

CANADIAN BOARD OF EXAMINERS FOR PROFESSIONAL SURVEYORS

**E1 - SPATIAL DATABASES
& LAND INFORMATION SYSTEMS**

March 2015

Although programmable calculators may be used, candidates must show all formulae used, the substitution of values into them, and any intermediate values to 2 more significant figures than warranted for the answer. Otherwise, full marks may not be awarded even though the answer is numerically correct.

Note: This examination consists of 10 questions on 4 pages.

Marks

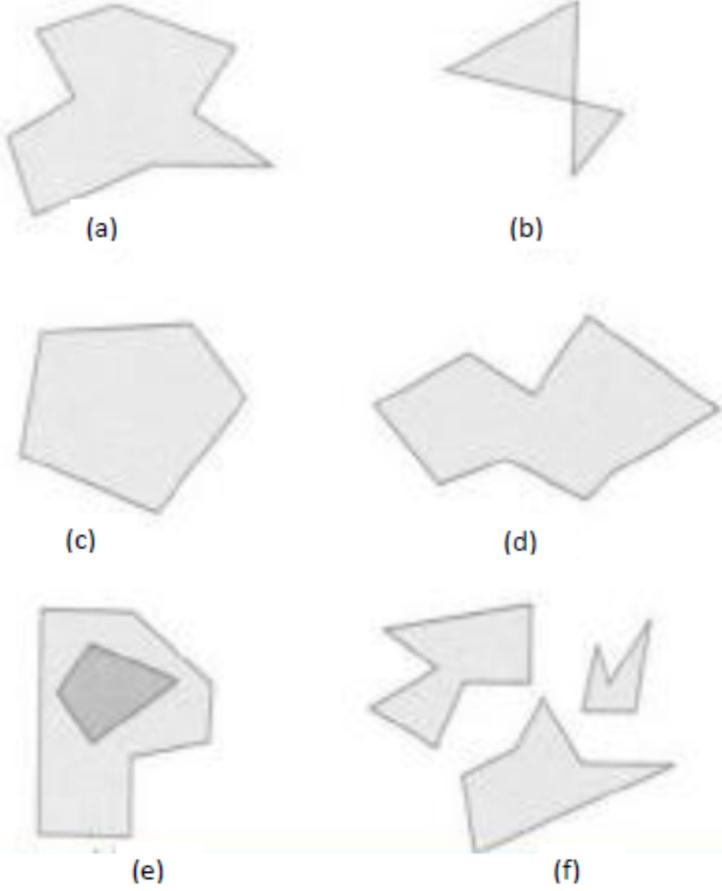
Q. No

Time: 3 hours

Value Earned

1.	<p>Based on the tables given below, what will be the result for the SQL statement below:</p> <p>Select Boundary.id-contour,x,y From Country, Boundary, Contour, Point Where name = France And Country.id-boundary = Boundary.id-boundary And Boundary.id-contour = Contour.id-contour And Contour.id-point = Point.id-point Order by Boundary.id-contour, point-num</p> <div style="display: flex; justify-content: space-around; margin: 20px 0;"> <div style="text-align: center;"> <p><i>Country</i></p> <table border="1" style="border-collapse: collapse; text-align: center;"> <thead> <tr> <th><i>name</i></th> <th><i>capital</i></th> <th><i>population</i></th> <th><i>id-boundary</i></th> </tr> </thead> <tbody> <tr> <td>Germany</td> <td>Berlin</td> <td>78.5</td> <td>B1</td> </tr> <tr> <td>France</td> <td>Paris</td> <td>58</td> <td>B2</td> </tr> <tr> <td>...</td> <td>...</td> <td>...</td> <td>...</td> </tr> </tbody> </table> </div> <div style="text-align: center;"> <p><i>Boundary</i></p> <table border="1" style="border-collapse: collapse; text-align: center;"> <thead> <tr> <th><i>id-boundary</i></th> <th><i>id-contour</i></th> </tr> </thead> <tbody> <tr> <td>B1</td> <td>C1</td> </tr> <tr> <td>B2</td> <td>C2</td> </tr> <tr> <td>B2</td> <td>C3</td> </tr> <tr> <td>B3</td> <td>C4</td> </tr> <tr> <td>B3</td> <td>C5</td> </tr> <tr> <td>...</td> <td>...</td> </tr> </tbody> </table> </div> </div> <div style="display: flex; justify-content: space-around; margin: 20px 0;"> <div style="text-align: center;"> <p><i>Contour</i></p> <table border="1" style="border-collapse: collapse; text-align: center;"> <thead> <tr> <th><i>id-contour</i></th> <th><i>point-num</i></th> <th><i>id-point</i></th> </tr> </thead> <tbody> <tr> <td>C1</td> <td>2</td> <td>P1</td> </tr> <tr> <td>C1</td> <td>1</td> <td>P2</td> </tr> <tr> <td>C1</td> <td>3</td> <td>P3</td> </tr> <tr> <td>C1</td> <td>...</td> <td>...</td> </tr> <tr> <td>C2</td> <td>1</td> <td>P4</td> </tr> <tr> <td>C2</td> <td>2</td> <td>P5</td> </tr> <tr> <td>C2</td> <td>...</td> <td>...</td> </tr> <tr> <td>...</td> <td>...</td> <td>...</td> </tr> </tbody> </table> </div> <div style="text-align: center;"> <p><i>Point</i></p> <table border="1" style="border-collapse: collapse; text-align: center;"> <thead> <tr> <th><i>id-point</i></th> <th><i>x</i></th> <th><i>y</i></th> </tr> </thead> <tbody> <tr> <td>P1</td> <td>452</td> <td>1000</td> </tr> <tr> <td>P2</td> <td>365</td> <td>875</td> </tr> <tr> <td>P3</td> <td>386</td> <td>985</td> </tr> <tr> <td>P4</td> <td>296</td> <td>825</td> </tr> <tr> <td>P5</td> <td>589</td> <td>189</td> </tr> <tr> <td>...</td> <td>...</td> <td>...</td> </tr> </tbody> </table> </div> </div>	<i>name</i>	<i>capital</i>	<i>population</i>	<i>id-boundary</i>	Germany	Berlin	78.5	B1	France	Paris	58	B2	<i>id-boundary</i>	<i>id-contour</i>	B1	C1	B2	C2	B2	C3	B3	C4	B3	C5	<i>id-contour</i>	<i>point-num</i>	<i>id-point</i>	C1	2	P1	C1	1	P2	C1	3	P3	C1	C2	1	P4	C2	2	P5	C2	<i>id-point</i>	<i>x</i>	<i>y</i>	P1	452	1000	P2	365	875	P3	386	985	P4	296	825	P5	589	189	10	
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2.	Explain what is meant by georeferencing and why is GPS the preferred method for georeferencing.	10	
3.	<p>Which one of the statements is false? Explain why.</p> <ul style="list-style-type: none"> - The probability of data consistency is not reduced in a properly designed spatial database that is managed through a DBMS. - Spatial databases provide a wider access to data being collected throughout an organization. - A spatial database makes it possible to produce quick answers to ad-hoc queries. 	10	
4.	<p>Compare the various spatial database models for elevation data. Which ones would you expect to be best for:</p> <ul style="list-style-type: none"> a) landscape dominated by fluvial erosion and dendritic drainage patterns, b) a glaciated landscape, c) a map of population density for Canada? 	5 5 5	
5.	<p>Draw the Quadtree tree for the point data below.</p>	5	
6.	<p>Governments and national mapping agencies have a unique critical role in developing and maintaining authoritative national databases. To improve the quality and timeliness of these authoritative databases many have argued that they need to find ways to incorporate volunteered or crowdsourced geospatial data in these databases. Explain how this kind of data can be incorporated into authoritative national databases. Please provide practical examples.</p>	10	

7.	<p>Layers or levels in a GIS cannot be used to (choose one):</p> <ul style="list-style-type: none"> - Group related geographic features by function - Isolate point, line, and area features - Develop thematic maps - Combine non-spatial and attribute information - Highlight logical relationships among geographic features. <p>Explain why.</p>	10	
8.	<p>Generalization in spatial databases is a very important aspect in a geomatics engineering project. At what map scale would the difference between spherical and ellipsoidal coordinates be important (assuming that you can distinguish a line of 0.5 mm on a map)?</p> <p>Assume Earth's mean radius $R=6371\text{km}$ and ellipsoidal flattening of $1/300$.</p>	10	
9.	<p>Two dimensional objects or surface objects are mostly used for representing entities with large areas such as parcels or administrative units in spatial databases. It is usual to distinguish six types of polygons (see figure below). Define and explain the main geometric characteristics of these six types of polygons.</p> <div style="text-align: center;">  </div>	10	

10.	<p>Explain how and what type of data (e.g. sensor data, cadastral data, etc) can be stored in the following database types:</p> <ul style="list-style-type: none"> a) Graph database b) Relational database c) Object oriented database <p>Describe what are the main advantages and limitations of each one.</p>	10	
Total Marks:		100	