End Semester Exam 28th Nov 2024

# GS2.401 Spatial Informatics

**Total Marks: 76**

**Time: 90minutes**

Note: Make Suitable assumptions wherever needed and state it clearly when answering. No doubts will be clarified during the exams.

6x2=12

**Part I.**

1. Evolving spatial technologies are more dependent on spatial databases, either structured or unstructured (including NoSQL). Briefly state why you agree or disagree with this statement?
2. Pick and write the correct pair from the following

| | |
|---|---|
| a. Network links | Large office Complexes |
| b. Centers | School bus pickup points |
| c. Link attributes | Train tracks |
| d. Stops | One-way street |

3. A city is divided into 12 zones. The Education department of the city government (a Municipal Corporation in India) wants to ensure that there is one school for every 1000 students. How will you generate the City Map showing the count of schools needed for each Zone if you only have a raster map of total population density at an appropriate grid resolution?
4. Road department collects and reports the data of AADT (average annual daily traffic) on each road segment. A traffic study wants to use it for regulating traffic flow at each junction, but finds it inadequate. What do you think is missing in this empirical data? How would you formulate the data collection for such a problem.
5. You have been given a Soil map that has more than 100 polygons containing 7 different soil classes, 30 different values for the thickness (in cm) of the top soil and a soil water holding capacity value ranging from 0 to 100. You have been tasked with making two maps - (A) Showing the Soil water holding capacity; and (B) Showing the top soil thickness. Which of the attribute generalisation methods will you use for each of these.
6. Which of these are correct with respect to Metadata? (Select all correct statements)
   a. Raw data or content is stored as part of the metadata
   b. Catalogue services like Geonetwork help handle metadata
   c. Metadata helps people and systems discover the data
   d. OGC does not have a metadata standard
   e. It is the detailed description of the data
   f. Helps understand the semantics (ontology) of the data

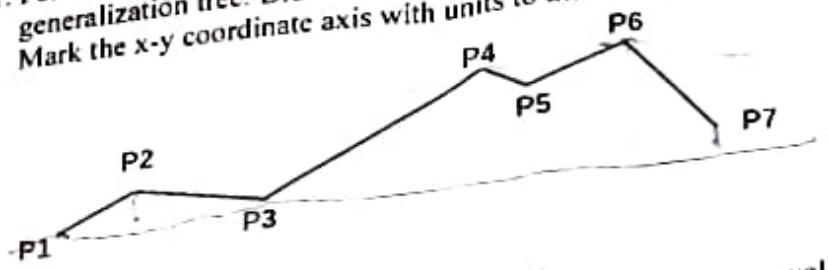
5x4=20

**Part II.** Answer the following questions

7. What do you think are the opportunities or challenges that new emerging technologies pose to Geospatial systems and science? Discuss this in the context of (a) LiDAR data collection over a part of city; (b) IoT nodes deployed for sensing temperature and humidity
8. In a study of animals, the locations of the prey and the predator can be represented by their respective positions and a circular region around them. Which data access method/s will you use to store the prey locations and the

predator location (both are separate data themes/files)? Also explain how this helps in finding the availability of prey for the predator

9. Let's say, Gachibowli area post office is being re-organised into 3 sub-areas with each having a Post office of its own. Lets say these sub areas are IIIT Indiranagar; Housing board. There are already 13 postboxes within the area and the collection of post from these post boxes need to be re-assigned to the 3 new post offices. Choose the algorithm to solve this and enumerate its steps too.
10. What does one mean by Spatial Autocorrelation? Briefly explain what is Moran Index.
11. For the following given part of a road network, represent the Binary line generalization tree. Draw and show the road network at 3-zoom levels. [Hint: Mark the x-y coordinate axis with units to this data.]




4x6=24

**Part III.** Answer any **Four** question by detailing out your answers well

12. A restaurant chain is planning to open about 5 restaurants in different parts of your city (choose a city of your choice) and wants to make sure that no two restaurants compete with each other for the customers. You are the consultant who needs to identify these 5 spots. Now, (i) List out the data needed for this study; and (ii) Using any one of the appropriate accessibility criteria, explain the steps in arriving at the suitable locations.
13. GNSS are becoming an indispensable part of many Geoservices we use. Briefly explain
    a. How does a GNSS (GPS) work? (use a figure to explain)
    b. How is the Indian NavIC system different from Navstar GPS?
    c. Your application can save One track for the whole day of your movement. How will you use this to identify the paths you frequent on a weekday vs weekend.
14. (a) List and briefly explain the two most commonly used Geospatial Web Services.
    (b) Mention the problem statement of your class SI Project and explain how you will implement one of these GeoWeb services for your project to provide a rich and interactive user experience.
15. You are working as a consultant on a project investigating the incidence of throat cancer in India due to smoking. You have been given demographic census data including age, sex, total birth and death data at the administrative district level. The incidence of and deaths from Cancer are available at all the town/city hospitals. Describe how you would use GIS methods to prioritize which 20 districts have to be picked for a Cancer support program. What spatial analysis techniques would you use? Enumerate with a flow chart explicitly
16. What is the role of clustering in GeoDB? Explain in detail any two spatial clustering techniques used.

**Part IV. Answer any Two question by detailing out your answers well** 2x10=20

17. In a given region there are both irrigation canals and water bodies (tanks, Lakes, ponds) for supply of water for crops. But it is found that some areas of the region are green and productive, while other areas are not. Explain how, using GIS, will you identify these parts. And how will you help improve the condition of the not so productive areas. [Note: data characteristics and flow chart needs to be written]
18. A courier company in India operates cargo planes between all the major cities of the country and claims to deliver goods within 24 hours. On a bad weather day one-fourth of all the cities cannot be flown into and they are located in the South-west quadrant/region of the country. Using network analysis, explain how the service can be maintained. List the related data and assume it is all available. [Hint: use a figure to explain effectively]
19. The state of Kerala had both floods and landslides few years ago. If we suppose that those were caused due to a mix of natural and man-made factors, how will you do a risk assessment of the place? List all possible datasets you need, and enumerate your approach for a spatial analysis of the region to identify regions of risk (classes can be No-risk, Low-risk, Moderate-risk, High-risk). Present a flowchart showing both the data processing and the spatial functions you adopt.
20. As a planner working for a town municipality you are asked to demarcate the land suitable for industrial zones, with a minimum area of 10hectares. (1ha = 100mx 100m). You have access to the following data sets. Describe how you would use a spatial techniques to find suitable areas
    - A land use map containing the following classes: Lakes, streams, forest, single cropping lands, double/triple cropping lands, wastelands, industry, low-density residential areas and high-density residential areas. The data set is stored in a raster format with a cell size of 10x10 m.
    - A digital elevation model stored in a square raster. The raster has a 30 meter resolution.
    - A vector data set containing cadastral information. Each parcel has attributes containing information about: Owner, value and dominating land use.
    - A road data set. The roads are stored in a network data structure where each road link has attributes containing information about: Speed limit, length, travel time and owner.
    - A vector data set containing railroads and stations.
    - A vector data set with green zones that ought to be protected.
    - Some of the conditions include that agriculturally productive lands should not be used, should be within 25kms from the rail stations, should be atleast 2km away from green zones and 3km away to residential areas.

***Best of Luck!!***