

National Exams December 2018

04-Geom-A7, Geospatial Information Systems

Duration 3 Hours

NOTES:

1. If doubt exists as to the interpretation of any question, the candidate is urged to submit with the answer paper, a clear statement of any assumptions made.
2. This is a CLOSED BOOK EXAM.
One of either a Casio or Sharp approved calculator is permitted.
3. Ten (10) questions constitute a complete exam paper. The candidate may answer any Ten (10) of the Fifteen (15) questions provided. The first ten questions as they appear in the answer book will be marked.
4. Each question is of equal value of 10. (Full marking scheme on Page 5)
5. Most questions require an answer in essay format. Clarity and organization of the answer are important.

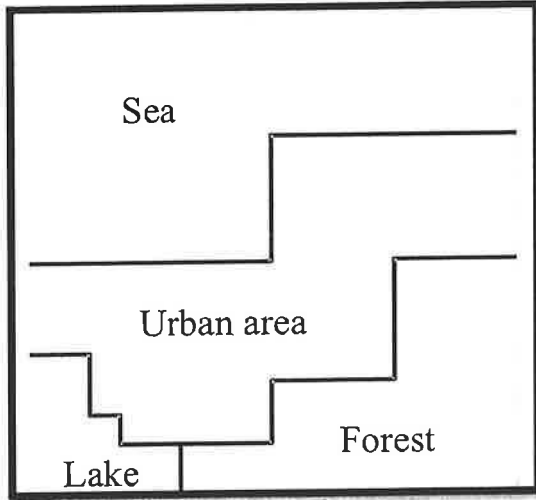
Complete 10 of the following questions.

1. a) What is the difference between spatial (i.e. geometric) and attribute uncertainty? b) Describe what is metadata and what would be metadata's role in identifying spatial and attribute uncertainty?
2. In the context of geospatial information design a reality captured from remote sensing devices or manual surveying can be represented with three different types of models, which include: 1) Conceptual Model; 2) Logical Model; 3) Physical Model. Please explain how each model can be defined, produced and represented.
3. a) Briefly describe the Buffer function that is used extensively in GIS. b) Explain how buffer is being used in proximity analysis?
4. Discuss the difference between the discrete object and continuous field concepts in the context of GIS database.
5. a) How a Structured Query Language (SQL) is used in geospatial data management? b) For each row of the table below, explain the distinction between these two SQL scripts. The table building has the following fields: ID, ADDRESS, TYPE.

	SQL script 1	SQL script 2
1	INSERT INTO building VALUES (700, '12 Queen W St, Toronto', 'commercial');	UPDATE building SET type='commercial' WHERE id=700
2	DELETE FROM building WHERE id=700;	INSERT INTO building VALUES (700, '12 Queen W St, Toronto', 'commercial');
3	SELECT * FROM building	SELECT address FROM building
4	DROP TABLE building;	DELETE FROM building;

6. Compare and contrast the following pairs:
 - a) Object-oriented data model and relational data model
 - b) Spatial functions and spatial constraints

7. Given the land use map below, represent its raster image using a quadtree data indexing structure.



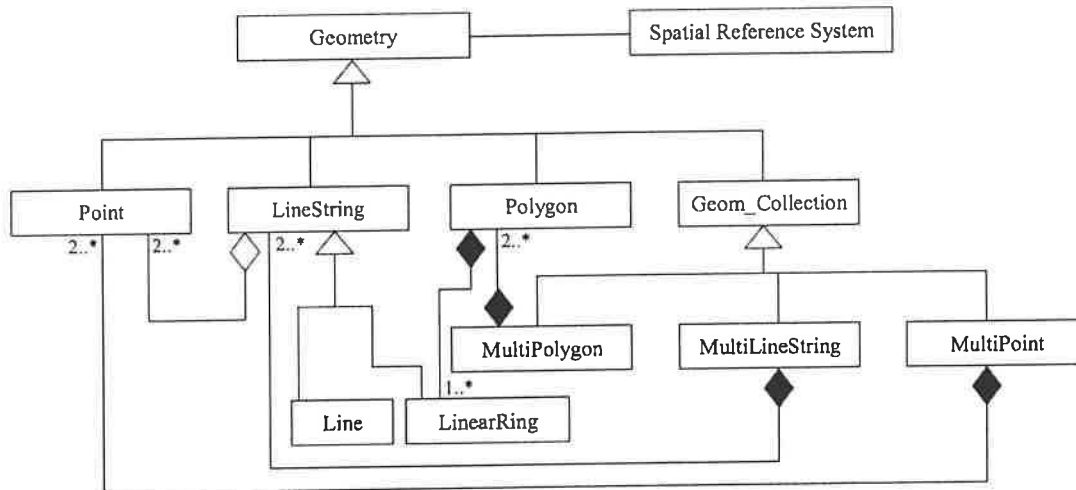
s	s	s	s	s	s	s	s	s	s	s	s	s	s	s	s
s	s	s	s	s	s	s	s	s	s	s	s	s	s	s	s
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s	s	s	s	s	s	s	s	u	u	u	u	u	u	u	u
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u	u	u	u	u	u	u	u	u	u	u	u	f	f	f	f
l	l	u	u	u	u	u	u	u	u	u	u	f	f	f	f
l	l	u	u	u	u	u	u	f	f	f	f	f	f	f	f
l	l	l	u	u	u	u	u	f	f	f	f	f	f	f	f
l	l	l	l	l	f	f	f	f	f	f	f	f	f	f	f
l	l	l	l	l	f	f	f	f	f	f	f	f	f	f	f

8. There are four overlay operators to aggregate spatial data: a) Arithmetic b) Logical c) Probabilistic d) Fuzzy; describe each of operator briefly.
9. a) Identify in which category you consider a decision makers' preference or interest with respect to 1) Spatial Data, 2) Spatial Information and 3) Spatial knowledge categorization, b) Justify your answer with a real-case example.
10. List and briefly explain at least five criteria that are commonly used to describe geospatial data quality.
11. a) What is "address matching"? b) Why is address matching an important vector analysis?
12. Assume a GIS modeling problem of finding suitable site for new ski resort, which should be within 500 m of major roads, cannot be within 50 m of streams and agriculture lands, should be in area with slope of at least 35%. Given road map, stream map, Digital Elevation Model and land use data, draw a flowchart to show each step clearly, including data input layers, processing functions and output, of the problem solving process.

13. Compare and contrast thin-client and thick-client strategies in designing a web mapping application.

14. a) Define map projection. b) Explain why map projections are needed.

15. The following UML class diagram conceptually describes the OGC Geometry Schema. In this diagram, three different types of relationships between classes have been used. Identify these relationships and explain their main functions.



Marking Scheme

1. a) 5/10 marks, b) 5/10 marks
2. 10 marks
3. a) 5/10 marks, b) 5/10 marks
4. 10 marks
5. a) 2/10 mark; b) 8/10 marks
6. a) 5 marks; b) 5 marks
7. 10 marks
8. a) 2/10 marks; b) 2/10 marks; c) 2/10 marks; d) 2/10 marks
9. a) 6/10 marks, b) 4/10 marks
10. 2/10 marks for each item ($5 \times 2 = 10$)
11. a) 4/10 marks; b) 6/10 marks
12. 10 marks
13. 10 marks
14. a) 6/10 marks; b) 4/10 marks
15. 10 marks