

**REPUBLIC OF SOUTH AFRICA  
DEPARTMENT OF MINERALS AND ENERGY  
EXAMINATION FOR THE MINE SURVEYORS CERTIFICATE OF COMPETENCY**

DATE: 12 OCTOBER 2006 (Thursday)  
TIME: 8:30 to 11:30 (3 Hours)

TOTAL MARKS: 100  
TO PASS: 50

**SURVEY I**

- Note:**
- (1) Work to 1 second of arc and 0,001m except where stated otherwise.
  - (2) All steps and checks must be shown.
  - (3) Logs and functions must be shown to six (6) decimal places.
  - (4) Sketches are not drawn to scale.
  - (5) The make and model number of your calculator **must** be written on the front cover of your answer book.

**QUESTION 1**

- a) Name and describe the four different types of levelling instruments.
- b) With the help of notes and sketches describe how you would adjust a level

[15 marks]

**QUESTION 2**

- a) You have to measure a survey line approximately 250,000 metres long. You are supplied with a steel tape 60 metres long. A high degree of accuracy is essential. The terrain is generally level but has a number of irregular hollows along the line. Describe in detail what precautions you would take to obtain an accurate measurement of the base line.
- b) The sides of a rectangular field were measured as 100,000 m, and 65,000 m, using a 60 metre tape which was subsequently found to have the first 0,235 m missing and to be 0,5 % too short. What is the correct area?
- c) You have to establish a peg B exactly 200,000m from peg A using a 100 metre steel tape which is standardised at 20°. The temperature during the time of measurement is 30°. If the correct linear C.O.E (co-efficient of expansion) of the steel tape is 0,000012 per degree Celsius, calculate the measurement which must be recorded by the steel tape under these conditions to establish peg B from A.

[16 marks]

### QUESTION 3

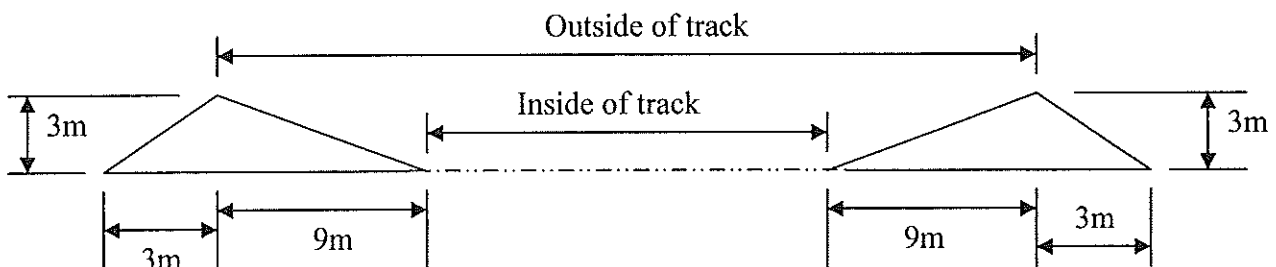
- Sketch a Coradi planimeter and name the parts thereof.
- A planimeter was used to measure the area of a circle having a radius of 50 mm. A reading of 1,879 revolutions was obtained. Using the same planimeter with the same setting, the area of an irregular figure drawn on a plan to a scale of 1: 100 was traced. If the reading obtained was 5,637 revolutions, calculate the area of the irregular figure represented by the drawing. Answer to the nearest square metre.
- A planimeter was used to obtain the area of a circle 20 cm in diameter. If the reading obtained was 5,236 revolutions, what was the setting in square centimetres of the planimeter.

[18 marks]

### QUESTION 4

A circular track is laid out on level ground. The inside circumference is 400m and the sides slope 1 to 3 on the track and 1 to 1 towards the outside of the bank. The base of the bank is 12m wide.

Sketch not to scale



Calculate the contents in  $m^3$  of the bank.

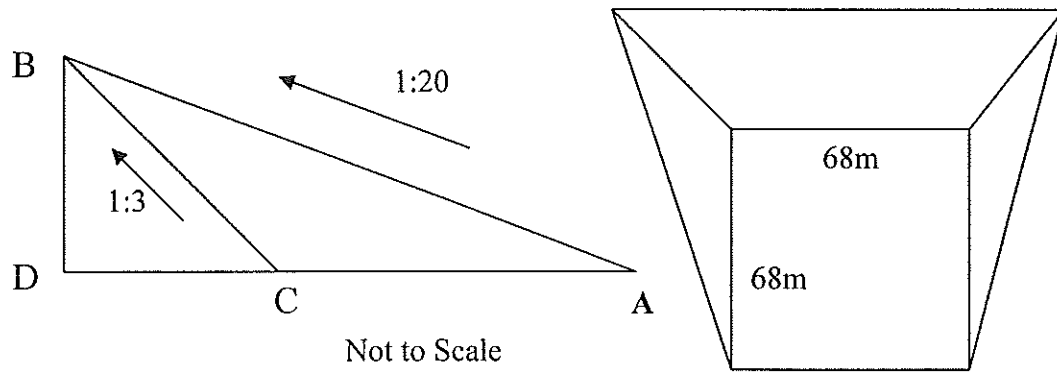
[12 marks]

### QUESTION 5

- What does WGS84 stand for?
- Describe what is WGS84 and why was there a need for it?

[15 marks]

**QUESTION 6**

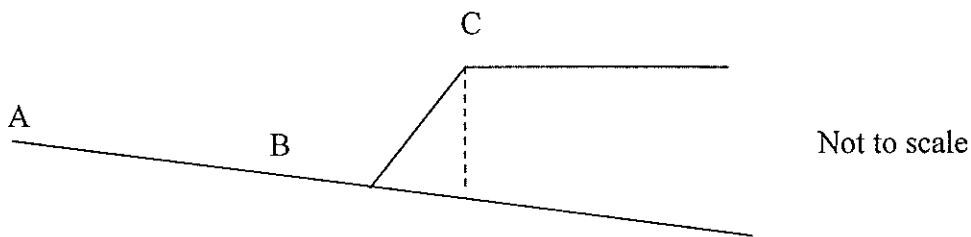


An excavation needs to be made for the foundation of a building on ground, the surface of which slopes evenly at a grade of 1:20. The required excavation must have a level bottom of 68m square with side and back slopes of 1:3.

Calculate the volume of the excavation

[12 marks]

**QUESTION 7**



An instrument was set up at point A on the ground and the vertical angle taken to point C on top of a dump. The telescope was then depressed and a mark B established on the ground in line with A and C. The vertical angle and the stadia readings were observed from A to B. At B the vertical angle was taken to C.

Data,		
Multiplying constant of instrument	=	100
Additive constant of instrument	=	Nil
Elevation at point A	=	1 712,801 m AMSL
Height of instrument at both A and B	=	1,372 metres

Instrument at A:		
Vertical angle to C	=	+ 8:10:00
Vertical angle to B	=	- 7:00:00
Stadia readings to B	=	2,387 and 0,357

Instrument at B:		
Vertical angle to C	=	+ 36:20:00

Assuming the slope of the ground from A to B to continue to vertically below C, and given the data above,

Calculate,

- a) The elevation of point C
- b) The vertical depth of the dump below C.

[12 marks]

[Total 100 marks]