

REPUBLIC OF SOUTH AFRICA

DEPARTMENT OF MINERALS AND ENERGY

EXAMINATION FOR THE MINE SURVEYOR'S CERTIFICATE OF  
COMPETENCY

DATE: 13 October 2005 (Thursday)  
TIME: 8:30 – 11:30 (3 Hours)

TOTAL MARKS: 100  
TO PASS: 50

SURVEY 1

- Note:
- (1) The make and model number of your calculator must be shown on the front cover of your answer book.
  - (2) Intermediate results need not be shown.

QUESTION 1

A tacheometer was set up over a benchmark P and the following observations taken to a station Q:

	Height of Inst. (metres)	Vertical Angle	Reading on Staff (metres)
Stadia method:	1.463	+8°46'00"	1.701
			1.463
			1.225
Tangential method	1.463	+11°45'00" +8°06'10"	3.964
			0.912

Given:

Elevation of benchmark P = 1 134.373 metres A.M.S.L  
The multiplying constant of Instrument = 100.000  
The additive constant of the Instrument = Nil

Calculate by both the stadia and tangential methods, the horizontal distance from P to Q and the elevation of the station Q.

[20 marks]

### QUESTION 2

Define the following terms:-

- (a) Magnetic North
- (b) Magnetic Meridian
- (c) Magnetic Declination
- (d) Isogonic Lines
- (e) Agonic Lines

[10 marks]

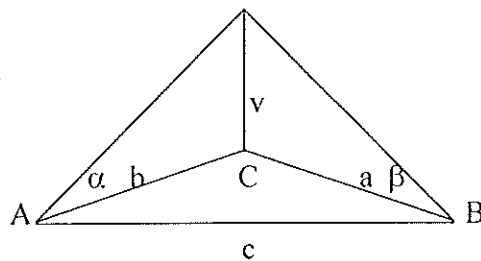
### QUESTION 3

The tonnage from two vertical shafts, each 2 994 m, one 9 m diameter circular and the other 15 x 4 m rectangular, is to be dumped on a rectangular piece of ground 600 m x 600 m in the form of a truncated cone with a circular base.

Assuming both the top and bottom of the dump to be level and the angle of repose  $35^\circ$ , what will be the ultimate height of the dump if the proportion of in situ to broken rock is 3:5?

[20 marks]

### QUESTION 4



Given :  $C = 80^\circ$   
 $\alpha = 48^\circ$   
 $\beta = 53^\circ$   
Distance AB = 300 m

Calculate the height (v).

[15 marks]

QUESTION 5

The following is an extract from a direction sheet of a traverse with a closure between two beacons.

Direction P5-A: 343° 12' 20" distance 240.730m  
 Direction A-B: 340° 18' 40" distance 351.770m  
 Direction B-C: 338° 35' 30" distance 373.440m  
 Direction C-D: 339° 18' 30" distance 290.860m  
 Direction D-E: 341° 47' 10" distance 311.240m  
 Direction E-P6: 344° 19' 50" distance 333.410m  
 Direction P6-P7: 343° 37' 30"

From original survey direction P7-P6 = 163° 34' 30"

Co-ordinates P5 = - 964.87      + 927.37  
 Co-ordinates P6 = -1 578.76      +2 725.59

Calculate the adjusted co-ordinates of all points in the above traverse

[17marks]

QUESTION 6

The following leveling observations were taken over a ground through which a furrow 3.0m wide with vertical sides had to be cut. The furrow is to slope at an even gradient, between the stations A and B.

Calculate the gradient of the furrow and the total volume to be excavated.

Station	B/S	I/S	F/S	Elevation	Distance from A
A	1.450			+217.350	Nil
1		1.910			60
2		2.160			120
3	1.520		2.780		180
4		1.715			240
5		2.085			300
6	1.050		2.710		360
7		1.710			420
8		1.970			480
B			2.980		534

[18 marks]

[100 marks]