

Name :

Roll No. :

Invigilator's Signature :

CS / B.TECH (IT) / SEM-7 / IT-703B / 2010-11

2010-11

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)

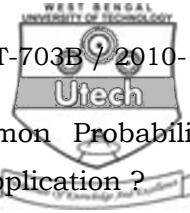
1. Choose the correct alternatives for any ten of the following :

$$10 \times 1 = 10$$

- i) Gamma correction in image processing is related with
 - a) Image Negative
 - b) Log Transformation
 - c) Power-Law Transformation
 - d) None of these.



- ii) The range for illumination is
- a) $[0, \infty]$
 - b) $[-256, 255]$
 - c) $[0, 1]$
 - d) $[-1024, 1023]$.
- iii) Spatial Transformation and Gray Level Interpolation are two basic operations of
- a) Constrained least square restoration
 - b) Homographic filter
 - c) Geometric transformation
 - d) Unconstrained least square restoration.
- iv) Image Segmentation algorithms are generally based on one of the two basic properties of intensity values and these are
- a) discontinuity and similarity
 - b) portability and adaptability
 - c) continuity and similarity
 - d) none of these.
- v) Which is not the operator for edge detection for image segmentation ?
- a) Roberts Operator
 - b) Perwitt Operator
 - c) Sobel Operator
 - d) Butterworth Operator.



- vi) Which is not among the most common Probability Density Function in image processing application ?

 - a) Salt and Pepper Noise
 - b) Gaussian Noise
 - c) Sobel Noise
 - d) Rayleigh Noise.

vii) Which is not the property of 2-D Fourier transform ?

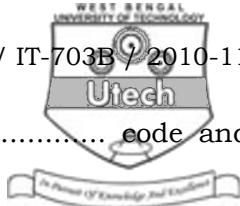
 - a) Distributivity
 - b) Scaling
 - c) Rotation
 - d) Linearity.

viii) GPS means

 - a) Global Partitioning System
 - b) Grade Positioning System
 - c) Global Positioning System
 - d) Globe Partitioning System.

ix) Automated cartography is

 - a) the study and practice of making maps
 - b) represented the terrain of the mapped object on flat media
 - c) the process of processing maps with the aid of computer driven devices such as plotters and graphical displays
 - d) all of these.



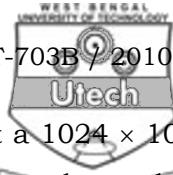
- x) The original GPS design contains code and code.
- a) CDMA , PRN
b) GSM , PN
c) Coarse / Acquisition (C/A) , Precision (P)
d) none of these.
- xi) GIS means
- a) Geographic Information System
b) Geographical Information System
c) Geospatial Information System
d) all of these.

GROUP – B

(Short Answer Type Questions)

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

2. Explain the basic mechanism of spatial domain filtering.
3. Why is image restoration needed ? Describe a model of the Image degradation / restoration process. $1\frac{1}{2} + 3\frac{1}{2}$
4. What is cartography ? “Modern cartography is closely integrated with GIS.” Explain. $1 + 4$
5. What is GPS ? What is GPS surveying ? Explain different sources of errors for the GPS signal. $1 + 1 + 3$



6. How many minutes would it take to transmit a 1024×1024 images with 256 gray level using 56 k baud modem, where Baud rate = the no. of bits transmitted per second ? Assume transmission is done with packets consisting of one start bit, 8 bit of information and one stop bit.

GROUP – C

(Long Answer Type Questions)

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

7. a) What is pixel ? What are the 4 neighbours of pixel ?
What are the 8 neighbours of pixel ? $1 + 1\frac{1}{2} + 1\frac{1}{2}$
- b) What is adjacency ? Explain 4-adjacency, 8-adjacency and m -adjacency. 4
- c) For the pixel arrangement shown in the figure :

0 1 1
0 1 0
0 0 1

- i) show the pixels that are 8-adjacency to the centre pixel by the dashed lines.
- ii) show the pixels that are m -adjacency to the centre pixel by the dashed lines. $1 + 1 + 1 + 1 + 1\frac{1}{2} + 1\frac{1}{2}$



8. a) What is the importance of local processing and global processing via the Hough transform for image segmentation ? 3 + 4
- b) What is thresholding ? Explain region growing by pixel aggregation. Describe region splitting and merging in the context of image segmentation. 1 + 3 + 4
9. a) Explain the following spatial data model : 3 × 3
- Raster Data Model
 - Vector Data Model
 - TIN Data Model.
- b) What is Remote sensing ? Describe its area of application in GIS. 1 + 2
- c) What is Electromagnetic spectrum ? 3
10. a) What is histogram ? Explain the concept of using histogram for image quality assessment. 2 + 3
- b) Define the following filters : $4 \times 2\frac{1}{2}$
- Butterworth Filter
 - Gaussian Filter
 - Median Filter
 - Mean Filter.



3 × 5

11. Write short notes on any *three* of the following :

- a) High Boost Filtering in spatial domain
- b) Power Law Transformation
- c) Gray Level Interpolation
- d) GIS
- e) Illumination / Reflectance based image modelling
- f) DTC.

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