higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE

BUILDING AND STRUCTURAL SURVEYING N5

(8060045)

15 November 2022 (X-paper)
09:00–12:00

Nonprogrammable calculators may be used.

This question paper consists of 7 pages, 2 addenda and 1 formula sheet.

014Q1E2215

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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. Start each section on a new page.
5. Use only a blue or black 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.

1.1 A surveyor should be a registered professional with relevant qualities.

1.2 Setting out is the placing of pegs in the ground to mark out limits for a structure.

1.3 Bearings cannot be obtained to a greater accuracy than 5' or 10'.

1.4 A plane survey covers a relatively small area to the extent that the curvature of the earth is ignored.

1.5 At all times, more than one additional known point must be sighted to check the orientation setting.

1.6 Try to keep lines of sight close to the ground to minimise the effects of irregular refraction.

1.7 For close work, such as traversing and setting out, a ranging rod is better than a tacheometric staff.

1.8 Always orient on the closest possible points, consistent with good visibility.

1.9 Always orient on an object that can be sighted with the most accuracy.

1.10 Whenever possible, make a small mark on the top of the peg.

(10 × 1) **[10]**

QUESTION 2

Choose a term from COLUMN B that matches a description in COLUMN A. Write only the letter (A–L) next to the question number (2.1–2.10) in the ANSWER BOOK.

COLUMN A		COLUMN B	
2.1	Employed principally for large-scale details that are geometrically regular	A	reconnaissance
2.2	May be used as temporary signals to indicate the location of points	B	traverse survey
2.3	Used for short-distance measurements, but not for accurate work	C	levelling
2.4	Short perpendicular measurements from a straight line to detail features near the line	D	flag poles
2.5	Examination of the area to be surveyed before taking measurements	E	vertical line
2.6	The location of a point by measuring distance and angles	F	chain surveying
2.7	Operation of determining the differences in height of points on the surface of the earth	G	metallic tapes
2.8	Representation of the surface features of the earth onto a plane surface to a small scale	H	map
2.9	Representation of features onto a horizontal plane surface to a large scale	I	offsets
2.10	When several points have to be levelled from one setup	J	area levelling
		K	plan
		L	reduced level

(10 × 2) **[20]**

QUESTION 3

Complete the following sentences by writing only the missing word or words next to the question number (3.1–3.6) in the ANSWER BOOK.

Suppose it is known that the direction to a certain point is 215° 37’ 20”. In order to orient the instrument, it must be so manipulated that this value is read when the point is sighted. The following refers to orientation of the theodolite:

3.1 Loosen both plate clamps and … the lower plate until the reading approximates 215° 37’ 20”.

3.2 … the upper clamp and, by means of the upper-plate tangent screw, set the reading to exactly 215° 37’ 20”.

3.3 With the lower-plate clamp still loose, … the instrument until the chosen object comes into the field of view of the telescope.

3.4 Tighten the lower-plate clamp and, by means of the lower-plate tangent screw, set the vertical … so that it bisects the object.

3.5 Check that the reading is still …

3.6 ... the upper plate clamp, and do not touch the lower-plate clamp or the tangent screw again.

(6 × 2) **[12]**

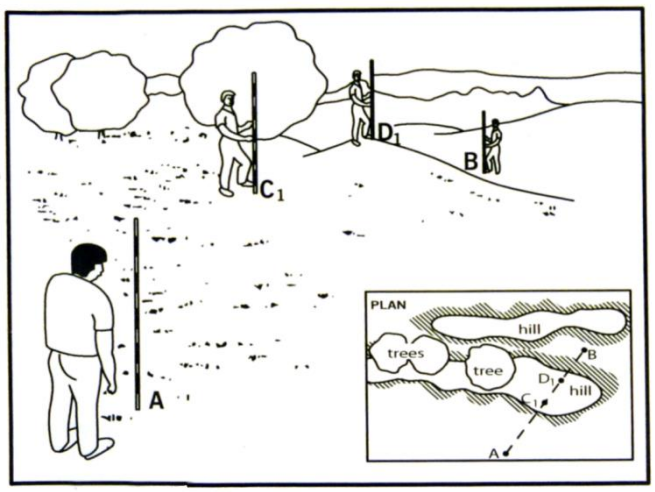
TOTAL SECTION A: 42

SECTION B

QUESTION 4

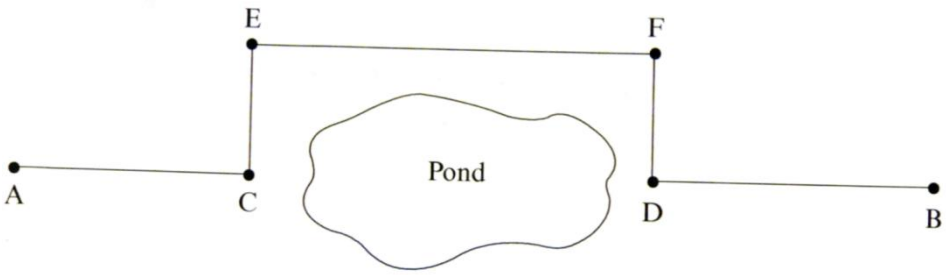
4.1 Look at the two pictures below and explain in detail how to obtain a straight line between points A and B in each case.

4.1.1



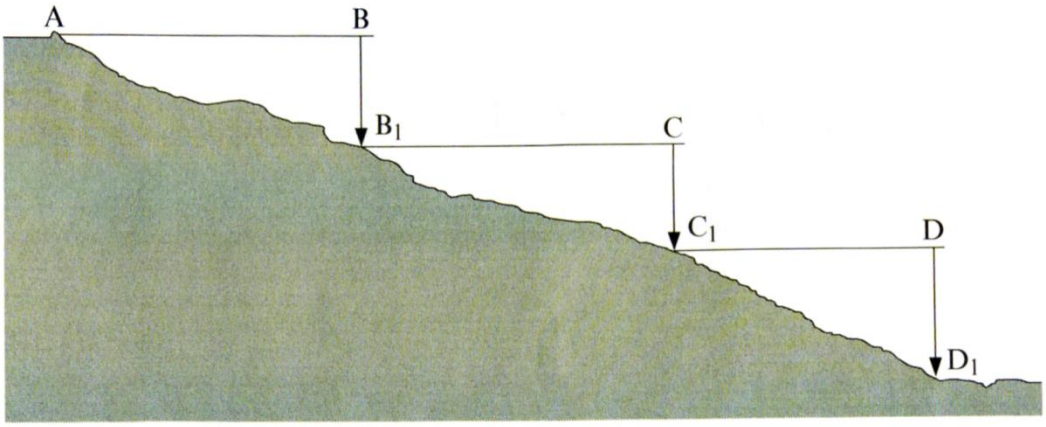
(5)

4.1.2



(5)

4.2 Explain in detail how to obtain a straight line between A and D1 in the picture below.



(11)
[21]

QUESTION 5

ADDENDUM B (attached) is of a longitudinal section of a pipeline. Use the information from the drawing to answer the following questions:

5.1	Calculate the length of piping required between points A and B and points B and C.	(15)
5.2	Calculate the slope as a percentage of the pipeline between points A and B and points B and C.	(10)
5.3	Field notes were taken during a levelling survey, as indicated on ADDENDUM A. Reduce the readings using the rise and fall method. Write your answers on the table in ADDENDUM A.	(12)
		[37]

TOTAL SECTION B: 58
GRAND TOTAL: 100

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ANNEXURE A

EXAMINATION NUMBER	

POINT	BACK SIGHT	INTERMEDIATE SITE	FORE SIGHT	RISE	FALL	REDUCED LEVEL	REMARKS
A	2.310						BM 1306.90
B	2.054		3.532				
C	2.694		3.502				
D		3.654					
E	3.536		3.452				
F			2.554				

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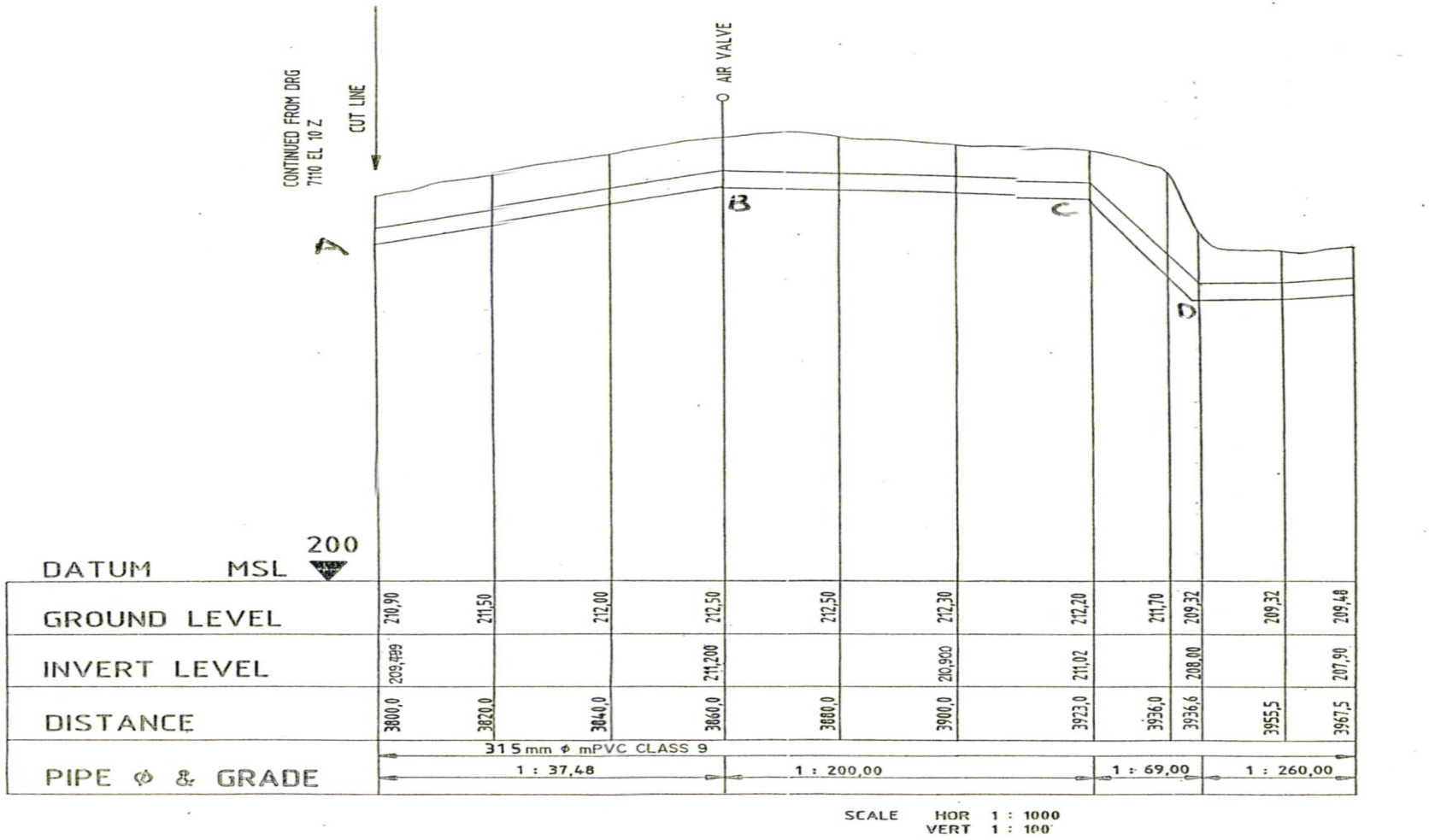
ADDENDUM B



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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

3

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

$HD = 100/\cos^2\Theta$ of $KS\cos\Theta$

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

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

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

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

$Ce = {}^{L.H}/_{R}$

$Slope = {}^{\Delta h}/_{HD}$

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

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