



Name :

Roll No. :

Invigilator's Signature :

CS/B.TECH (CSE)/SEM-8/CS-802C/2011

2011

GIS & REMOTE SENSING

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 :

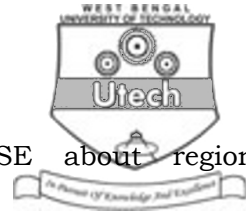
10 × 1 = 10

i) If the earth is approximated by a ellipsoid generated from an ellipse with major and minor semi-axes a and λa respectively, how much is the polar flattening ?

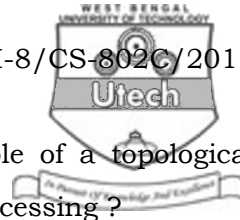
- a) λ b) $1 - \lambda$
c) $\sqrt{1-\lambda}$ d) $\sqrt{1-\lambda^2}$

ii) Which of the following projections is used for mapping areas with long North-South extent ?

- a) Mercator b) Lambert Conformal
c) Transverse Mercator d) Robinson's



- iii) Which of the following is FALSE about region quadrees ?
- a) Every non-leaf node has 4 children
 - b) If the quadtree has a root, t leaves and m other internal nodes, then $t = 3m + 4$
 - c) All nodes at the same height represent regions of equal area.
 - d) The height of the tree is $\log n$, where n is the number of nodes.
- iv) Which of the following is a vector data format ?
- a) Geo TIFF
 - b) TIGER
 - c) MrSID
 - d) JPEG.
- v) Which of the following is not a basic element in topological relationships ?
- a) Adjacency
 - b) Containment
 - c) Connectivity
 - d) None of these.
- vi) Which of the following is an example of a neighborhood operation in raster-based GIS data processing ?
- a) Reclassification
 - b) Rrecoding
 - c) Slope determination
 - d) Overlay.



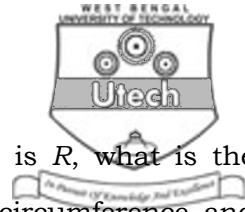
- vii) Which of the following is an example of a topological function in vector-based GIS data processing ?
- a) Address geocoding b) Surface interpolation
c) Area computation d) Overlay analysis.
- viii) Which of the following involves in reducing the number of categories of attribute data on a layer ?
- a) Line simplification b) Reclassification
c) Sliver removal d) Address geocoding
- ix) Which of the following best approximates the visible range of the electromagnetic spectrum ?
- a) 0.4 to 0.7 microns b) 0.7 to 1.2 microns
c) 0.1 to 0.4 microns d) 1.2 to 1.6 microns.
- x) Which of the following is NOT a format for storing multiband remote sensing images ?
- a) DOQ b) BIL
c) BIP d) BSQ.

GROUP – B

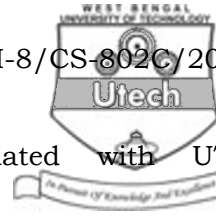
(Short Answer Type Questions)

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

2. What are the five elements defining a geodetic datum ? 5



3. a) If the equatorial radius of the earth is R , what is the approximate ratio of the equatorial circumference and the length of the 45° N parallel ? 1
- b) Why are secant map projections useful ? 1
- c) Why are the Transverse and Oblique variants of the Mercator projection sometimes used ? 1
- d) If the scale is doubled for the parallels and halved for the meridians, how is projection property of direction affected ? 1
- e) How does the Mercator's projection affect directions ? 1
4. Answer the following with respect to UTM coordinates :
- a) What is the projection system on which UTM coordinates are based ? 1
- b) How many degrees of longitude is each projection zone wide ? 1
- c) What is the first zone and what is its central meridian ? 1
- d) What is the span of a typical UTM zone band (other than the northernmost band) in terms of degrees of latitude ? 1
- e) How are eastings measured ? 1



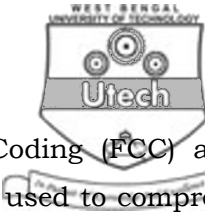
5. a) What are the problems associated with UTM boundaries ? 2
- b) What are the approaches used to deal with these problems ? 3
6. What are nominal, ordinal, interval and ratio attributes ? Explain with examples from the GIS domain. 5

GROUP – C

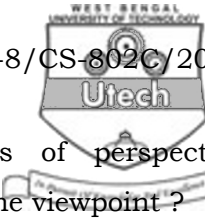
(Long Answer Type Questions)

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

7. a) What are the relative merits and demerits of raster and vector methods for spatial data structures ? 5
- b) What are the main characteristics of the different types of raster file formats ? 5
- c) What are the different topological overlay operators involved in vector-based GIS data processing ? 5
8. a) i) Give an algorithm to determine whether a point is inside a polygon. 3
- ii) What improvements can you suggest if it is known in advance that the polygon is convex ? 2



- b) i) Explain how Freeman Chain Coding (FCC) and Run Length Encoding (RLE) are used to compress raster data. 3
- ii) Convert [2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 4, 4, 4, 6, 4, 4, 4, 4, 4, 4, 2, 2, 4, 4, 4, 6, 6, 6, 6, 6, 6, 6, 6, 6, 0, 0, 0, 0, 0, 0, 0, 6, 6, 0, 0, 0, 0, 0, 0] from FCC to RLE, assuming that the directions are numbered clockwise starting with North as 0. 2
- c) i) What are the minimum and maximum number of nodes for a region quadtree of height h ? 2
- ii) Construct a region quadtree for the following raster data :
- 00000011
00000011
11000000
11000000
11110000
11110000
11110000
11110001 3
9. a) Explain the *image-to-map* method of georeferencing for raster based geographic data processing. 5
- b) i) Given an ellipsoid representing the earth. What angle does the latitude of a point x on the ellipsoid surface exactly represent? Explain with a simple diagram. 3



- ii) What are the different types of perspective projections classified based on the viewpoint ? 2
 - c) In georeferencing what is the geoid and what is it used for ? 5
 - 10. a) Explain the role of the following digital analysis techniques in mosaicking raster images :
 - i) Histogram Matching 2
 - ii) Feathering 3
 - b) Explain how overlay analysis using logical and arithmetic operators is performed in raster-based geographic data processing. 5
 - c) How are the following neighbourhood operations are performed in raster-based GIS processing ?
 - i) Spatial Aggregation. 3
 - ii) Filtering. 2
 - 11. a) Give the conditions that may necessitate cartographic generalization. 5
 - b) Explain the basic principles of Electromagnetic Remote Sensing. 5
 - c) Describe briefly the processes involved in digitization of existing maps. 5
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