INDIAN STATISTICAL INSTITUTE

FOURTH SEMESTER EXAMINATION, 2016/18 SESSION

ELECTIVE PAPER ON GEOGRAPHICAL INFORMATION SYSTEMS

(MASTER IN LIBRARY INFORMATION SCIENCE)

26th April 2018

10:00AM-01:00PM

(3 Hours)

INSTRUCTIONS TO STUDENT

1. This Question paper consists of 1 page.
2. Attempt all questions to score maximum marks.
3. Please print all your answers in the Answer Booklet provided.
4. Scientific Calculator is allowed.

Q1. Write briefly about the following:

(a) Geographical Information Science (GISci) **[3 marks]**

(b) Spatiotemporal modelling **[3 marks]**

(c) Mathematical maps Vs. Geographical maps **[3 marks]**

(d) Relation between morphometric order ratios and Fractal Dimension **[3 marks]**

(e) Use of data represented as Landscapes **[3 marks]**

Q2. Explain (i) in detail shape-size based classification of spatial objects, and (ii) briefly the directional relationship between every spatial object and every other spatial object of a cluster of non-overlapping spatial objects . **[10 marks]**

Q3. Locationally significant spatial object within a cluster of spatial objects is the object from which it is easy t reach of out other spatial objects with minimum energy expenditure. How to designate each spatial object within a cluster of spatial objects with ranks ranging from highly significant to least significant. **[8 marks]**

Q4. Given N spatial objects, explain on how to cluster those N objects in to k-groups ($k \ll N$), by employing hierarchical clustering and Minimal Spanning Tree based clustering. **[10 marks]**

Q5. Across the geographical space, there are four states, denoted as X_1, X_2, X_3, X_4 such that $\bigcap_{i=1}^{4} X_i = \phi$. The monthly rainfall values recorded respectively at X_1, X_2, X_3, X_4 are 10, 20, 30, 40 millimetres. Write an algorithm to convert such location-specific data into contiguous rainfall cartogram map, and explain the process with illustrations. **[8 marks]**

Q6. Explain briefly, variations in spatial, spectral and temporal scales and their impacts. Write full set of equations involved in computing the (I) binary morphological median and binary morphological dual median between X and Y, where X and Y are compact spatial objects such that $X \not\subset Y$, and (ii) greyscale morphological median and its dual between $f(x,y)$ and $g(x,y)$ being the source and target spatial fields respectively. Show example source and target spatial objects (fields) of your choice, and compute median and dual median. **[10 marks]**

Q7. Given a Digital Elevation Model (DEM), in other words a 2-D function depicted as $f(x,y)$ denoting elevations at spatial positions (x, y), how do you extract valley and ridge connectivity networks. Provide steps involved in the algorithm with supporting equations and illustrations. **[9 marks]**

End of the Paper.