

CANADIAN BOARD OF EXAMINERS FOR PROFESSIONAL SURVEYORS

C6 – GEODETIC POSITIONING

June 2020

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 5 questions on 2 pages.

Marks

Q. No

Time: 3 hours

Value Earned

1.	<p>This is an extract of an IERS bulletin:</p> <table border="1"> <thead> <tr> <th>DATE</th> <th>x (arcsec)</th> <th>y (arcsec)</th> <th>UT1-UTC (sec)</th> </tr> </thead> <tbody> <tr> <td>2016 12 30</td> <td>0.0825</td> <td>0.2639</td> <td>-0.40693</td> </tr> <tr> <td>2016 12 31</td> <td>0.0807</td> <td>0.2636</td> <td>-0.40780</td> </tr> <tr> <td>2017 1 1</td> <td>0.0790</td> <td>0.2635</td> <td>0.59127</td> </tr> <tr> <td>2017 1 2</td> <td>0.0775</td> <td>0.2636</td> <td>0.59022</td> </tr> </tbody> </table>	DATE	x (arcsec)	y (arcsec)	UT1-UTC (sec)	2016 12 30	0.0825	0.2639	-0.40693	2016 12 31	0.0807	0.2636	-0.40780	2017 1 1	0.0790	0.2635	0.59127	2017 1 2	0.0775	0.2636	0.59022		
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	<p>a) x, y stands for polar motion. Explain the phenomenon of polar motion. How are these values obtained nowadays? What are they needed for?</p> <p>b) Define UT1 and UTC. Which space-geodetic technique allows for the determination of UT1? How is UTC obtained? What happened between December 31st 2016 and January 1st 2017?</p>	5																					
2.	<p>GPS was designed and implemented as a military satellite navigation system in the 1980s. Its primary application is to allow instantaneous positioning world-wide at a meter level. How is this solution obtained? (Explain which observations are used, which additional information is requested and where it comes from. Give the observation equation.)</p>	10																					
3.	<p>The Canadian Height Reference System CGVD28 has been replaced by the new CGVD2013.</p> <p>a) How is the CGVD2013 defined and realized? What are the advantages compared to CGVD28?</p>	7																					
	<p>b) You just finished a GPS survey. The output of your GPS-software are Cartesian coordinates XYZ with respect to NAD83(CSRS) of all markers. After having transformed them to UTM coordinates and to CGVD28 heights, you are asked to change to the new CGVD2013. Explain in details the impact on the calculation of the UTM coordinates and how you get the CGVD2013 heights.</p>	8																					

