

**The University of Melbourne**

**Semester 2 Assessment 2007**

**Department:** Geomatics

**Subject Number:** 451-337

**Subject Title:** Satellite Positioning and Geodesy

**Reading Time :** 15 minutes

**Writing Time :** 3 hours

**This paper has 3 pages including this cover page**

**Authorised Materials:**

Electronic calculators are permitted

**Instructions to Invigilators:**

Students require script books

**Instructions to Students:**

All five (5) questions are to be attempted  
All answers are to be written in the script books provided  
All questions carry equal marks

**Baillieu Library:**

Paper is to be archived in the Baillieu Library

1. (a) The GPS *satellite message* provides a considerable amount of information to users of the system. Provide a complete description of the structure, contents and applications of the satellite message.

(8 marks)

- (b) Give complete definitions for the following:

- (i) Precise ephemeris
- (ii) Ambiguity resolution
- (iii) The geoid
- (iv) Geodetic coordinates
- (v) Conformal transformation

(12 marks)

2. One of the keys to optimising the precision and accuracy of GPS carrier phase positioning is to understand and manage the various sources of error. Describe the main errors that impact on GPS surveying and detail options for error mitigation.

(20 marks)

3. (a) Measurement differencing is commonly used in the processing of GPS carrier phase observations. Describe the advantages and disadvantages of measurement differencing.

(5 marks)

- (b) The observation equation for GPS carrier phase measurements is given below:

$$\Phi = c(dt - dT) + R - d_{\text{ion}} + d_{\text{trop}} - \lambda N(t_0) + n$$

- (i) Develop an observation equation for the triple difference observable.
- (ii) Describe the main advantages of the triple difference observable in processing GPS carrier phase data.

(15 marks)

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4. (a) GDA94 is the Geocentric Datum of Australia. Using GDA94 as an example, describe the processes of datum definition and datum realisation. (10 marks)
- (b) GPS is not able to directly determine orthometric heights. Elaborate on the reasons why this is so and describe how this so-called *GPS heighting problem* can be resolved. (10 marks)
5. (a) Explain and illustrate what a GPS receiver actually measures when tracking the L1 and L2 carrier phase signals. (7 marks)
- (b) Describe the GPS Standard Positioning Service (SPS). (7 marks)
- (c) What changes are scheduled to be made as part of the GPS modernisation program and what benefits will these bring to users? (6 marks)

>>>>>>>>> **End of Examination** <<<<<<<<<<