path between p and q. If particular

path does not exist between these two points, explain why ?

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

6

2. (a) Explain the bit-plane slicing technique. Show the different bit planes of a 3-bit image of fig. Q. 2(a) :

6	6	6	6	7	7	7	7	7
6	5	5	5	4	4	4	4	7
6	5	3	3	2	2	2	4	7
6	5	3	1	1	1	2	4	7
6	5	3	1	0	1	2	4	7
6	5	3	1	1	1	2	4	7
6	5	3	3	3	2	2	4	7
6	5	5	5	5	4	4	4	7
6	6	6	6	7	7	7	7	7

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Fig. Q.2(a)

(b) The gray levels in an image $g_1(x, y)$ range from 10 to 100. It is desired to change it into an image $g_2(x, y)$ in which the gray levels range from 0 to 255 using a linear transformation of its gray levels. Write the equation for $g_2(x, y)$ as a function of $g_1(x, y)$.

4

3. (a) Write short note on Histogram processing. 6

(b) Generate 4 × 4 slant transform and show how it is an "Orthogonal" transform. 7

4. (a) What are the advantages and disadvantages of median filter ? Obtain output image by applying 3 × 3 median filter of the following image :

$$\begin{bmatrix} 2 & 4 & 15 & 0 \\ 3 & 5 & 2 & 6 \\ 11 & 0 & 2 & 10 \\ 6 & 16 & 0 & 0 \end{bmatrix}$$

7

(b) Write a short note on Wiener filtering. 6

5. Write short notes on (any **TWO**) :

(a) Haar transform

(b) Laplacian of Gaussian filter

(c) 8 × 8 Hadamard transform. 14

SECTION—B

6. (a) Explain the generated image compression model with neat block diagram. 5

(b) Find the chain code and shape numbers of the image given in Fig. Q. 6(b). Also find the order of shape numbers. Assume 4-connectivity.

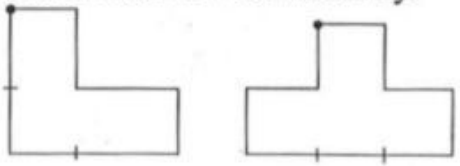

Fig. Q. 6(b)

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