



ORDRE DES INGÉNIEURS DU QUÉBEC

NOVEMBER 2009 SESSION

Open-book examination
Calculators : only authorized models
Duration : 3 hours

04-GEOM-B2 Satellite Navigation

Question 1 (20%)

Describe (in order of importance) the errors associated with a GPS absolute positioning using pseudorange observables. How can these errors be reduced or eliminated?

Question 2 (15%)

Explain the main steps to resolve carrier phase ambiguities in GPS kinematic mode.

Question 3 (15%)

If the HDOP and PDOP values are equal to 3.2 and 8, respectively, calculate the corresponding VDOP value. What is your conclusion (with explanation) about this calculation? Prove that these DOP values are unitless.

Question 4 (15%)

With the following values, calculate the ionospheric-free pseudorange observable (and its precision).
P(Y) on L1 : 24 081 915.45 m ± 0.1 m; P(Y) on L2 : 24 081 922.29 m ± 0.1 m.

Question 5 (20%)

Describe (with explanation) the optimal GPS methodology to be used to fulfill the positioning requirements for:

- Street stake-out in a new residential subdivision development.
- Topographical map update at a scale of 1 : 50 000.
- Ship navigation in the St. Lawrence seaway.
- Geodetic network densification in a sub-urban area.

Question 6 (15%)

Compare the advantages and the disadvantages of GPS technique (using 4 antennas on a platform) and INS technique for attitude determination.