



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 :

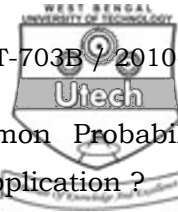
10 × 1 = 10

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.



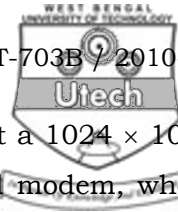
- x) The original GPS design contains ..... code and ..... code.
- a) CDMA , PRN
  - b) GSM , PN
  - c) Coarse / Acquisition (C/A) , Precision (P)
  - d) none of these.
- xi) GIS means
- a) Geographic Information System
  - b) Geographical Information System
  - c) Geospatial Information System
  - d) 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  $1024 \times 1024$  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
  - i) Raster Data Model
  - ii) Vector Data Model
  - iii) 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 × 2½
  - i) Butterworth Filter
  - ii) Gaussian Filter
  - iii) Median Filter
  - iv) Mean Filter.



11. Write short notes on any *three* of the following :  $3 \times 5$

- 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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