UNIVERSITY OF SOUTH AUSTRALIA

DIVISION OF INFORMATION TECHNOLOGY, ENGINEERING AND THE ENVIRONMENT

School of Geoinformatics, Planning and Building

Semester 1, 1999

Geomatics 1: 10252

Time Allowed **:** 3 hours + 10 minutes reading time

General Instructions to Candidates

Total Marks = 120

Attempt ALL questions.

Marks for questions shown in brackets.

Please ensure front of answer book is completed with your name, student I.D. number, course and section of the examination (if applicable).

QUESTION 1

(a) Define the following levelling terms :

i) backsight;
ii) AHD; and
iii) bench mark. **(6)**

(b) Which is the most commonly used type of levelling instrument? How is it different from the other two types? **(2)**

(c) An automatic level was tested for collimation error by the two peg test. Determine the magnitude and sign of the collimation error from the test data below :

Instrument Position	BS	FS	Remarks
Midpoint of line XY	1.265		X
		1.543	Y
Near X on XY extended	1.184		X
		1.469	Y

The distance XY is 50 metres. **(6)**

(d) How can the effects of collimation error be reduced in field practice? **(2)**

(e) What is a contour, and on a contour plan what is the contour interval? What are contour plans used for? **(4)**

QUESTION 2

(a) Reduce the following levelling observations using the rise and fall method :

BS	IS	FS	Remarks
1.587			TBM2
1.369		1.405	Change point
	-2.024		Underside of bridge
	1.648		A (centreline of road)
1.832		1.460	Change point
	1.156		Natural surface
	-2.603		Overhead pipe
	1.791		B (centreline of road)
1.374		1.865	Change point
		1.429	TBM2

The reduced level of TBM2 is 35.264 m. **(15)**

(b) The coordinates of two points D and E are :

	East	North	RL
D	163.247	108.593	54.385
E	126.607	136.073	54.156

Determine the gradient of the line DE (express the result as both a percentage and a rate) **(5)**

QUESTION 3

(a) Briefly describe the recommended procedures for the determination of both horizontal and vertical angles, including examples of booking and reduction methods. **(10)**

(b) Given that the magnetic declination was 5° 20' East in 1985 (2' East/year), determine the magnetic bearing of a line calculated to be 311° 24' true in 1999. **(4)**

(c) Use the survey information below to compute :

i) the angular misclosure of the traverse; and
ii) the adjusted bearings of the traverse. **(6)**

QUESTION 4

(a) From the following booking sheet of a theodolite/EDM detail survey, determine the horizontal distances and reduced levels of the observations :

At Station	HI	Horizontal Circle	Vertical Circle	Slope Distance	HR	Remarks
M	1.54	114° 28' 30"	85° 14' 50"	59.047	1.82	(1) Edge of path
		312° 11' 40"	98° 07' 10"	86.215	1.73	(2) Natural surface

The reduced level of station M is 74.635 m. **(10)**

(b) Assuming the horizontal circle readings in (a) above are true bearings, determine the coordinates of point (1). The coordinates of station M are E = 232.156, N = 319.805. **(5)**

(c) A grid of reduced levels is shown below. On the line A1-B1, calculate by linear interpolation :

i) the distance from grid point A1 to the 24.5 contour; and
ii) the distance from grid point B1 to the 25.0 contour. **(5)**

QUESTION 5

Use the survey and coordinate information below to calculate :

i) the adjusted bearings of the traverse;
ii) the unadjusted coordinates of all traverse points; and
iii) the linear misclosure and precision of the traverse.

Observed Angles		**Distances**	
A	91° 50’ 15”	AB	213.848
B	110° 02’ 30”	BC	234.176
C	57° 11’ 45”	CD	306.563
D	100° 54’ 50”	DA	152.432

Control Data
Bearing AB = 63° 35’ 30”
Coordinates of point A :
E = 500.000, N = 500.000

(20)

QUESTION 6

(a) From the traverse station coordinates listed below, determine :

i) the bearing and distance of each traverse line; and
ii) the area contained within the figure PQRP (express the result in square metres and hectares).

Station	**East (m)**	**North (m)**
P	193.924	477.825
Q	651.325	763.166
R	897.278	326.284

(15)

(b) i) Give a brief description of the three (3) individual components of the GPS system.
ii) List two (2) possible applications of GPS in land surveying.

(5)