CANADIAN BOARD OF EXAMINERS FOR PROFESSIONAL SURVEYORS

E1 - SPATIAL DATABASES & LAND INFORMATION SYSTEMS   October 2012

Note: This exam consists of 10 questions on 2 pages.

Q. No	Time: 3 hours	Value	Earned
1.	The Centre for Topographic Information (CTI), initiated a project centered on the development of a conceptual data model for a new GeoBase theme, the National Power Line Network (NPLN). The CTI asks you to build the first draft of this conceptual model (CIM level). The planned features of the NPLN are: • **Power Line Element**: "PowerLineElement primarily represents two types of physical power lines: a) high voltage transmission line circuits (often carrying electricity over long distances), and, b) production lines (typically connecting an electrical generation source with a nearby substation). A PowerLineElement is always bounded by two Junctions and is composed of one or more adjoining PowerLineSegments"(Geobase, 2012). Power Line Element is characterised by an identifier for the circuit, circuit rating and current type (Alternating current or Direct current) • **Power Line Segment**: "Portion of a PowerLineElement with uniform characteristics" (Geobase, 2012). Power Line Segment is characterised by unique ID, classification of the power line (production line and transmission line), corridor name and the width of the corridor. • **Junction**: "Point feature representing a connector (real or virtual) of the NPLN. Junctions are located at both ends of a PowerLineElement" (Geobase, 2012) All junctions are represented by a point. • **No Facility Junction**: "Type of Junction representing a connector (real or virtual) of the NPLN that is not a facility" (Geobase, 2012). No Facility Junction is characterised by a Boundary Transition Indicator which indicates whether the NoFacilityJunction is a point of transition at a national, provincial or territorial border. • **Facility Junction**: "Type of Junction representing a facility related to electrical power activities" (Geobase, 2012). All Facility Junctions are characterised by a name, number of incoming circuits to a junction and number or outgoing circuits from a junction. • **Generation Station**: "Type of Junction Facility that generates electric power" (Geobase, 2012). Generation Stations are characterised by type of fuel used for generating electrical power at the station and net power capacity of the station expressed in megawatts (MW). • **Substation**: "Type of Junction Facility in a grid network where electricity is regulated or rerouted" (Geobase, 2012). Substations are characterised by stepDown which is a facility with capabilities to reduce voltage levels and stepUp which is a facility with capabilities to increase voltage levels. Illustrate your first draft of the conceptual model (CIM level) (you can use UML or Entity- Relationship modeling formalisms) showing entities, attributes and relationships. Note: You must specify in your database conceptual schema what will be represented cartographically and what geometry will be used (point, line and polygon).	20	

2.	From the conceptual model you have created in #1, give one example of a complete SQL command used to:
	
	    a) Implement one class or entity of your conceptual model as a table.
	
	    b) Add data into this table.
	
	    c) Change the structure of this table.
	
	    d) Remove records or data from this table.
	
	    e) Change one field value to another value in this table.
	
	    f) Extract data from this table that fulfills specified criteria.
		2.5
		2.5
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		2.5
		2.5
		2.5	

3.	Name four types of non-spatial integrity constraints you should implement to preserve the integrity of your database (1 pt each). For each of them, give an example using the implementation of entities, attributes and relationships of the conceptual model you created in #1. (1.5 pt each)	10	
4.	Give two examples of spatial integrity constraints you should implement in the spatial database of # 1; one between two Line Segments and the other between a Power Line Element and a Junction. For each example give the spatial operator used (1.5 pts each) and make a scheme of the spatial relationship (1.5 pts each).	6	
5.	Give an example of three metadatas you should use to describe the NPLN data (see #1) (2.5 pts each)	7.5	
6.	Client/server computing is the method of running different processes on separate computers by sharing their resources. Give two examples of Client/Server architecture for database systems showing how these resources can be shared. Draw sketches. (2.5 pts each)	5	
7.	Define what an index is in a database. Name one indexing method. Draw a sketch showing how this indexing method works.	2.5 1.5 5	
8.	Give examples of three legal risks that individuals and organisations are subjected to relating to the use of spatial data.	7.5	
9.	Define each of the following: a) Transactional database b) CIM c) Field d) LIS e) Data Definition Language (DDL) f) R-tree g) Foreign key	14	
10.	Give three examples of what you should do in the design phase of the system development life cycle for spatial database.	6	
	Total Marks:	100	