Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/B.TECH(CSE)/SEM-7/CS-704G/2011-12

2011

IMAGE PROCESSING

Time Allotted : 3 Hours | Full Marks : 70

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

GROUP – A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for the following : $10 \times 1 = 10$

i) In the following figure which of the operation are true ?

		q	
	p		

a) $q \in N_4(p)$ b) $q \in N_D(p)$

c) $q \in N_8(p)$ d) Both (b) and (c).

ii) The points of $N_8(P)$ is equal to

a) $N_8(P) = N_4(P) \cap N_D(P)$

b) $N_8(P) = N_4(P) \cup N_D(P)$

c) $N_8(P) = N_4(P) * N_D(P)$

d) $N_8(P) = N_4(P) \% N_D(P)$.

iii) Logical operation is performed in

a) Only gray level image b) Only binary image

c) Both (a) and (b) d) None of these.

iv) Spatial Domain Technique works on

a) Direct manipulation of pixels

b) Indirect manipulation of pixels

c) Modified Fourier coefficients of an image

d) All of these.

v) Histogram are used for

a) Image enhancement b) Image compression

c) Image segmentation d) All of these.

vi) After Averaging operation the middle pixel is replaced by

10	12	11
11	23	12
10	14	15

a) 15.33 b) 13.11

c) 13 d) None of them.

vii) Contrast stretching is done for handling

a) Non-uniform lighting condition

b) Non-linearity

c) Small dynamic range of imaging sensors

d) All of these.

viii) Estimation of degradation Model

a) By Observation

b) By Experimentation

c) By Mathematical Modelling

d) All of these.

ix) Image segmentation technique is based on

a) Discontine based b) Region based

c) Both (a) and (b) d) none of these.

x) Linking of edge point is based on

a) Local processing b) Blobal processing

c) Both (a) and (b) d) None of these.

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following. 3 × 5 = 15

2. a) Define Digital Image.

b) Explain Image Acquisition System. 1 + 4

3. a) Write the properties of two dimensional Fourier Transform.

b) What are the applications of Transformation ? 3 + 2

4. a) How is a 2-D Gaussian averaging filter separable ?

b) What is High Boost filter ? 3 + 2

5. a) Define Gray-level Interpolation.

b) Why the restoration is called as unconstrained restoration ? 2 + 3

6. a) Why is edge detection the most common approach for detecting discontinuities ?

b) What are the features of GIS System ? 2 + 3

GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following. 3 × 15 = 45

7. a) What transformation function is used to create an image negative ? 1

b) Explain the fundamental Steps of Digital Image Processing. 4

c) A unit cube with vertices at (0, 0, 0), (0, 0, 1), (0, 1, 0), (0, 1, 1), (1, 0, 0), (1, 0, 1), (1, 1, 0) and (1, 1, 1) is scaled using the scale factors $S_x = 2$, $S_y = 3$, $S_z = 4$

What are the vertices of the transformed figure ? 3

d) What is the requirement of image sampling and quantization ? 3

e) Explain the uniqueness and convolution properties of Fourier transform. 4

8. a) Differentiate between spatial domain enhancement and frequency domain enhancement. What do you undersand by blurring ? 3 + 2

b) Show that the Fourier transform and its inverse are linear process. 5

c) Give short descriptions on smoothing spatial fitering and sharpening spatial filtering. 5

9. a) What is image segmentation ? 1

b) Explain global processing via Hough transform. 4

c) How do the relative size of object and background regions influence threshold detection ? 2

d) What are the differences between Line and Edge Detection ? 3

e) Why second derivative operation is not normally used for Edge detection ? 2

f) How to choose the seed points for region growing operation ? 3

10. a) Give the definition of GIS. 2

b) Explain how the degradation process is modelled with the help of degradation function. 4

c) Explain the three principal ways to estimate the degradation function for use in Image Restoration. 3

d) Why does the degradation matrix become circulant ? 2

e) Discuss the major application areas of GIS. 4

11. Write short notes on any *three* of the following : 3 × 5

a) Contrast Stretching

b) Restoration by Homomorphic Filtering

c) Optimal Threshold

d) Region Splitting & Merging

e) GIS data feeds.