

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



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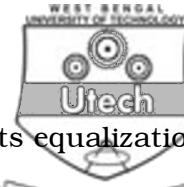
5. Describe the region growing technique for image segmentation and mention the problems associated to it. 5
6. Discuss the Hough transform method for edge linking. 5

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



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

b) Consider the following image :

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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.

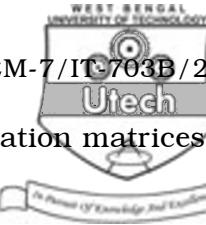
c) How is high pass filtering done in frequency domain ?

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



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

