B.E. Eighth Semester (Electronics & Communication / Electronics & Telecommunication Engineering) (C.B.S.)

Elective - II : (DIP) Digital Image Processing

P. Pages : 3 **KNT/KW/16/7565**

Time : Three Hours * 0 2 7 5 * Max. Marks : 80

Notes :
1. All questions carry marks as indicated.
2. Solve Question 1 OR Questions No. 2.
3. Solve Question 3 OR Questions No. 4.
4. Solve Question 5 OR Questions No. 6.
5. Solve Question 7 OR Questions No. 8.
6. Solve Question 9 OR Questions No. 10.
7. Solve Question 11 OR Questions No. 12.
8. Due credit will be given to neatness and adequate dimensions.
9. Assume suitable data whenever necessary.
10. Diagrams and chemical equations should be given whenever necessary.
11. Illustrate your answers whenever necessary with the help of neat sketches.
12. Use of non programmable calculator is permitted.

1. a) What are different Image acquisition techniques? Explain any one of them. **7**

b) Define the term 4– , 8– and m-path between two points p and q. **6**

OR

2. a) What are different distance measures used for image? Compute De, D4 and D8 distance between two pixels p and q in the image shown below. **6**

	0	1	1	1 (q)
	1	0	0	0
	1	1	1	1
(p)	1	1	0	1

b) Consider the image segment shown, let V = [0, 1] and V = [1, 2]. Compute the length of the shorten 4– , 8– and m-path between p and q. If particular path does not exist between these two points, explain why? **7**

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

3. a) Determine the convolution of 2D signals : **6**

$x(m,n) = \begin{bmatrix} 2 & 5 & 3 \\ 1 & 4 & 1 \end{bmatrix}$ and $h(m,n) = [1\ 2\ 3]$.

b) For 2×2 transform A and image U, calculate the transformed image V and the basis images : **8**

$$A = \frac{1}{\sqrt{2}}\begin{bmatrix} 1 & 1 \\ 1 & -1 \end{bmatrix};\ U = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$$

OR

4. a) Generate 4×4 slant transform and show how it is "orthogonal" transform. **10**

b) Obtain the 4 – length DCT for the following discrete sequence : **4**

$\{1, 3, -2, 4\}$.

5. a) What is histogram matching? Explain. **6**

b) The Gray level histogram of an image is given below : **7**

Gray level	0	1	2	3	4	5	6	7
Frequency of occurrence	400	700	1350	2500	3000	1500	550	0

Compute the gray level histogram of the output image obtained by enhancing the input by histogram equalization technique.

OR

6. a) Explain bit plane slicing. For 4×4 4 bit image obtain the image by considering higher two bits only. **6**

$$\begin{matrix} 11 & 4 & 10 & 8 \\ 12 & 9 & 2 & 5 \\ 4 & 2 & 7 & 5 \\ 0 & 1 & 6 & 2 \end{matrix}$$

b) Obtain the output image by applying 3×3 median filter of the following image. **7**

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

7. a) Explain the generalized image compression model with neat block diagram. **8**

b) Determine which bit, if any is in error in the Hamming encoded messages : **6**
1100111, 1100110 and 1100010
what are the decoded values?

OR

8. a) Describe a point detection method for detection of isolated points in an image. **5**

b) Decode the message 0.23355 using arithmetic coding. The symbols with probabilities are: **9**

Symbol		Probability
a	$\longrightarrow$	0.2
e	$\longrightarrow$	0.3
i	$\longrightarrow$	0.1
o	$\longrightarrow$	0.2
u	$\longrightarrow$	0.1
!	$\longrightarrow$	0.1

9. a) Discuss the global processing via though transform. Use though transform to find a straight line for data points (0,1), (1,1), (2,2) and (3,3). **7**

b) Draw the medial axis of a circle, a square, a rectangle and equilateral triangle. **6**

OR

10. An image contain two types of regions R_1 and R_2. The prior probabilities are $P_1 = 0.4$ and $P_2 = 0.6$ respectively. Probability density functions of regions R_1 and R_2 are denoted by $P_1(t)$ and $P_2(t)$ respectively, where : **13**

$P_1(t) = 0.25 - 0.0625\,|4 - z|$ for $0 \le z \le 8$

$P_2(t) = 0.2 - 0.04\,|9 - z|$ for $4 \le z < 14$

Determine the optimum threshold image segmentation.

11. a) Describe the region splitting and merging techniques for image segmentation. **7**

b) Write a short note on Fourier descriptor. **6**

OR

12. a) Sketch the Gradient and Laplacian for each mask. **6**

b) Write a short note on chain code descriptor. **7**

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