End Semester Exam 29th Nov 2023

CS4.408 Spatial Informatics

Time: 180minutes **Total Marks: 74**

Note: If need, make Suitable assumptions and state it clearly when answering. No doubts will be clarified during the exams.

Part I. 6x2=12

1. What does one mean by Spatial Tessellation? Give an example of a real life application that uses this idea in its operations.
2. A software library/tool called PROJ (or PROJ4) is used in many spatial web and desktop applications. What is it and what does that help do? Which keyword (or tag) in Web services defines the parameters for this?
3. Briefly explain Google Polyline algorithm and its use in Google maps.
4. You are developing a tourist game that allows a user to pick the nearest and farthest POI (point of interest) that can be visited. Which spatial data access method will you use to answer this, if all distances are linearly measured along the road network? The game has access to a large set of POIs in 2D.
5. What is GeoTiff format of raster/image storage?
6. What is contiguity analysis? Using an example show how this helps.

Part II. Answer any **Seven** of the following questions 7x4=28

7. A dataset contains a million points that indicates the location of cars, captured once in an hour, in a given week. Explain briefly whether you will use Point Quadtree or KD-tree, if the data is used to identify the parking areas in the given region.
8. You have access to a bunch of never seen historical maps of battle areas from India. State your assumptions and briefly describe the method you will choose to create 3 or more data layers to be shown as GIS data.
9. How does GML feature collection world preserve the details of the spatial object that a non-spatial XML based model cannot? Explain with ref to the schema.
10. What is a watershed? You have been given the task of creating a cascade of lakes (when a lake fills it overflows and fills the downstream lake) in a large watershed. Briefly explain the steps you will employ for delineating the watershed and connecting the lakes with channels to achieve the goal.
11. Taking the example of a Road network, explain Network Attributes. Also, show how this can affect the finding of the shortest path between two locations.
12. What are the main functions of GIS? In the Big data scenario, which of these functions do you think needs to be given importance and why?
13. "Data is 50-60% of a spatial project effort/cost." Support this statement based on your own experience in the Project that you worked on. Give details.
14. You are given a population density raster dataset with values ranging from 1 to 3000. You would like to generate a map with only 5 classes. Briefly explain any one method of reclassification that you will employ to represent the data.

Part III. Answer any **Three** questions by detailing out your answers well 3x6=18

15. Taking the example of a Road network, explain Network Attributes. Also, show how this can affect the finding of the shortest path between two locations.
16. Explain – (i) WMS; (ii) WFS-T; and (iii) WPS

17. (i) The buffering operation can be carried out on both raster and vector data models. Explain which is better and why?
(ii) An environmental impact assessment is carried out to study the areas affected by the spread of air pollution due to the large scale burning of domestic solid waste collected from a large city. How will you model this study to provide the right insights if the volume of the waste burning and its location is known?
18. What are the different types of accessibility measures – discuss with suitable examples.

Part IV. Answer any TWO by detailing out your answers well 2x8=16

20. A study of Urban sprawl covering a distance of 100Km around the city of Hyderabad is planned. You have access to 3 maps for the years 1980, 2000 and 2020. The 1980 map is derived from a satellite image and hence has land cover classes; while the 2000 map is based on the Master plan of the city indicating the various planning zones like Residential zone, commercial zone, mixed-use zone, sub-urban zones, low intensity development zones and industrial zones; and the 2020 map has lots of detail including parks, entertainment areas, residences, commercial areas and so on. Based on the discussion in the class, describe how you will go about doing this study of Urban sprawl. Also, we would like to know in which direction the urbanisation has happened more rapidly than others. [Show a flowchart or block diagram with details for better clarity]
21. In a municipal town, there is a need to develop a system that helps the municipal authorities to identify each dwelling and link it with all the municipal services that are provided, and evaluate the service level of each zone in the Municipality.
    (a) You are tasked with the responsibility of preparing a spatial data platform that does contain all the related data. Enumerate the data and its attributes that you will choose for developing such a data platform considering any one municipal service.
    (b) How will you store the data you listed above and visualize/publish this data through a WebGIS platform?
    (c) What kind of a query model will you develop for (i) identifying the areas of low service levels; (ii) prioritizing a zone based on a defined criterion; Show how you will analyse the data and provide the results in tabular or map form for these outcomes.
22. (a) How are surfaces represented in GIS? Why is a true 3D representation not always possible or useful.
    (b) Given a large number of surveyed elevation points and 25m contour lines across a region that has a large plain and a valley, detail out the interpolation method you will use to create the elevation raster map of the region.

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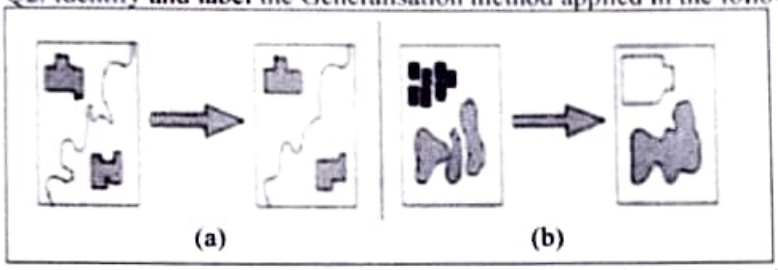
Monsoon 2023 Quiz-2

Time: 45 minutes **Total Marks: 25**

Part I. MCQs – Each 1.5 mark

Q1. A railway line and road cross each other when seen in a satellite or aerial image (view from above). As a network analyst, when will you consider this crossing as a node or not as a node?

Q2. Identify and label the Generalisation method applied in the following map figures



Q3. In which method of stream ordering, the order of the stream assigned to the downslope link increases when the streams of the same order intersect?

A. Strahler ordering
B. Shreve ordering
C. None of these
D. Both of these

Q4. A good example of reverse geo-coding is?

A. Calculating the route length from coordinates
B. Get the Building address from coordinates
C. Get the Geospatial service from the coordinates
D. Mapping all the service users on the map from the coordinates

Q5. The _____ dichotomy underlies many areas of GIS, including its data models, data quality, analysis, and modelling

A. Difficult to say
B. Vector-Raster
C. Field-Object
D. Space-Time
E. Geospatial-Statistical

Q6. While dealing with the 3D data sets, we are interested in

A. Toponomy
B. Topology
C. Topography
D. Topo sheet

Part II. More than One answer maybe Correct. Correct and wrong answers get Partially positive or partially negative marks respectively. Each Question is 2 Marks

Q7. Pick and write the correct pair from the following (Hint: write only the pairs like A-1 etc)

A.	Network links	1. Customers on a delivery route
B.	Centers	2. Number of lanes
C.	Link attributes	3. Fire station
D.	Stops	4. Road segments

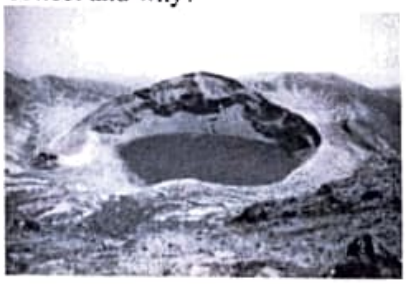
Q8. Visual Analysis of Spatial distributions use which all of the following approaches
A. Compares only the locational components of Spatial Objects
B. Evaluating the temporal components of the Spatial Objects
C. Probability distribution of the attributes is compared
D. Evaluating and comparing the spatial components
E. Comparing the attributes of the Spatial objects
F. None of these as it depends uniquely on the application

Q9. DEM data can be generated from
A. LiDAR point cloud data
B. Satellite data of any resolution and orientation
C. Contours from Toposheets
D. Digitized paper maps
E. Field Survey of Elevation Points
F. Aerial or Satellite Stereo Imagery

Q10. The traditional disciplines that provided the key ideas and insights into the use of Space and time paradigms are
A. Mathematics
B. Philosophy
C. Agriculture
D. Geography
E. Physics
F. Psychology
G. Language and Literature
H. History

Part III. Answer the following questions. Each carry 4 marks

Q11. Let's say you are a frequent visitor to the National park that has an emerald green volcanic lake (Eg. Okama Crated Lake as shown in the fig) at the top of the mountain and has a mountainous landscape around it. From your own space-time perspective as a user, (a) Which data layers will you capture, with its characteristics; (b) Indicate how each data you collect is useful to a visitor; (c) If you were the manager of this National Park, mention atleast one more data layer that you collect and why?


Okama Crater Lake at Mt. Zao, Japan

Q12. Let's say, Gachibowli area post office is being re-organised into 3 sub-areas, with each having a Post office of its own. These sub-areas are IIIT; Indiranagar; Housing board. There are already 13 post-boxes within the area and the collection of post from these post boxes need to be re-assigned to the 3 new post offices. (a) Explain an algorithm choosing the right accessibility criteria to solve this and enumerate its steps too. (b) Also, argue (in 1 or 2 lines) if your method can help in distribution of letters/post to each house in the respective sub-areas.