

**ASSOCIATION OF CANADA LANDS SURVEYORS - BOARD OF EXAMINERS  
WESTERN CANADIAN BOARD OF EXAMINERS FOR LAND SURVEYORS  
ATLANTIC PROVINCES BOARD OF EXAMINERS FOR LAND SURVEYORS**

**SCHEDULE II/ ITEM 1  
GEODETTIC POSITIONING**

**Note:** This examination consists of 4 questions on 1 page.

**Marks**

**Q. No**

**Time: 3 hours**

**Value Earned**

1.	<ul style="list-style-type: none"> <li>a) What is a horizontal datum?</li> <li>b) What is the ITRS? What are ITRFs? How do they relate?</li> <li>c) How is the Canadian Spatial Reference System defined and realized?</li> <li>d) Is there any difference between relative positioning and differential positioning? Explain.</li> <li>e) What is the advantage of geodetic networks over single baselines?</li> </ul>	5 5 5 5 5	
2.	<p>The Canadian Height System is based on orthometric heights. GPS positioning provides geodetic (or ellipsoidal) heights.</p> <ul style="list-style-type: none"> <li>a) Define orthometric height</li> <li>b) Define geodetic height</li> <li>c) How are they related?</li> <li>d) In practice, what would you do to transform from one to another?</li> <li>e) Define sea surface topography.</li> </ul>	5 5 5 5 5	
3.	<ul style="list-style-type: none"> <li>a) Consider two points A and B located on the equator. Their respective longitudes are <math>\lambda_A = 45^{\circ}00'00''</math> and <math>\lambda_B = 45^{\circ}00'05''</math>. What is the distance between these two points, in unit of length? Consider an Earth with radius equal to 6,370 km.</li> <li>b) How would you classify GPS receivers in terms of observables, accuracy and applications?</li> <li>c) The motion of a satellite can be described by six Keplerian elements: the major-semi axis of the orbital ellipse <math>a</math>, the eccentricity of the orbital ellipse <math>e</math>, the inclination of the orbital ellipse <math>i</math>, the argument of perigee <math>\omega</math>, the right ascension of the ascending node <math>\Omega</math> and the true anomaly <math>f</math>. Describe the variation of the major-semi axis of the orbital ellipse <math>a</math> with time for a GPS satellite? After 10 years, would <math>a</math> be larger, equal or smaller than the initial <math>a</math>? (Do not consider satellite maneuvers). Why?</li> <li>d) What is the difference between a passive and an active positioning system?</li> <li>e) What makes “ambiguity” so important in GPS carrier phase positioning?</li> </ul>	5 5 5 5 5	
4.	<ul style="list-style-type: none"> <li>a) What is the difference between absolute and relative confidence ellipses?</li> <li>b) Under what circumstance would you use absolute and relative confidence ellipses?</li> <li>c) Consider a range satellite system in which all satellites transmit the same frequency. How can a receiver distinguish among the different signals to know which one is transmitted by a particular satellite?</li> <li>d) Is it important to take into account the effects that troposphere has on electromagnetic signals? Explain.</li> <li>e) What is the importance of “tides” in high accuracy geodetic positioning?</li> </ul>	5 5 5 5 5	
<b>Total Marks:</b>		100	