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CS/B.Tech (IT)/(Supple)/SEM-7/IT-703B/09
IMAGE PROCESSING AND GIS (SEMESTER - 7)

1. ..... *Signature of Invigilator*

2. ..... *Signature of the Officer-in-Charge*

Reg. No. | | | | | | | | | | | | | | |

Roll No. of the Candidate | | | | | | | | | | | | | | |

CS/B.Tech (IT)/(Supple)/SEM-7/IT-703B/09
ENGINEERING & MANAGEMENT EXAMINATIONS, JULY – 2009
IMAGE PROCESSING AND GIS (SEMESTER - 7)

Time : 3 Hours] [Full Marks : 70

INSTRUCTIONS TO THE CANDIDATES :

1. This Booklet is a Question-cum-Answer Booklet. The Booklet consists of **32 pages**. The questions of this concerned subject commence from Page No. 3.
2. a) In **Group – A**, Questions are of Multiple Choice type. You have to write the correct choice in the box provided **against each question**.
   b) For **Groups – B** & **C** you have to answer the questions in the space provided marked 'Answer Sheet'. Questions of **Group – B** are Short answer type. Questions of **Group – C** are Long answer type. Write on both sides of the paper.
3. **Fill in your Roll No. in the box** provided as in your Admit Card before answering the questions.
4. Read the instructions given inside carefully before answering.
5. You should not forget to write the corresponding question numbers while answering.
6. Do not write your name or put any special mark in the booklet that may disclose your identity, which will render you liable to disqualification. Any candidate found copying will be subject to Disciplinary Action under the relevant rules.
7. **Use of Mobile Phone and Programmable Calculator is totally prohibited in the examination hall.**
8. You should return the booklet to the invigilator at the end of the examination and should not take any page of this booklet with you outside the examination hall, **which will lead to disqualification**.
9. Rough work, if necessary is to be done in this booklet only and cross it through.

No additional sheets are to be used and no loose paper will be provided

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Marks Obtained

	Group – A										Group – B				Group – C				
Question Number																		***Total Marks***	***Examiner's Signature***
Marks Obtained																			

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Head-Examiner/Co-Ordinator/Scrutineer

S–53054 (31/07)

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IMAGE PROCESSING AND GIS

SEMESTER - 7

Time : 3 Hours] [Full Marks : 70

Graph sheet is provided on Page No. 31.

GROUP – A

(Multiple Choice Type Questions)

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

i) 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. ☐

ii) 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. ☐

iii) 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) $s = L - r$. ☐

iv) Sampling of an image is required for

a) Quantization b) Sharpening

c) Smoothing d) Digitization. ☐

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

a) 2 unit b) $\sqrt{2}$ unit

c) 1 unit d) 1·5 unit. ☐

vi) 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. ☐

vii) Region growing is a process used in

a) segmentation b) edge detection

c) thinning d) noise removal. ☐

viii) Intensity range of 8-bit pixel image is

a) 0 to 7 b) 0 to 15

c) 0 to 31 d) 0 to 255. ☐

ix) 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.

☐

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 ∞ 5 = 15

2. Describe the region growing technique for image segmentation and mention the problems associated to it. 5

3. Discuss the Hough transform method for edge linking. 5

4. Derive the expression for mean filter. Discuss the effect of window size on the performance of a mean filter. 2 + 3

5. Discuss a method for estimating thresholds that produce the minimum overage segmentation error. 5

6. How raster based analysis is used in GIS ? 5

GROUP – C

(Long Answer Type Questions)

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

7. 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

8. 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) .

   c) How does the discrete cosine transform differ from the DFT ? Is it the real part of DFT ? 2 + 1

9. 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

10. 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

11. 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

END