



Name :

Roll No. :

Invigilator's Signature :

CS/B.TECH(IT)/SEP.SUPPLE/SEM-7/IT-703B/2012

2012

IMAGE PROCESSING AND GIS

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) An image of size 1024×1024 pixels in which the intensity of each pixel is an 8 bit quantity requires the storage space (if not compressed)
 - a) 1 kB
 - b) 1 MB
 - c) 2 kB
 - d) 2 MB.



ii) In image processing technique the input and output are

- a) low quality image and improved quality image
- b) description and image
- c) image and description
- d) low quality image and description.

iii) In 8-distance measurement system distance between centre pixel and a corner pixel is

- a) 2 units
- b) $\sqrt{2}$ units
- c) 1 unit
- d) 1.5 units.

iv) Sampling of an image is required for

- a) Quantization
- b) Sharpening
- c) Smoothing
- d) Digitization.

v) The negative of an image with gray levels in the range [0, $L - 1$] is obtained by using the negative transformation, which is given by the expression

- a) $s = L - 1 - r$
- b) $s = L - 1 + r$
- c) $s = L - 1$
- d) $s = L - r$.



vi) Intensity range of 8-bit pixel image is

- a) 0 to 7 b) 0 to 15
- c) 0 to 31 d) 0 to 255.

vii) Time complexity of mean filter is

- a) greater than median filter
- b) smaller than median filter
- c) equal to median filter
- d) cannot be compared to median filter.

viii) Linear stretching

- a) uniformly distributes the pixels of an image
- b) uniformly distributes the intensity of an image
- c) sharpens the image
- d) add noise to the image.

ix) Region growing is a process used in

- a) segmentation b) edge detection
- c) thinning d) noise removal.



x) A pixel p at coordinates (x, y) has four horizontal and vertical neighbours whose coordinates are given by

- a) $(x - 1, y - 1), (x - 1, y), (x, y - 1), (x, y + 1)$
- b) $(x + 1, y), (x - 1, y), (x, y + 1), (x, y - 1)$
- c) $(x + 1, y - 1), (x - 1, y), (x - 1, y + 1), (x, y + 1)$
- d) $(x + 1, y), (x + 1, y - 1), (x, y + 1), (x - 1, y + 1)$

GROUP – B

(Short Answer Type Questions)

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

- 2. Discuss a method for estimating thresholds that produce the minimum average segmentation error. 5
- 3. How raster based analysis is used in GIS ? 5
- 4. Derive the expression for mean filter. Discuss the effect of window size on the performance of a mean filter. 2 + 3



5. Describe the region growing technique for image segmentation and mention the problems associated to it. 5
6. Discuss the Hough transform method for edge linking. 5

GROUP – C

(Long Answer Type Questions)

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

7. a) What is pixel connectivity and what are neighbour pixels ? Show a four-neighbour and an eight-neighbour pixel grids. 4
- b) Write down the discrete Fourier Transformation relations in 2-D. For 4×4 image show the Fourier Transformation matrix W_4 (calculate the elements of the matrix). 2 + 6
- c) How does the discrete cosine transform differ from the DFT ? Is it the real part of DFT ? 2 + 1



8. a) What do you mean by a histogram and its equalization ?

4

b) Consider the following image :

6

| | | | |
|---|----|----|----|
| 5 | 4 | 12 | 5 |
| 5 | 5 | 12 | 5 |
| 5 | 12 | 12 | 11 |
| 5 | 5 | 11 | 5 |

Where is gray level range zero to fifteen ? Equalize the above image histogram.

Show the histogram before and after equalization.

c) How is high pass filtering done in frequency domain ?

What is its effect on the image ?

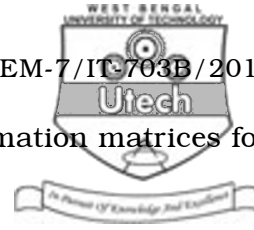
5

9. a) What do you mean by image capturing and image digitization ? How are gray level images represented ?

5

b) Draw the block diagram of an image processing system and explain the roles of its different parts.

5



- c) Define the basic geometrical transformation matrices for images in homogeneous notation. 5
10. a) What is image enhancement ? 3
- b) Why is low pass spatial filtering used for image ? 4
- c) What is the net effect of high pass filtering for a gray scaled image ? 4
- d) What are the masks used in case of image filtering ? 4
11. a) Classify different image segmentation techniques. 5
- b) Describe how line segments can be detected using Hough transform. 5
- c) Consider the line $y = 3x + 4$. Draw four corresponding lines in the transformed space where the lines intersect at the point (3, 4). 5

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