Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/MCA/SEM-5/MCAE-501B/2012-13

2012
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 × 1 = 10

   i) A digital image is composed of a finite number of elements, each of which has a particular location and value. These elements are called

   a) dot b) pixel

   c) point d) none of these.

   ii) The total amount of energy that flows from the light source and it is usually measured in watts (W) is called

   a) Radiance b) Luminance

   c) Reflectance d) none of these.

iii) Digitizing the coordinate values of an image is called

a) Quantization b) Sampling

c) Segmentation d) Compression.

iv) The ratio of the vertical points to horizontal points necessary to produce equal-length lines in both directions on the screen is called

a) Resolution b) Quantization

c) Aspect ratio d) none of these.

v) An image of 1024 × 1024 pixels, in which the gray scale is [0, 255]. How much storage space is required if the image is not compressed ?

a) 1024 × 1024 × 256 bits

b) 1024 × 1024 × 255 bits

c) 1024 × 1024 × 8 bits

d) none of these.

vi) Which connectivity arise multiple path connection ?

a) 4-connectivity b) 8-connectivity

c) *m*-connectivity d) none of these.

vii) The eye does not respond with equal sensitivity to all visual information. Which information has less importance than other information in normal visual processing is called

a) Inter-pixel redundancy

b) Coding redundancy

c) Psychovisual redundancy

d) none of these

viii) In which image, histogram covers broad range of the gray scale ?

a) Dark image b) Bright image

c) Low-contrast image d) High-contrast image.

ix) Replaces the value of a pixel by the median of the gray levels in the neighbourhood of that pixel is called

a) Mean filter b) Median filter

c) Max filter d) Min filter.

x) Which filter is used to reduce pepper noise ?

a) Max filter b) Min filter

c) Harmonic mean filter d) None of these.

GROUP – B

(Short Answer Type Questions)

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

2. Distinguish between digital image and binary image.

3. Explain how to zoom an image.

4. Write down the 2 dimensional DFT and inverse DFT expressions of some function. Show that DFT and its inverse are linear processes.

5. Discuss about Image negative and Log transformations.

6. What conditions does distance measure between pixels satisfy ? How Euclidean, City-Block and Chess-Board distances are defined ? For the latter two write matrices to elucidate.

7. Explain about image averaging process.

8. Explain about Discrete Cosine Transform.

GROUP – C

(Long Answer Type Questions)

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

9. a) What do you mean by pixel ? How image is represented in Cartesian co-ordinate system ? Differentiate quantization in signal processing and image processing.

   b) Differentiate between point-based transformation and region-based transformation. Describe log and negative transformation for image. 1 + 3 + 3 + 3 + 3 + 2

10. a) Briefly describe image histogram specification technique and also write the algorithm.

b) Consider the following image.

6	4	12	5
5	5	12	5
5	12	12	11
5	5	11	5

Where gray level range is zero to fifteen ? Equalize the above image histogram. Show the histogram before and after equalization. 5 + 10

11. a) Briefly describe Gaussian filtering.

b) Consider the following image

3	4	4	5	5
1	3	5	7	6
2	2	3	6	6
3	2	5	6	6
3	3	4	5	5

Calculate the value of the marked pixel of the following image segment when the following enhancement

techniques are applied using with 3 × 3 mask size.

(i) Mean Filter

(ii) Max filter

(iii) Min filter.

c) Write the algorithm for iterative thresholding technique.

d) Describe structure element, open, close operations.

2 + 3 + 5 + 5

12. Write short notes on any *five* of the following : 5 × 3

a) Wiener filter
b) Sampling
c) Fourier transform
d) Run length coding
e) Inverse filtering
f) Hadamard transforms
g) MMSE
h) Run length smearing algorithm
i) KL.