CANADIAN BOARD OF EXAMINERS FOR PROFESSIONAL SURVEYORS

C-6 GEODETIC POSITIONING

March 2013

Note: This examination consists of 6 questions on 2 pages.

Time: 3 hours

Q. No		Marks Value	Earned
1.	*Quotation from a publication by David B. Zilkoski (NOAA)* : There are several different height systems used by the surveying and mapping community. Two of these height systems are relevant to the International Great Lakes Datum of 1985 (IGLD 85): ***orthometric heights*** and ***dynamic heights***. ***Geopotential numbers*** relate these two systems to each other. a) Define geopotential numbers and give their SI-units b) Which ***type*** of measurements are needed to determine geopotential numbers? Explain ***with formulas*** how they are obtained. c) How can geopotential numbers be converted to dynamic heights? d) Define orthometric heights. How are they obtained from geopotential numbers?	3 10 3 4	
2.	In Canada a new vertical datum will be introduced in the near future, replacing the existing one. a) How will this new vertical datum be defined, realized and maintained? b) In your opinion what will be its impact on the everyday work of a surveyor?	10 5	
3.	RTK is a broadly used GPS-technique allowing for a rapid determination of coordinates. a) Explain the acronym of RTK. Comment briefly on how it works. What type of GPS observations are used? Which accuracy can be achieved? b) Explain in detail the technique for ambiguity resolution used in RTK. Why is ambiguity resolution an important issue in RTK? c) What is a PDOP and how is it obtained? What is its use?	8 7 5	
4.	The *International Earth Rotation and Reference Systems Service* (IERS) publishes the following Earth orientation parameters : ***i)*** polar motion (x,y), ***ii)*** universal time (UT1 – UTC, UT1 – TAI), ***iii)*** Celestial pole offsets (Dpsi, Deps). a) Which spaceborne technics contribute to the determination of these parameters? b) Explain what polar motion accounts for. c) Explain in details what UT1 and TAI are and explain how they are obtained.	4 5 6	

5.	There are several versions of NAD83, the most important being NAD83(original) and NAD83(CSRS). a) Explain the acronyms. What are the common features and the differences between the two datums? b) The new NAD83(CSRS) realization was accompanied by a transition to a new reference frame structure for Canada. The traditional horizontal network hierarchy was replaced with a more modern framework *(M. Craymer)*. Explain in details the hierarchy of the new NAD83(CSRS) network.	7 8	
6.	On the official data sheet of a benchmark (situated in Alberta) you find the following information : ***Horizontal Datum : NAD83 (updated 93-09-03)*** ***3TMCoordinates*** *Scale Factor 0.999900 at Reference Meridian : 114°* *Northing : 5 794 901.393 m* *Easting : 13 543.364 m* *Convergence : 00° 09' 25."32* *Station Ellipsoid Factor : 0.999864* *Station Combined Factor : 0.999767* a) Explain what 3TM Coordinates are. Why is the Northing larger than the Easting? b) What is meant by *Convergence*? What is its use? c) Define the *Scale Factor (at Reference Meridian*), the *Station Ellipsoid Factor* and the *Station Combined Factor*. How are they determined? What is their use?	4 3 8	
	Total Marks:	100	