



# education

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Department:  
Education  
**REPUBLIC OF SOUTH AFRICA**

**T180(E)(M26)T  
APRIL 2010**

**NATIONAL CERTIFICATE**

**BUILDING AND STRUCTURAL SURVEYING N5**

**(8060045)**

**26 March (X-Paper)  
09:00 – 12:00**

**NO programmable calculators may be used.**

**This question paper consists of 5 pages, a 1-page formula sheet and an answer sheet.**

**DEPARTMENT OF EDUCATION  
REPUBLIC OF SOUTH AFRICA  
NATIONAL CERTIFICATE  
BUILDING AND STRUCTURAL SURVEYING N5  
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 correctly according to the numbering system used in this question paper.
  4. Follow ALL the given instructions in the question paper.
  5. Sketches should be neatly and clearly labelled.
  6. Your understanding of the subject is what is important NOT reproduction of the study material.
  7. Start each question on a NEW page.
  8. Write neatly and legibly.
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**QUESTION 1**

Choose the correct word(s) from those given in brackets. Write only the word(s) next to the question number (1.1 – 1.5) in the ANSWER BOOK.

- 1.1 Instrument is a common site name given to any (surveying instrument on a tripod/hand-held instrument/type of tape measure). (2)
  - 1.2 A traveller is mainly used to (control an excavation/pipe laying/water mains hydraulic pressure). (2)
  - 1.3 One of the basic requirements when setting up a levelling instrument is to (adjust the circular bubble to be in its centre/make sure that the tripod feet are not firmly forced on the ground/the top of the tripod is sloping gently). (2)
  - 1.4 A theodolite can be used to set out (vertical angles/horizontal angles/levelling/all three). (2)
  - 1.5 Errors are classified as (gross errors/systematic errors/accidental errors/all three). (2)
- [10]**

**QUESTION 2**

Indicate whether the following statements are TRUE or FALSE. Choose the answer and write only 'true' or 'false' next to the question number (2.1 – 2.5) in the ANSWER BOOK.

- 2.1 Plane survey covers a relatively small area to the extent that the curvature of the earth is ignored. (2)
  - 2.2 Setting out is placing of pegs in the ground to mark out limits for a structure, foundation, road earthwork and road final levels. (2)
  - 2.3 Angular measurement is a horizontal or vertical measurement in degrees, minutes and seconds between two points from a third point. (2)
  - 2.4 An alternative term for a chainage is survey station. (2)
  - 2.5 A surveyor should be a registered professional. (2)
- [10]**

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**QUESTION 3**

Briefly explain the following terms used in surveying:

- |     |                 |             |
|-----|-----------------|-------------|
| 3.1 | Plan            | (3)         |
| 3.2 | Scale           | (3)         |
| 3.3 | Booking         | (3)         |
| 3.4 | Plane surveying | (3)         |
| 3.5 | Staking         | (3)         |
|     |                 | <b>[15]</b> |

**QUESTION 4**

- |     |  |             |
|-----|--|-------------|
| 4.1 | Reduce the levelling information in TABLE 1 (ANNEXURE A attached) to obtain elevation of points A, B, C, D, E and F using the rise and fall method. Do the necessary checking for error (DO NOT DO ANY CORRECTIONS). Do ALL the calculations in TABLE 1 and submit it with your ANSWER BOOK. | (15)        |
| 4.2 | Explain how you would set-out a rectangular site along a road if the road is used as a reference on the site plan.   | (10)        |
|     |  | <b>[25]</b> |

**QUESTION 5**

- |     |   |             |
|-----|---|-------------|
| 5.1 | Draw the surveying co-ordinate system diagram showing the 'X' and 'Y' axis, direction and bearings.   | (6)         |
| 5.2 | State any TWO practical uses of contours.   | (4)         |
| 5.3 | State FIVE general requirements for accurate taping.  | (10)        |
| 5.4 | A line 'A' measures 5 cm from a datum line on a vertical section of scale 1:20. A second line 'B' measures 6 cm from the same datum on the same vertical scale. The two lines are 20 cm apart on a horizontal scale of 1:100. Determine the gradient between A and B as a ratio and a percentage (%). | (5)         |
|     |   | <b>[25]</b> |

**QUESTION 6**

- |     |  |     |
|-----|--|-----|
| 6.1 | The standard temperature of a tape is 16 degrees Celcius and the coefficient of expansion is $0,00012/^{\circ}\text{C}$ . What is the reduced horizontal distance if the measured distance is 348 m in a slope of $5^{\circ}50'$ and a temperature of $32^{\circ}\text{C}$ ? | (5) |
|-----|--|-----|

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6.2 Given the co-ordinates:

C -1056,48      +310769,26  
D -9677,96      +369542,77

Calculate the orientated distance between C and D.

(10)  
[15]

TOTAL: 100

**BUILDING AND STRUCTURAL SURVEYING N5****FORMULA SHEET**

Any applicable formula may be used.

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

Or

$$V = -KS \cos \theta \sin \theta$$

$$HD = 100 / \cos^2 \theta \text{ of } K S \cos \theta$$

$$Ct = L.e.(Tm-Ts), Ct = L.e.(Tm-Ts) \text{ of } L[1+e(Tm-Ts)]$$

$$Cs = L. (1-\cos \theta)$$

$$Cs = H (\sec \theta - 1)$$

$$Ce = L.H/R$$

$$\text{Slope} = \Delta h / HD$$

$$V = d/3 [(y_1 + y_n) + 2(y_3 + y_5 + \dots + y_{n-2}) + 4(y_2 + y_4 + \dots + y_{n-1})]$$

ANNEXURE A

EXAMINATION NUMBER:

TABLE 1

| POINT | BACK<br>SIGHT | INTER<br>SIGHT | FORE<br>SIGHT | RISE | FALL | REDUCED<br>LEVEL | REMARKS       |
|-------|---------------|----------------|---------------|------|------|------------------|---------------|
| A     | 1,320         |                |               |      |      |                  | TBM<br>28,965 |
| B     | 1,360         |                | 1,332         |      |      |                  |               |
| C     |               | 1,233          |               |      |      |                  |               |
| D     | 2,145         |                | 1,113         |      |      |                  |               |
| E     | 2,165         |                | 2,652         |      |      |                  |               |
| F     |               |                | 2,536         |      |      |                  | TBM<br>28,311 |
|       |               |                |               |      |      |                  |               |
|       |               |                |               |      |      |                  |               |