higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

T180**(E)**(A1)T

NATIONAL CERTIFICATE

BUILDING AND STRUCTURAL SURVEYING N6

(8060056)

1 August 2019 (X-Paper)
09:00–12:00

Calculators may be used.

This question paper consists of 5 pages, 2 answer sheets, 1 diagram sheet and 1 formula sheet.

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DEPARTMENT OF HIGHER EDUCATION AND TRAINING
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE
BUILDING AND STRUCTURAL SURVEYING N6
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. Sketches should be neat and clearly labelled.
5. Start each question on a NEW page.
6. Write neatly and legibly.

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QUESTION 1

Define each of the following terms:

1.1 Foresight

1.2 Level line

1.3 Invert level

1.4 Chainage

1.5 Agonic lines

(5 × 2) **[10]**

QUESTION 2

Combine the following circle-left and circle-right horizontal angle observations which were taken from T1 and find the oriented directions T1 – B1 and T1 – B3. Use the coordinates of T1 and B2.

At T1:

	Circle left	**Circle right**
B1	300:42:16	120:41:32
B2	71:43:04	251:42:24
B3	169:39:22	349:38:52
B1	300:42:04	120:41:56

Coordinates:

T1	-2 562,56	+3 862,12
B2	-2 991,62	+3 012,34

[10]

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QUESTION 3

Given the following data:

Coordinates:

L: +1 882,96; +1 282,85
M: +1 082,60; +1 154,27

Line	Direction	Distance (m)
L-N1	278:33:21	258,87
N1-N2	309:04:15	152,56
N2-N3	252:34:23	250,50
N3-M	224:31:47	265,24

Use ANSWER SHEET 1 (attached) to do the necessary calculations to find the final coordinates of N1, N2 and N3. Adjustments must be made according to the Bowditch rule. **[20]**

QUESTION 4

A theodolite was set up at station D and readings were taken to spot shots D1, D2, D3 and D4.

ANSWER SHEET 2 (attached) contains all relevant information. Complete the tacheometry field sheet on ANSWER SHEET 2. **[20]**

QUESTION 5

5.1 FIGURE 1 on the DIAGRAM SHEET (attached) represents the plan of an area to be excavated to an elevation of 130,00 m. Surface levels at the corner of the grid are given. The sides of the excavation are vertical. The bulking factor is 13%.

Calculate the volume of the ground to be carted away in cubic metres. (10)

5.2 Reproduce FIGURE 1 on the DIAGRAM SHEET (attached) in the ANSWER BOOK to scale 1:500. Calculate and plot the 136 m contour line. (10)
[20]

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QUESTION 6

The data on FIGURE 2 on the DIAGRAM SHEET (attached) apply to a road curve. Pegs are required at every full 20 m chainage.

6.1 Calculate and tabulate the data to set out the curve. (16)

6.2 Calculate the crown distance. (4)
[20]

TOTAL: 100

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ANSWER SHEET 1

EXAMINATION NUMBER:

NAME	JOIN	ΔY	ΔX	NAME	Y	X
L				L		
N1				N1		
N2				N2		
N3				N3		
M				M		

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ANSWER SHEET 2

EXAMINATION NUMBER: | | | | | | | | | | | | | |

Station		Distance		HI or middle hair MH	Angles		HI – MH + -	Height component + -	Height difference + -	Elevation of point	Remarks
From	To	Stadia	Hor		Hor	Vert					
D				1,48							
	D1	3,98 1,26			84:34:00	97:38:00					
	D2	2,84 1,24			182:46:00	80:46:00					
	D3	4,26 1,48			268:02:00	85:24:00					
	D4	3,98 1,28			344:44:00	99:16:00				679,94	BM 1

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DIAGRAM SHEET

EXAMINATION NUMBER: | | | | | | | | | | | | | |

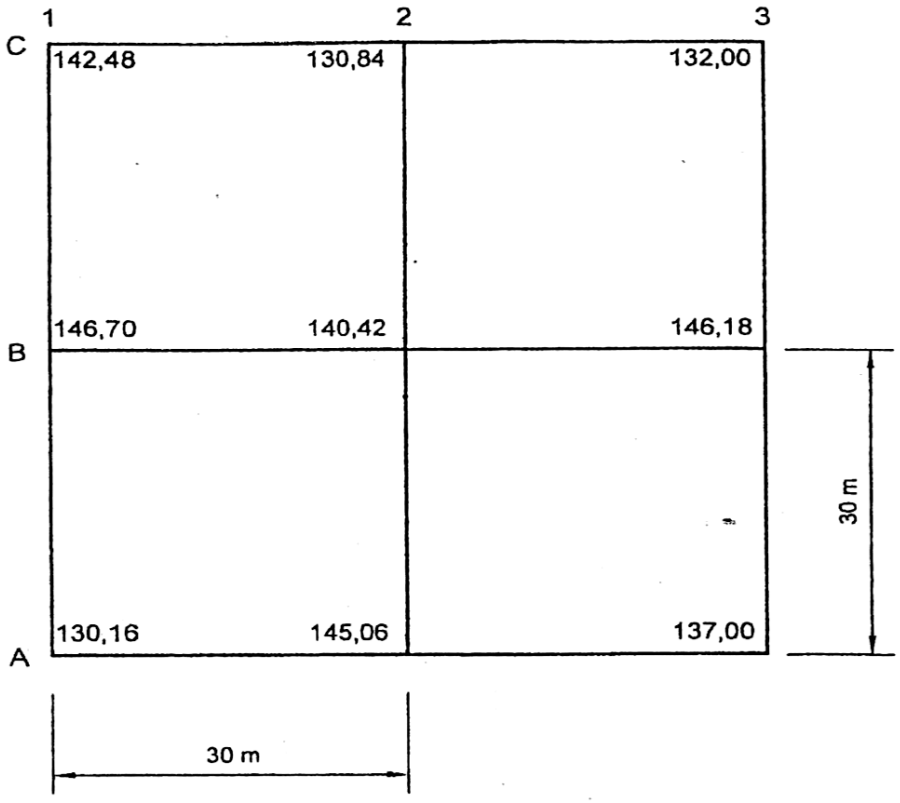

FIGURE 1

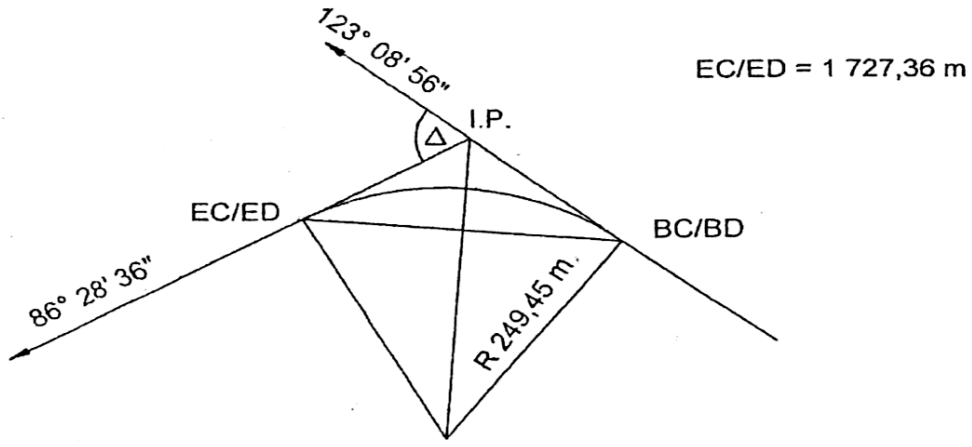

FIGURE 2

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FORMULA SHEET

Any other applicable formula may also be used.

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

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

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

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

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

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

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

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

$$C = \frac{\text{Distance}}{\text{Total distance}}\text{X}_l$$

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

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

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

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

$$\vartheta = \frac{1\,718{,}9.a}{R}$$

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

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

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

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

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

$$a^2 = b^2 + c^2 - 2bc.CosA$$

$$b^2 = a^2 + c^2 - 2ac.CosB$$

$$c^2 = a^2 + b^2 - 2ab.CosC$$

$$\frac{SinA}{a} = \frac{SinB}{b} = \frac{SinC}{c}$$

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