B.E. Sem. VII (Rev) (E & TC) Elective I Image Processing

Con. 2286-05. (REVISED COURSE) AM-8527

(3 Hours) [Total Marks : 100

N.B. 1. Question No. 1 is **compulsory**.
2. Attempt any **four** questions out of remaining **six** questions.
3. **Figures** to **right** indicates **full** marks.
4. Assume **suitable** data if **necessary**.

1. (a) Define 10
(i) Spatial Resolution
(ii) Intensity Resolution
(iii) Temporal Resolution
(iv) PSF (Point Spread Function)
(v) Image Enhancement.

(b) Reason the following contentions. 2.5 x 4
(i) For N x N image with 2^m grey level, points lying on the isopreference curve in N-M plane corresponds to image of equal subjective quality.
(ii) Moments are used as a similarity measure in comparisions of two regions of an image with the other regions.
(iii) For contineous image histogram can be perfectly equalised, but it may not be so for digital image.
(iv) Brightness discrimination is poor at low levels of illuminations.

2. (a) What is the impulse response of each filter 6

(i) The transfer function is

$$H(z_1, z_2) = 1 - a_1 z_1^{-1} - a_2 z_2^{-1} - a_3 z_1^{-1} z_2^{-1} - a_4 z_1^{+1} z_2^{-1}$$

(ii) Frequency Response is

$H(w_1, w_2) \doteq 1 - 2 \propto \cos w_1 - 2 \propto \cos w_2$

(b) Let 6

$$A = \begin{bmatrix} 1 & 1 \\ 1 & -1 \end{bmatrix}, \quad B = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$$

Find Kronecker products A ⊛ B and B ⊛ A. Comments on you result.

(c) Three column vector are given below 8

$$\phi_0 = \begin{bmatrix} w^0 \\ w^0 \\ w^0 \end{bmatrix}, \phi_1 = \begin{bmatrix} w^0 \\ w^1 \\ w^2 \end{bmatrix}, \phi_2 = \begin{bmatrix} w^0 \\ w^2 \\ w^4 \end{bmatrix}$$

where $w = e^{-j2\pi/3}$
Prove that they are orthogonal. Using these vectors generate 3 x 3 nine orthogonal patterns.
Pij (x, y), i, j, x, y = 0, 1, 2.

3. (a) An image of size 5 x 5 quantized to 16 gray level is given below. Operate on this image by any two edge extraction operator of size 3 x 3 use appropriate threshold valve. Give outputs before and after thersholding. Give your comments. 10

10	12	15	15	2
12	10	15	3	8
15	14	2	10	10
13	4	15	12	2
1	12	14	1	1

(b) Assuming that edge starts on the first column and ends in last column. For following grey level image.

k ↓ \ j →	0	1	2
0	2	1	0
1	1	1	7
2	6	8	2

Sketch all possible paths and determine the edge corresponding to minimum cost path.

4. (a) What are different types of redundancies in digital images. 6

(b) Explain following method of data compression – 12
(i) Huffman Coding
(ii) Runlength Coding
(iii) Transform Coding.

5. (a) Explain in detail enhancement technique in spatial domain used for images. 10

(b) (i) Discuss thining algorithm for finding skeleton of a region. Apply it to a square and trangle. 6
(ii) Illustrate opening and closing operations with suitable examples. 4

6. (a) Explain with examples the following. 10
(i) Thinning.
(ii) Global processing via graph theoretical techniques.

(b) Explain following techniques. 10
(i) Arithmetic Coding.
(ii) Bit plane Coding.

7. Write short note on following (any four) — 20
(i) Fourier Descriptors.
(ii) Moments.
(iii) Uniform sampling and non uniform sampling.
(iv) Wavelets.
(v) RGB colour model.