Department of Computer Science and Engineering
IIT Kharagpur

Class Test 1 GIS (Autumn-2024) 20-Aug-2024

Full Marks: 30 Time: 1hour

A) MCQ with justifications. Write the correct option(s) and justify (max. 2statements). [6x2 = 12]

1) Which of the following is NOT a common operation performed on raster data in GIS?
   a) Overlay analysis b) Buffer analysis
   c) Classification d) Network analysis

2) Which spatial data type is best suited for representing continuous phenomena, such as temperature?
   a) Vector data b) Raster data
   c) Network data d) Temporal data

3) Consider the following two statements S1 and S2
   S1: To derive information about spatial relationships between geographic phenomena a set of analytical procedures are followed in Spatial modeling.
   S2: Data analysis means understanding spatial data using the statistical methods derived from spatial mathematics and geo-statistics.
   a) S1 is TRUE, S2 is FALSE b) S1 is FALSE, S2 is TRUE.
   c) Both S1 and S2 are TRUE d) Both S1 and S2 are FALSE.

4) Which of the following statements is (are) TRUE for Raster data representation?
   a) The attribute is represented by each cell value for the raster image.
   b) Points and lines can be used to represent real world features.
   c) Stores images as rows and columns of numbers with digital values/number (DN) for each cell.
   d) Continuous or thematic data labels are not classified.

5) Consider the statements:
   S1: Spatial predicate for topological relationship: *inside(region x region)-> region.*
   S2: Spatial relations are invariant under topological transformations, like translation, scaling, rotation.
   a) S1 is TRUE, S2 is FALSE b) S1 is FALSE, S2 is TRUE.
   c) Both S1 and S2 are TRUE d) Both S1 and S2 are FALSE.

6) Consider the following two statements S1 and S2
   S1: Spatial data comes from a continuous set with implicit relationship. Spatial entities have relationships such as distance, direction.
   S2: Pictograms can simplify conceptual data models and reduce clutter in ER diagrams (in case of spatial data).
   a) S1 is TRUE, S2 is FALSE b) S1 is FALSE, S2 is TRUE.
   c) Both S1 and S2 are TRUE d) Both S1 and S2 are FALSE.

B) Consider the following database schemas: [4+5+5+4 = 18]

- **Sanctuary** {ID, name, location (state), start-date, area (in sq.km)}
- **Regional-Area** {AreaID, SanctuaryID, Name, type (forest/wetland/grassland), size(in sq.km)}
- **Animal-Species** {speciesID, SanctuaryID, name, scientific-name, conservation-status (endangered/vulnerable), avg-lifespan(in years), habitat(dense forest/grassland etc)}
- **Plant-Species** {speciesID, SanctuaryID, name, scientific-name, conservation-status (endangered/vulnerable), avg-height (in meters), habitat(dense forest/grassland etc)}
- **Conservation-Report** {report-ID, Sanctuary-ID, species-ID, conservation-scheme, start-date, end-date}

Write SQL for the following cases:

1) List all the sanctuaries where the total area of forest regions exceeds 25 sq.km.
2) List all animal species that are found in more than one sanctuary, along with the count of sanctuaries they inhabit.
3) Calculate the average lifespan of all animal species in each sanctuary and list the sanctuaries with an average lifespan greater than 15 years.
4) List all plant species that are native to more than one habitat type within the same sanctuary.