

**UNIVERSITY OF SOUTH AUSTRALIA**

DIVISION OF INFORMATION TECHNOLOGY, ENGINEERING AND THE  
ENVIRONMENT

School OF Geoinformatics, Planning and Building  
Semester 1, 1999

**Geodetic Science 4N : 10218**

Time Allowed : 3 hours + 10 minutes reading time

**General Instructions to Candidates:**

Total Marks = 100

Attempt only FOUR questions. Attempt three (3) questions from Section A and one (1) question from Section B.

Use separate books for each section.

All questions are of equal value.

Please ensure front of answer book is completed with your name, student I.D. number and course.

## SECTION A

### QUESTION 1

- a) Define with the aid of diagrams the following height systems:
- Geopotential numbers
  - Dynamic heights
  - Orthometric heights
  - Helmerts heights
  - Normal heights
  - Heights above the ellipsoid
- b) Discuss their significance, use and where applicable their inter-relationship.

### QUESTION 2

What is a gravity anomaly?

List various types of gravity anomalies and discuss their inter-relationship and possible applications.

### QUESTION 3

Define, with the aid of diagrams where applicable:

- a) The potential at a point P due to an irregular shaped body  
b) Normal potential  
c) Disturbing potential  
d) Normal gravity, and  
e) gravitational force and gravity

Detail the factors, the effects, the values of the terms in b) c) and d) above.

### QUESTION 4

- a) Define the Geoid.  
b) Stokes' Formula may be represented by

$$N = \frac{R}{4\pi G} \iint_{\sigma} \sigma g S(\sigma) d\sigma$$

- i) What is the significance of this formula  
ii) Show a general shape of the function  $S(\sigma)$   
iii) What correction needs to be made if:  
a) the mass of the earth does not equal the mass of the reference ellipsoid.  
b) the potential of the earth does not equal the potential of the reference ellipsoid.  
iv) Show with the aid of diagrams what the effects of ignoring the corrections discussed in iii) above.  
v) Discuss what is meant by the term "co-geoid".

## **SECTION B**

### **QUESTION 1**

Stop and Go Kinematic GPS is commonly used in South Australia for its tertiary control network. Describe :

- a) its concepts;
- b) its methods of initialisation; and
- c) the field collection of kinematic data.

### **QUESTION 2**

- a) Discuss the advantages and disadvantages of Two-height and One-height modes of network adjustments.
- b) GPS positioning gives coordinates in WGS84 geocentric coordinate system. Describe, with the aid of diagrams, its transformation into AGD84.