



**higher education
& training**

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE

BUILDING AND STRUCTURAL SURVEYING N5

(8060045)

**16 April 2021 (X-paper)
09:00–12:00**

Calculators may be used.

This question paper consists of 4 pages, 1 addendum and 1 formula sheet.

197Q1A2116



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BUILDING AND STRUCTURAL SURVEYING N5
TIME: 3 HOURS
MARKS: 100

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. Start each section on a new page.
 5. Use only a black or blue pen.
 6. Write neatly and legibly.
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SECTION A**QUESTION 1**

Indicate whether the following statements are TRUE or FALSE by writing only 'True' or 'False' next to the question number (1.1–1.10) in the ANSWER BOOK. Give ONE reason for each answer.

- 1.1 Never leave the instrument standing on a tripod for over one minute. 
- 1.2 The chainman can manipulate the instrument when necessary.
- 1.3 During transportation, it is safe to subject the instrument to a minimum of rock shock.
- 1.4 Treat the instruments with respect by ensuring clamps are overtightened.
- 1.5 When it is necessary to carry the instrument on a tripod, keep it as horizontal as possible.
- 1.6 Protect the instrument from rain and dust and if unavoidable wipe it with a soft dry cloth.
- 1.7 At least once a month, clean all exposed instrument parts including lenses with a soft cloth, slightly damped with light oil.
- 1.8 Occasionally polish all exposed parts, including lenses and screw threads with a good quality wax polish. 
- 1.9 At the first signs of growth, send the instrument for thorough cleaning.
- 1.10 Try never to touch the lenses, clean them only with the soft brush provided for this purpose.

(10 × 2)

[20]**QUESTION 2**

Complete the following paragraph by writing only the missing word next to the question number (2.1–2.10) in the ANSWER BOOK.

The position of a point can be (2.1) ... when it is known how far that point is from one or more given points, so that the place of the first point, if lost, can be found again by repeating the (2.2) ... in the opposite direction.

The (2.3) ... which are to be determined in surveying are not mathematical points treated of in geometry, but the (2.4) ... of fences, beacons and the like, which are mere points in comparison with the extensive (2.5) ... and (2.6) ... which they are the means of determining.

The determination of the relative (2.7) ... of points is all that is necessary for the principle objects of surveying. The position of a point may be determined by a variety of (2.8) ... In most types of surveying, the ruling principle is to 'work from the (2.9) ... to the (2.10) ...'




(10 × 1)

[10]

QUESTION 3

Briefly explain the following terms used in surveying:

- 3.1 Precision
- 3.2 Accuracy 
- 3.3 Coordinates
- 3.4 A grid
- 3.5 Systematic error

(5 × 3)

[15]**TOTAL SECTION A: 45****SECTION B****QUESTION 4**

- 4.1 The direction to a certain point is supposedly known as $215^{\circ} 37' 2''$. In order to orient the theodolite, it must be so manipulated that this value is read when the point is sighted.

Explain systematically the method of setting the direction to orientate the instrument.

(12)

- 4.2 A square plot has an area of 16 m^2 . The land is to be represented on a plan of 1:500.

Find the length of one side in millimetres.



(8)

- 4.3 A rectangular site has been set out on a sloping ground surface. As a site surveyor you are required to put profiles for excavation to level the site.

Explain the sequence of transferring your formation levels onto the profiles if you take the length of the traveller into consideration.

(5 × 2)

(10)

- 4.4 Calculate the orientated distance between A and B, given the following coordinates:

A - 1 065,84 + 310 796,62

B - 9 677,69 + 369 524,77

(10)

[40]**QUESTION 5**

In the TABLE on the ADDENDUM (attached) the data is given for a levelling task with a bench mark (TBM) at A, used as the point of reference.

Use the given data to find the level of ALL points on which readings were taken using the RISE and FALL method. Do ALL the calculations in the TABLE, write your EXAMINATION NUMBER on the ADDENDUM and hand it in with the ANSWER BOOK. DO NOT DO CORRECTIONS.

[15]

TOTAL SECTION B: 55
GRAND TOTAL: 100

ADDENDUM

EXAMINATION NUMBER:

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TABLE

POINT	BACK-SIGHT	INTER-SIGHT	FORE-SIGHT	RISE	FALL	REDUSED LEVEL	REMARKS
A	0.15						TBM 40.60
B	1.63		1.30				
C		1.20					
D	1.69		1.43				
E	2.35		1.43				
F			1.10				

BUILDING AND STRUCTURAL SURVEYING N5

FORMULA SHEET

Any applicable formula may be used.

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

OR

$$V^3 = -KS \cos \theta \sin \theta$$

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

$$C_t = L.e.(T_m - T_s), C_t = L.e(T_m - T_s) \text{ of } L[1 + e(T_m - T_s)]$$

$$C_T = \frac{w^2 L^3}{24.T^2}$$

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

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

$$Ce = \frac{L.H}{R}$$

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

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