Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/B.Tech/CSE/SEM-8/CS-802C/2013

2013

GIS AND 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 : $10 \times 1 = 10$

i) If the earth is approximated by an 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 non-perspective ?

a) Mercator b) Gnomonic

c) Orthographic d) Stereographic.

iii) What is the approximate ratio of the length of the 60˚N parallel and the length of the 45˚N parallel ?

a) √2 b) 1/√2

c) √3/2 d) 2.

iv) The international date line is roughly along 180˚ longitude, but is drawn with diversions to pass around some territories and island groups. At any instant of time *t*, what is the maximum number of different dates that would be showing in locations across the world ?

a) 1 b) 2

c) 3 d) 4.

v) Which of the following best approximates the visible range of the electromagnetic spectrum in microns ?

a) 0.4 to 0.7

b) 0.7 to 1.2

c) 0.1 to 0.4

d) 1.2 to 1.6.

vi) Typically a map with scale 1 : 24,000 is a

a) large scale map

b) medium scale map

c) small scale map

d) none of these.

vii) Which of the following Gnomonic projections does not map parallels to arcs of concentric circles ?

a) Conical b) Cylindrical

c) Azimuthal d) None of these.

viii) 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.

ix) Which of the following is FALSE about a geoid ?

a) It coincides with the mean sea level over the earth's oceans

b) It forms a reference surface for vertical coordinates

c) It represents an equipotential surface for gravity

d) None of these.

x) Which of the following statements is TRUE about Map Scale ?

a) A large scale displays a large area in greater detail

b) A small scale map displays a small area in lesser detail

c) A large scale map displays a large area in lesser detail

d) A small scale map displays a large area in lesser detail.

GROUP – B
(Short Answer Type Questions)

Answer any *three* of the following. 3 × 5 = 15

2. Prove that if a region quadtree has a root, r leaves and m other internal nodes, then $r = 3m + 4$.

3. Derive the minimum and maximum number of nodes for a quadtree of height h.

4. Why are secant map projections and transverse and oblique variants of the mercator projection sometimes used ?

5. 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 wide in each projection zone ? 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

6. What are isotropic and anisotropic fields ? Explain with examples from the GIS domain.

GROUP – C
(Long Answer Type Questions)

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

7. a) What are local, focal and zonal operations ? Explain with examples. 5

   b) Explain how the height of a point whose (*x*, *y*) coordinates are known can be determined in a terain represented by a TIN data structure. 5

   c) What are the different topological overlay operators involved in vector-based GIS data processing ? 5

8. a) Give an algorithm to determine whether a point lies inside a polygon. 5

   b) Give an algorithm to determine whether a point lies inside a *convex* polygon. 5

   c) Explain the image-to-map method of georeferencing for raster based geographic data processing. 5

9. a) Give an algorithm to build the region quadtree for the region $P \cap Q$, given the quadtree for the regions P and Q. 5

   b) What are the different types of perspective projections classified based on the viewpoint ? 5

   c) In georeferencing what is the geoid and what is it used for ? 5

10. a) Explain the role of digital analysis techniques in mosaicing raster images. 5

b) Explain how *viewshed analysis* is performed in raster-based geographic data processing. 5

c) Give an algorithm for line simplification and illustrate its key steps with figures. 5

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