



**PROFESSIONAL (GEODETIC) EXAMINATION**  
**Friday December 1, 2000**  
**9:00AM**

---

**TIME ALLOWED:** Four (4) hours  
**# OF QUESTIONS:** Nine (9)

---

**INSTRUCTIONS**

1. There are nine (9) questions; please ensure that you have a complete copy of the examination.
2. Note the number of marks for each question before compiling your answers.
3. Place your exam registration number at the top right-hand corner of each page of your answers. DO NOT write your name on or in the book(s).
4. Each answer must begin on a new page, however questions may be answered in any order.
5. Reference each response to its question number, including subsection.
6. Write only on the right hand side of the examination book. You may wish to use the left (blank) side for calculations, etc., however anything written on the blank side will not be considered during marking.
7. Do not write in pencil.
8. This examination must be returned to the invigilator.

**TOTAL MARKS:** 100  
**PASS:** 65%

**Question 1**

**(10)**

Your firm has been awarded a contract with MTO to conduct a control and pre-engineering survey for 17km of a two lane rural highway in Northeastern Ontario. As with every well-organized survey, some pre-project planning must take place.

- a) Prepare an agenda for the kick-off meeting with the client and your senior staff.
- b) Explain the concerns or issues that need to be addressed under each heading on the agenda (do not explain the "survey").

**Question 2**

**(15)**

A potential client contacts you, as an OLS, requesting a proposal for geodetic survey services for a remote location in Northern Ontario.

Prepare a typical business letter to the client confirming his request.

As this letter will form the sole business agreement, be sure to address all matters pertinent to a good business contract.

**NOTE:** Marks will be only given for business/contract issues, so be brief in describing the actual survey work. Do not do a cost estimate, just insert a dollar figure.  
Do not sign the letter.

**Question 3**

**(15)**

In order to conduct a successful GPS campaign, a systematic approach must be taken.

Describe a typical project scenario from conception to the delivery of the final results, for a GPS control survey of approximately one dozen points, designed to meet second order survey standards.

What areas of the project cycle must be given special attention and why?

**Question 4**

**(15)**

At the Annual Meeting of this Association held in February 2000, a motion was put forth during the open forum, which stated:

*BE IT RESOLVED THAT the AOLS Council investigate the implementation of a process whereby the Certificate of Registration holders, who conduct work in Ontario, and who submit work to clients in Ontario, be subject to a Peer Review Process under the Survey Review Department.*

- a) Outline why standards should be set for your discipline. (5 marks)
- b) List the framework/headings, under which standards should be developed noting in each instance, whether the standard should be a permissive or mandatory standard. (10 marks)

(Remember this is an outline and not a complete version of the standards)

**Question 5**

**(4)**

As a Certificate of Registration member and an owner of a non-cadastral business:

- a) What are the minimum insurance requirements? (2 marks)
- b) What would you recommend for insurance (types, term)? (2 marks)

**Question 6**

**(11)**

What are your responsibilities and/or liabilities as an owner of a non-cadastral survey firm in the following situations:

- a) An employee is injured on the job. (3 marks)
- b) An owner of a Cadastral Survey firm offers you a commission for any work you send their way. (3 marks)
- c) A municipality contracts you to establish a network of permanent horizontal control points. They refuse to pay because the points are not inter-visible and the vertical values you supplied are found to be unreliable. (5 marks)

**Question 7**

**(11)**

- a) Briefly explain the relationship between orthometric and ellipsoidal heights. (2 marks)
- b) In the design of vertical control networks, briefly explain why narrow loops in which the ratio of length/width is less than 4 are not acceptable. (2 marks)
- c) Explain the purpose and procedures in carrying out a simple peg test. (2 marks)
- d) What special techniques and equipment are required for precise or high order levelling? (2 marks)
- e) Explain a Princeton Test. (3 marks)

**Question 8**

**(10)**

- a) When performing a minimum constraint adjustment of GPS coordinate difference observations, the a posteriori variance factor is never equal to 1 as it should be. Explain why this happens and the implications for the adjustment. (5 marks)
- b) After scaling the variance-covariance matrix of the GPS coordinate differences (by a posteriori variance factor from the minimum constraint adjustment) a constrained adjustment is performed to the existing control. Again, the a posteriori variance factor is usually much greater than 1. Explain why. (5 marks)

**Question 9**

**(9)**

- a) Define the geoid. (2 marks)
- b) State the methods and approaches to determining the geoid. What are the absolute and/or relative accuracies associated with these methods? (4 marks)
- c) Outline the implications of the geoid on modern positioning techniques. (3 marks)