(ii) Similarity transformation

(iii) Euclidean transformation

(b) Consider the function sampling at the argument variables $T_0 = 0.5$, $t_1 = 0.75$, $t_2 = 1.0$, and $t_3 = 1.25$. where $f(0) = 2$, $f(1) = 3$, $f(2) = 4$ and $f(3) = 4$. Apply the discrete Fourier transform to obtain the Fourier spectrum.

(c) Write short notes on Stereo imaging.

5. Answer any **two** of the following : (10×2=20)

(a) Describe the watershed algorithm for image segmentation. Explain, why watershed segmentation tends to over-segment images ?

(b) Describe the following with respect to pattern recognition :

(i) Statistical classification

(ii) Syntactic recognition

(iii) Tree search

(c) A binary image contains straight lines oriented horizontally, vertically, at 45° and – 45°. Give the set of masks that can be used to detect 1 pixel long breaks in these lines. Assume that the gray level of the back ground is 0.

(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 0394   Roll No. ☐☐☐☐☐☐☐☐☐

B. Tech.

(SEM. VIII) THEORY EXAMINATION 2010-11

DIGITAL IMAGE PROCESSING

Time : 3 Hours   *Total Marks : 100*

Note : (1) Attempt **all** questions.

(2) All questions carry equal marks.

1. Answer any **four** of the following : (5×4=20)

(a) What are different models used for colour perception in image processing ? Describe each.

(b) Give the formula for two dimensional Fourier transform and its inverse. Why do we need two Dimensional transforms for image analysis ?

(c) A 4 by 4 input image is defined by the following matrix with gray scale [0-9] :

2	3	3	2
4	2	4	3
3	2	3	5
2	4	2	4

Draw the image histogram and show the new output image along with its histogram after histogram equalization.

(d) Explain sampling and quantization. Explain the effects of reducing sampling and quantization.

(e) What do you mean by image processing ? Distinguish between image processing and graphics. List Various components of image processing system.

2. Answer any **two** of the following : (10×2=20)

(a) What is meant by singularity and ill-condition in relation to image restoration ? Derive Expression of restored image using least square approach. Comment on the singularity of this filter.

(b) What is spatial filtering ? What is the difference between linear and nonlinear filters ? Give some examples of linear and non linear filters.

(c) Apply contrast stretching technique on 3 bit gray kevel image of size 4 by 4

2	1	2	1
4	5	5	6
3	2	1	4
6	2	1	6

3. Answer any **two** of the following : (10×2=20)

(a) What is Mathematical Morphology ? Suppose two discrete one dimensional functions are represented by the sequence :

$$f = [5\ 7\ 11\ 8\ 2\ 6\ 8\ 9\ 7\ 4\ 3]$$

$$h = [1\ 2\ 1]$$

Compute $f \oplus h$, $f \ominus h$, $f \circ h$; f.h.

(b) What is zooming ? How can it be performed ?

Obtain the digital negative of the following 8 bits per pixel image :

121	205	217	156	151
139	127	157	117	125
252	117	236	138	142
227	182	178	197	242
201	106	119	251	240

(c) A colour image in CMYK colour space has following values (in percentage)

$$C = 85, M = 69, Y = 56, K = 21$$

Convert this colour space into CMY and RGB colour space.

4. Answer any **two** of the following : (10×2=20)

(a) Define following transformations and List the properties that are preserved under each one :

(i) Affine transformation