

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

PAPER ID : 0594

Roll No.

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**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 level 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  $f \oplus h$ ,  $f \ominus h$ ,  $f \circ h$ ;  $f \cdot h$ .

- (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

(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  $45^\circ$  and  $-45^\circ$ . 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.