



# higher education & training

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Department:  
Higher Education and Training  
**REPUBLIC OF SOUTH AFRICA**

T140(E)(A7)T  
**APRIL EXAMINATION**

**NATIONAL CERTIFICATE**

**BUILDING AND STRUCTURAL SURVEYING N6**

(8060056)

**7 April 2016 (X-Paper)**  
**09:00–12:00**

**Calculators may be used.**

**This question paper consists of 4 pages, 1 formula sheet and 3 addenda.**

**DEPARTMENT OF HIGHER EDUCATION AND TRAINING**  
**REPUBLIC OF SOUTH AFRICA**  
NATIONAL CERTIFICATE  
BUILDING AND STRUCTURAL SURVEYING N6  
TIME: 3 HOURS  
MARKS: 100

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**INSTRUCTIONS AND INFORMATION**

1. Answer ALL the questions.
  2. Read ALL the questions carefully.
  3. Number the answers according to the numbering system used in this question paper.
  4. ALL the diagrams, sketches and drawings should be large, in good proportion, fully and clearly labelled and done in pencil.
  5. ALL ADDENDA should be handed in with the ANSWER BOOK. Remember to write your examination number on ALL ADDENDA.
  6. Write neatly and legibly.
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**QUESTION 1**

- 1.1 Briefly explain when a temporary adjustment of a theodolite has to be done. (2)
- 1.2 State the THREE procedures required during the temporary adjustment of the theodolite. (3)
- 1.3 Combine the following circle-left and circle-right horizontal angle observations which were taken from P1 and find the oriented directions P1-A and P1-C.

Use the coordinates of P1 and B.

At P1		
	Circle-left	Circle-right
A	168:32:38	348:32:22
B	250:28:16	70:27:54
C	92:54:44	272:54:10
A	168:32:16	348:32:08

Coordinates		
P1	- 1 831,48	+ 2 091,09
B	- 2 711,22	+ 2 876,55

(10)  
[15]

**QUESTION 2**

- 2.1 Complete the tacheometric fieldbook page on ADDENDUM 1 (attached). (15)
- 2.2 Calculate the horizontal distance from B to K in the ANSWER BOOK. (5)  
[20]

**QUESTION 3**

- 3.1 Calculate the coordinates of P2, P3 and P4 on ADDENDUM 2 (attached). Adjustments must be made according to the Bowditch rule. (20)
- 3.2 Plot the coordinates of P1, P2, P3, P4 and P5 to scale 1 : 5 000 in the ANSWER BOOK.
- Clearly show the direction of true north. (8)

[28]

**QUESTION 4**

4.1 Plot the cutting and embankment line on ADDENDUM 3 (attached) if the area within the solid lines (A B C D) is to be brought to a formation level of 32 m.

The side slope is 1 : 1,5 (1 vertical). (10)

4.2 Explain how a planimeter is used to find the area of an irregular figure. (8)  
**[18]**

**QUESTION 5**

A road curve is to be staked out from the beginning of the curve (B.C.) to the end of the curve (E.C.).

The radius is 200,20 m.

The angle of intersection ( $\Delta$ ) is 43:54:08.

The chainage at the end of the curve is 3 466,32 m.

The curve is to the left.

Pegs are required at every FULL 20 m chainage.

5.1 Calculate and tabulate the full setting-out data from B.C. to E.C. (15)

5.2 Calculate the chainage at the interception point. (4)  
**[19]**

**TOTAL: 100**

**BUILDING AND STRUCTURAL SURVEYING N6****FORMULA SHEET**

Any applicable formula may also be used.

$$\alpha = \tan^{-1} \frac{\Delta y}{\Delta x}$$

$$\alpha = \tan^{-1} \frac{\Delta x}{\Delta y} + 90^\circ$$

$$\alpha = \tan^{-1} \frac{\Delta y}{\Delta x} + 180^\circ$$

$$\alpha = \tan^{-1} \frac{\Delta x}{\Delta y} + 270^\circ$$

$$S = \frac{\Delta y}{\sin \alpha}$$

$$S = \frac{\Delta x}{\cos \alpha}$$

$$\Delta y = s \cdot \sin \alpha$$

$$\Delta x = s \cdot \cos \alpha$$

$$C = \frac{\text{Distance}}{\text{Total distance}} X_1$$

$$\Delta h = 50I \sin 2\theta + HI - MH = 100I \sin \theta \cos \theta + HI - MH$$

$$HD = 100I \cos^2 \theta$$

$$T = R \cdot \tan \frac{\Delta}{2}$$

$$La = \frac{\pi \cdot \Delta \cdot R}{180}$$

$$g = \frac{1718,9 \cdot a}{R}$$

$$Cd = T \cdot \tan \frac{\Delta}{4}$$

$$Lc = 2 \cdot R \cdot \sin \frac{\Delta}{2}$$

$$W_1 = \frac{g(a + hs)}{g - s}$$

$$W_2 = \frac{g(a + hs)}{g + s}$$

$$A = \frac{W_1 \cdot W_2 - a^2}{s}$$

$$a^2 = b^2 + c^2 - 2bc \cdot \cos A$$

$$b^2 = a^2 + c^2 - 2ac \cdot \cos B$$

$$c^2 = a^2 + b^2 - 2ab \cdot \cos C$$

$$\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$$