

GGE 2012
Advanced Surveying
Winter Term 2010-2011
Geodesy and Geomatics Engineering, University of New Brunswick

Mid-term Test

45 minutes, closed book

February 22, 2011

Answer all four questions from 1) ~ 4).

This test counts for **20%** of your mark in this course. Use diagrams where applicable.

1) A EDM can determine the distance with an accuracy at the mm level. The final distance can be reduced based on the phase difference between outgoing and incoming signals by sending multiple wavelengths. Let us assume that this EDM sends a series of the signals whose wavelengths are 20km, 1km, 200m, 10m and 0.5m. And the corresponding partial wavelengths resolved in unit of cycle are 0.59, 0.79, 0.93, 0.54, and 0.70. Then, calculate the resolved cycles and the corresponding distances shown in the following table [15 pts].

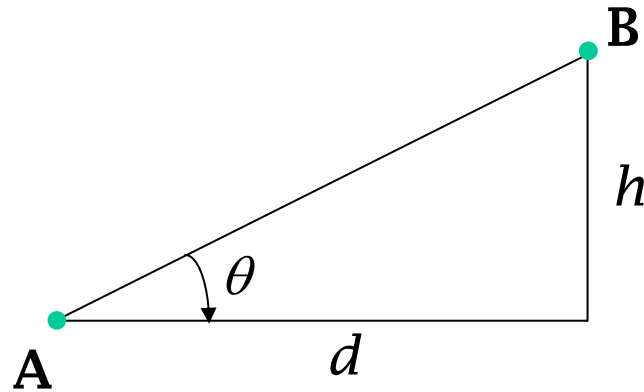
Wavelength sent by the EDM	Partial wavelength resolved in cycle	Total cycles resolved in total	Distance determined in metre
2,000 m	0.59	0.59	11,800.000 m
1,000 m	0.79		
200 m	0.93		
10 m	0.54		
0.5 m	0.70		

2) There are several methods of determining height between two points in a local area: ***differential levelling; trigonometric heighting; simultaneous reciprocal heighting; and GPS heighting***. Depending on accuracy requirements of your project, you have to choose a correct method.

2-a) Briefly describe the principle of each method [10 pts].

2-b) Explain the advantages and the expected precision of each method [10 pts].

3) In order to determine the best estimate of height on the point of B from the point of A, the different numbers of observations for elevation angle and horizontal distance are made. The corresponding values achieved are shown in the table:



	mean	Standard deviation(σ)	Number of observation (n)
Horizontal distance (d)	56.78 m	2 cm	4
Vertical angle (θ)	9° 12' 7"	30"	9

Solve for the best estimate for height, h , and its corresponding standard deviation based on error propagation law of variances [25 pts].

4) Answer the followings:

4-a) What are the major advantages of the 3D terrestrial laser scanner versus conventional survey instruments, e.g. EDM? [15 pts].

4-b) In precision levelling, a parallel plate micrometer (PPM) is placed in front of the objective lens. What is the main purpose of this device [5 pts].