

UNIVERSITY OF SOUTH AUSTRALIA

FACULTY OF ENGINEERING AND THE ENVIRONMENT

School of Geoinformatics, Planning and Building

Semester 1, 1998

Geodetic Science 4 : 10218

Time Allowed : 3 hours + 10 minutes reading time

General Instructions to Candidates

Total Marks = 100

Attempt ANY 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, course and section of the examination (if applicable).

SECTION A

QUESTION 1

Detail methods of :

1. obtaining the values of gravity within a region; and
2. reducing the observed gravity values to the geoid.

If a value of gravity was observed on the sea floor at a depth D , outline a method of obtaining the equivalent value of gravity on the sea surface (density of sea water is 1.03 g/cm^3).

QUESTION 2

Discuss the various heighting systems used in geodesy giving particular reference, where applicable, to the effects of gravity, datum definition, inter-relationships and applications.

QUESTION 3

Stokes' formula may be used to determine the geoid ellipsoid separation and may be given in the general form :

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

- (a) What assumptions are made in the derivation of this formula ?
- (b) What is the effect of changing the mass or the potential of the reference ellipsoid ?
- (c) To what accuracy is the value of R required if N is required to be calculated to $\pm 5 \text{ cm}$?
- (d) Discuss the types of gravity anomalies that may be used in Stokes' formula.

QUESTION 4

- (a) With the aid of a diagram derive the inter-relationship between the geoid ellipsoid separation and the disturbing potential (Brun's Formula) stating any assumptions made.
- (b) Define the following and discuss their inter-relationships :
 - i) gravitational force;
 - ii) gravity;
 - iii) normal potential;
 - iv) normal gravity;
 - v) geopotential
 - vi) geoid
 - vii) geop; and
 - viii) spherop.

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 method of initialisation; and
- c) field collection of kinematic data.

QUESTION 2

GPS heighting is given in terms of ellipsoidal height above the WGS84 system.

Assuming that the geoid is smooth, describe a geometric method for the determination of orthometric height in an area of up to 30 x 30 km.