

UNIVERSITY OF SOUTH AUSTRALIA

School of Built and Natural Environment

Semester 1, 2004

Geodetic Concepts: GEOE 2009

Time Allowed: 2hours + 10 minutes reading time

GENERAL INSTRUCTIONS TO CANDIDATES:

- **Open Book exam**
- **Calculator required**
- **Total Marks = 100**
- **Attempt all questions, marks are shown in brackets.**

Please ensure front of answer books are completed with your name, student I.D. number course and section of the examination.

ABBREVAITIONS AND CONSTANTS USED IN THIS EXAM

DATUM	ABBREVIATION	SEMI MAJOR AXIS	FLATTENING
Australian Geodetic Datum 1984	AGD84	6378160 metres	1/298.25
World Geodetic System 1984	WGS84	6378137 metres	1/298.257223563
Geocentric Datum of Australia 1994	GDA94	6378137 metres	1/298.257222101

UTM – Universal Transverse Mercator
GRS80 – Geodetic Reference System 1980
MGA94 – Map Grid of Australia 1994
GPS – Global Positioning System

QUESTION 1

(a) In the Australian Map Grid Manual 1984 the distances between successive degrees of latitude are shown as 30.715 metres at the equator and 31.026 at the poles. Explain why these are not the same.

(10)

(c) When quoting eastings and northings in UTM metres it is often necessary to show four decimal places of a metre. Approximately what number of decimal places of a second of arc would this equate to for longitude and latitude in Adelaide, (latitude and longitude of Adelaide approximately 35°S , $138^{\circ} 30'\text{E}$)? Show all calculations.

(10)

QUESTION 2

The radius of curvature on the spheroid is defined by:

- the radius of curvature in the meridian
and
- and the radius of curvature in the prime vertical

Evaluate the radii of curvature in both the meridian and prime vertical at the poles and the equator in terms of **a** (the semi-major axis) and **b** (the semi-minor axis) only. An algebraic solution is required, do not use actual numbers.

(15)

Explain the results you have derived.

(5)

QUESTION 3

The value of scale factor on a Transverse Mercator Grid can be worked out by several methods, each one involving a greater degree of approximation. Show these methods of calculating scale factor and list and explain the variables in each where appropriate.

(25)

QUESTION 4

A surveyor working at Port Pirie connects between successive survey marks that have MGA94 coordinates. As he along a road he finds almost 3 degrees error between his observed bearing along the road and that given by the coordinates from the survey marks. What has happened and how would he overcome this problem?

(15)

QUESTION 5

A local council has asked you for advice on how to convert the coordinates of their assets, held in AMG48 format, into MGA94 coordinates. What methods could you use? Outline the advantages and disadvantages of each method.

(20)