Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/M.TECH-ME(CSE)/SE/SEM-3/PGCSE-301(A), PGSE-301(A), PGCSE-302(A), PGSE-302(A)/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
(Objective Type Questions)

1. Answer *all* the questions : 10

   a) A 256 × 256 image with 256 grey levels is to be transmitted through a 56 K modem.

      i) The spatial resolution of the image is 1

      ii) The No. of bits/pixel is 1

      iii) The time taken to transmit the image is 3

   b) A pixel has a grey level value of 25 in the above image. After applying negation, the resulting grey level is 1

   c) What are the drawbacks of region growing methods for segmentation ? 1

   d) What are the basic principles for segmentation ? 1

e) Does image compression refer to information reduction ? 1

f) What do you mean by objective fidelity criterion ? 1

GROUP – B

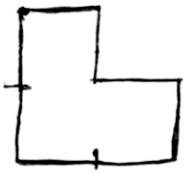
(Short Answer Type Questions)

Answer any *three* of the following $3 \times 5 = 15$

2. Describe the RGB colour model.

3. What is an image pyramid ?

4. For the shape given below, write down the chain code, order number, difference and shape No. Which directional code are you using ?



5. What do you mean by zero-crossing in relation with edge-detection and explain its significance in edge detection ?

6. Write short note on runlength coding.

GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following. $3 \times 15 = 45$

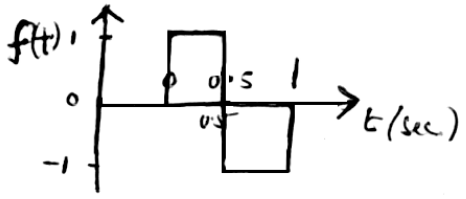
7. a) List and describe three-point processing techniques used for image enhancement in the spatial domain. 12

b) What is filtering ? List 2 functions of filters. What do Laplacian filters do ? 3

8. a) What is Fourier analysis ? List 2 shortcomings of the Fourier transform. What is STFT ? 4

b) What is a wavelet and what are its properties (mention 2) ? 3

c) For the wavelet given below, answer the following questions :



i) What types of wavelet is it ? 1

ii) What is the result of scaling by factor of 2 ? 2

iii) What is the result of scaling by a factor of $\frac{1}{2}$ and time shifting by + 0·5 sec ? 2

d) With the help of a diagram, explain the basic steps of frequency domain filtering. 3

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

a) Image Restoration

b) Erosion

c) Convolution

d) Fundamental steps in digital image processing

e) 2D Fourier transform.

10. a) Describe the Hough Transform method for edge linking. 5

    b) Explain the region split and merge technique for image segmentation. 5

    c) Describe the Otsu's method for threshold selection. 5

11. a) Explain the arithmetic coding for image compression using a suitable example. 5

    b) Consider the following 4 × 4, 8 bit image :

39	39	126	126
39	39	126	126
39	39	126	126
39	39	126	126

    Determine the LZW coding in a step-by-step fashion for the above mentioned image. 6

    c) What will be the Huffman coding for image given in Question No. 11(b) ? Does it better than LZW coding ? 2 + 2

==========