



higher education
& training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

T170(E)(M28)T

NATIONAL CERTIFICATE

BUILDING AND STRUCTURAL SURVEYING N5

(8060045)

28 March 2019 (X-Paper)
09:00–12:00

Nonprogrammable calculators may be used.

This question paper consists of 6 pages, 1 addendum and 1 formula sheet.

DEPARTMENT OF HIGHER EDUCATION AND TRAINING
REPUBLIC OF SOUTH AFRICA
NATIONAL CERTIFICATE
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. Write neatly and legibly.
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QUESTION 1

- 1.1 Choose a term from COLUMN B that matches a description in COLUMN A. Write only the letter (A–F) next to the question number (1.1.1–1.1.5) in the ANSWER BOOK.

COLUMN A		COLUMN B	
1.1.1	Booking	A	placing pegs in the ground to define the position of the survey station
1.1.2	Staking	B	covering a small area to ignore the curvature of the earth
1.1.3	Plan	C	entering measurements in a field book
1.1.4	Scale	D	proportional representation on paper of the actual dimension of a distance on the ground
1.1.5	Plane surveying	E	true scale representation to display accurate detailed information
		F	horizontal or vertical measurement between two points in degrees, minutes and seconds

(5 × 1)

(5)

- 1.2 Indicate whether the following statements are TRUE or FALSE. Choose the answer and write only 'True' or 'False' next to the question number (1.2.1–1.2.5) in the ANSWER BOOK.

- 1.2.1 A surveyor should be a registered professional.
- 1.2.2 An alternative term for chainage is 'survey station'.
- 1.2.3 Setting out refers to the placing of pegs in the ground to mark out limits for a structure.
- 1.2.4 A plumb bob is used for all levelling work in geodetic survey.
- 1.2.5 An optical square is a hand-held instrument used to set out right angles.

(5 × 1)

(5)

1.3 Various options are given as possible answers to the following statements. Choose the answer and write only the letter (A–D) next to the question number (1.3.1–1.3.5) in the ANSWER BOOK.

1.3.1 A distometer is used together with a ...

- A dumpy level.
- B theodolite.
- C clinometer.
- D compass.

1.3.2 A trig beacon is the highest point of ...

- A a known point above sea level.
- B known coordinates.
- C an area.
- D All of the above

1.3.3 The main purpose of using a traveller is to ...

- A have a uniform depth of excavation.
- B have a slightly slanting excavation.
- C lay the required bedding.
- D measure the width of an excavation.

1.3.4 A traveller/boning rod is made to form a ...

- A T.
- B H.
- C S.
- D L.

1.3.5 A plumb bob is mainly used to set out a true vertical to a point on ...

- A the ground.
- B a peg.
- C a benchmark.
- D All of the above

(5 × 2) (10)
[20]

QUESTION 2

State the use for each of the following survey instruments:

- 2.1 Boning rod
- 2.2 Abney level
- 2.3 Staff
- 2.4 Tripod
- 2.5 Theodolite

(5 × 2) **[10]**

QUESTION 3

- 3.1 A line P measures 5 cm from a datum line on a vertical section of a scale 1:20. A second line J 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.

Find the gradient between P and J as a ratio and a percentage. (5)

- 3.2 State FIVE general requirements for accurate taping. (5)

- 3.3 Give TWO practical uses of contours. (2 × 2) (4)

- 3.4 Explain how step chaining is conducted on-site. (5)

- 3.5 Explain the basic steps in setting up a levelling instrument. (6)

[25]

QUESTION 4

- 4.1 Explain how to set out a rectangular site along a road if the road is used as a reference on a site plan. (5 × 2) (10)

- 4.2 Explain how dips are taken in a crossroad when cutting the final levels with a grader. (5)

[15]

QUESTION 5

5.1 The coordinates of point A and B are as follows:

A	+10148,250	+10156,324
B	+10000,00	+10000,00

Calculate the direction and distance AB. Any correct method is acceptable as long as it will give the correct answers.

(15)

5.2 Reduce the levelling information given in the TABLE on the ADDENDUM (attached) to obtain the elevations of points A, B, C, D, E and F using the rise-and-fall method. Do the necessary error checking (do NOT make any corrections). Do ALL calculations on the ADDENDUM and submit it.

(15)

[30]

TOTAL: 100

ADDENDUM

EXAMINATION NUMBER:

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TABLE

POINT	BACK SIGHT	INTERMEDIATE SIGHT	FORESIGHT	RISE	FALL	REDUCED LEVEL	REMARKS
A	2,300						TBM 34,723
B	2,545		2,332				
C	2,754		2,233				
D		2,264					
E	2,936		2,342				
F			2,342				TBM 36,002

FORMULA SHEET

Any applicable formula may be used.

$$\Delta h = 50I \sin 2\theta + HI - MH = 100I \sin \theta \cos \theta + HI - MH \quad \text{OR} \quad V = -KS \cos \theta \sin \theta$$

$$HD = 100I \cos^2 \theta \quad \text{OR} \quad KS \cos \theta$$

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

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

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

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

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

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

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

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

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

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

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