higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

T180**(E)**(A4)T

NATIONAL CERTIFICATE

BUILDING AND STRUCTURAL SURVEYING N6

(8060056)

4 April 2018 (X-Paper)
09:00–12:00

Calculators may be used.

This question paper consists of 5 pages, 3 addenda 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

The following data is given:

Coordinates

A	+ 1 932,96	+ 1 332,85
B	+ 1 187,32	+ 1 233,95

Line	Direction	Distance (m)
A-B	313:41:10	193,85
B-C	283:25:47	258,51
C-D	204:16:31	179,58
D-E	245:08:21	308,20

Use ADDENDUM A to do the necessary calculations to find the final coordinates of B, C and D. Adjustments must be made according to the Bowditch rule. **[20]**

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

The following notes refer to observations from R in a tacheometric survey. The elevation of survey station R is 713,24 m and the theodolite is 1,46 m above R. The booked vertical angles are zenith distance.

Staff station	Horizontal angle	Vertical angle	Stadia readings
R1	136:49:00	98:36:00	1,90…….0,58
R2	173:21:00	81:39:00	4,02…….2,60
R3	246:32:00	82:09:00	1,84…….0,60
R4	299:52:00	101:36:00	3,64…….1,26

Use the information to complete the tacheometric sheet on ADDENDUM B. **[20]**

QUESTION 4

Plot the cutting and embankment line on ADDENDUM C if the area within the solid lines (A, B, C and D) is to be brought to a formation level of 140 m.

The side slope is 1 : 2 (1 vertical). **[10]**

QUESTION 5

Calculate the volume of material to be excavated for a channel between points S1 and S2.

The following information is given:

Chainage of S1 = 2 932,82 m
Chainage of S2 = 3 122,24 m
Formation width = 9 m
Depth at S1 = 2,68 m
Depth at S2 = 1,76 m
Side slopes = 1 : 2,5 (1 vertical)
Ground slope at S1 = 1 : 6 (1 vertical)
Ground slope at S2 = 1 : 8 (1 vertical) **[15]**

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QUESTION 6

Calculate and tabulate the setting out data for a road curve from the given information:

- A peg is required at every full 20 cm chainage.
- The curve is to the left.
- The radius is 210,00 m.
- The angle of intersection Δ is 42:00:00.
- The chainage of point of intersection (PI) is 4 348,21 m. **[20]**

QUESTION 7

Explain each of the following terms used in surveying:

7.1 Angle of direction (3)

7.2 Closed traverse (2)
[5]

TOTAL: 100

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ADDENDUM A **EXAMINATION NUMBER:**

QUESTION 1

NAME	JOIN	ΔY	ΔX	NAME	Y	X
A				A		
B				B		
C				C		
D				D		
E				E		

ADDENDUM B **EXAMINATION NUMBER:**

QUESTION 3

Station		Distance		HI or middle hair MH	Angles		HI – MH + -	Height component + -	Height difference + -	Elevation of point	Remarks
From	To	Stadia	Hor		Hor	Vert					
R											
	R1										
	R2										
	R3										
	R4										

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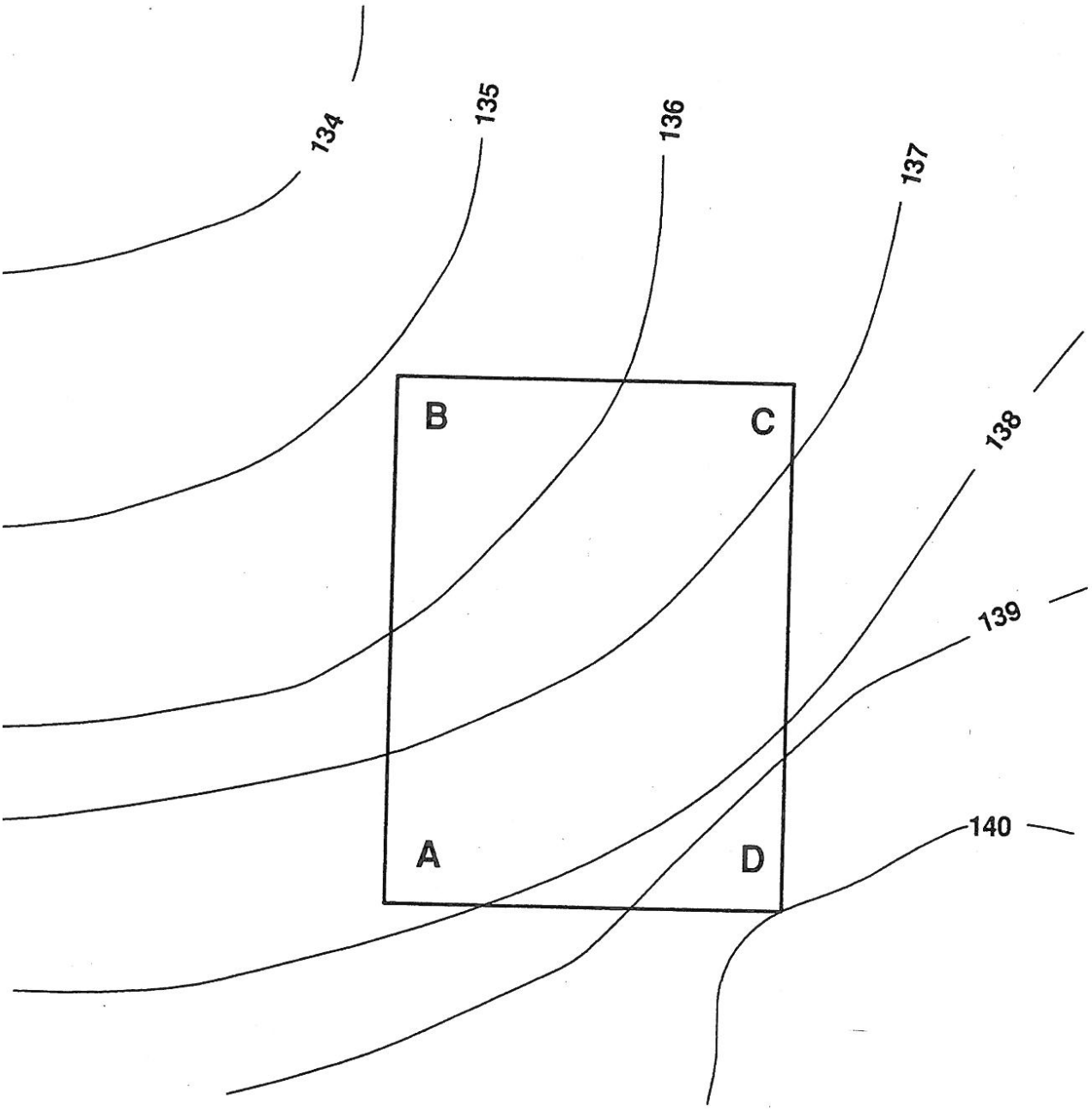
ADDENDUM C **EXAMINATION NUMBER:**

QUESTION 4



SCALE 1 : 500

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FORMULA SHEET

Any other applicable formula may also be used.

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

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

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

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

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

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

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

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

$$C = \frac{Distance}{Total\ \ distance} X_l$$

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

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

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

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

$$\vartheta = \frac{1718{,}9.a}{R}$$

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

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

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

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

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

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

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

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

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

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