higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE

BUILDING AND STRUCTURAL SURVEYING N6

1 AUGUST 2019

This marking guideline consists of 9 pages.

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QUESTION 1

1.1 Foresight is the last reading taken before the instrument is moved.

1.2 A level line lies in the level surface and is therefore normal to the direction of gravity at all times.

1.3 Invert level is the lowest level on a pipeline in which water will flow.

1.4 A chainage is the position of a point from the origin, e.g. chainage 500 means that the point is 500 m from the origin.

1.5 Agonic lines are imaginary lines joining places on the earth's surface where the declination at a given point is zero.

(5 × 2) **[10]**

QUESTION 2

Station	Circle left	Circle right	Mean angle	Correction	Adjusted angle
B1	300:42:16	120:41:32			
B2	71:43:04	251:42:24			
	131:00:48	131:00:52	131:00:50	-00:00:02	131:00:48✓
B2	71:43:04	251:42:24			
B3	169:39:22	349:38:52			
	97:56:18	97:56:28	97:56:23	-00:00:02	97:56:21✓
B3	169:39:22	349:38:52			
B1	300:42:04	120:41:56			
	131:02:42	131:03:04	131:02:53	-00:00:02	131:02:51✓
			360:00:06	-00:00:06	360:00:00✓

Join T1 – B2:

Dy_{T1-B2} = -2 991,62 – (-2 562,56)
= -429,09✓

Dy_{T1-B1} = +3 012,34 – 3 862,12
= -849,78✓

Direction T1 – B2 = $\frac{-429,06}{-849,78}$ 3rd quadrant

Tanθ = 0,50490715✓ 5,061 = 78:49:22

Direction T1 – B2:	206:47:22	258:49:22
Angle B2; T1; B2	97:56:21✓	97:56:21
T1 – B3	304:43:43	356:45:43
Angle B3; T1; B1	131:02:51✓	
T1 – B1	75:46:34	
Angle B1; T1; B2	131:00:48	
T1 – B2	206:47:22✓	

[10]

QUESTION 3

NAME	JOIN	ΔY	ΔX	NAME	Y	X
L				L	+1 882,96	+1 282,85
278:33:21		-255,99√	+38,51√			
258,87 m		-0,26√	+0,24√			
N1				N1	+1 626,71✓	+1 321,60✓
309:04:15		-118,44√	+96,16√			
152,56 m		-0,15√	+0,14√			
N2				N2	+1 508,12✓	+1 417,90✓
252:34:23		-239,00√	-75,02√			
250,50 m		-0,25√	+0,23√			
N3				N3	+1 268,87✓	+1 343,11✓
224:31:47		-186,00√	-189,08√			
265,24 m		-0,27√	+0,24√			
M				M	+1 082,60	+1 154,27
927,17✓		-799,43√	-129,43√		-800,36√	-128,58√
		-800,36√	-128,58√			
		-0,93√	+0,85√			

$\frac{-1,66}{927,17}$ X leg √ $\frac{+1,64}{927,17}$ X leg√

7 × 1 = 7
26 × 0,5 = 13
20

[20]

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QUESTION 4

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						724,00✓	
	D1	3,98 1,26	267,20√	2,62✓	84:34:00	97:38:00	-1,14✓	-35,81√	-36,95✓	687,05✓	
	D2	2,84 1,24	155,88√	2,04✓	182:46:00	80:46:00	-0,56✓	+25,34√	+24,78✓	748,78✓	
	D3	4,26 1,48	276,21√	2,87✓	268:02:00	85:24:00	-1,39✓	+22,22√	+20,83✓	744,83✓	
	D4	3,98 1,28	262,99√	2,63✓	344:44:00	99:16:00	-1,15✓	-42,91√	-44,06✓	679,94	BM 1

16 × 1 = 16
8 × 0,5 = 4
= 20 **[20]**

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QUESTION 5

5.1

HEIGHT	TIMES USED	PRODUCT
130,16	1	130,16√
145,06	2	290,12√
137,00	1	137,00√
146,70	2	293,40√
140,42	4	561,68√
146,18	2	292,36√
142,48	1	142,48√
130,84	2	261,68√
132,00	1	132,00√
	16	2 240,88√

Mean height = $\frac{2\ 240,88}{16}$ = 140,055✓
= 140,055 – 130,00
= 10,055
= 10,06 m✓

V = 4(30 × 30) × 10,06
= 3 600 × 10,06
= 36 216,08 m^3✓

13% = 36 216 × 0,13
= 4 708,08 m^3✓

Total volume = 36 216 + 4 708,08
= 40 924,08 m^3✓

10 × 0,5 = 5
5 × 1 = 5
= 10 (10)

5.2 The 136 m contour passes between:

A1 and A2
A1 and B1
C2 and C1
C2 and B2
C3 and B3

Differences in level:

A1 and A2 = 145,06 – 130,16 = 14,90 m√
A1 and B1 = 146,70 – 130,16 = 16,54 m√
C2 and C1 = 142,48 – 130,84 = 11,64 m√
C2 and B2 = 140,42 – 130,84 = 9,58 m√
C3 and B3 = 146,18 – 132,00 = 14,18 m√

Difference in level to 136 m contour (from lower level):

A1 and A2 = 136,00 – 130,16 = 5,84 m√
A1 and B1 = 136,00 – 130,16 = 5,84 m√
C2 and C1 = 136,00 – 130,84 = 5,16 m√
C2 and B2 = 136,00 – 130,84 = 5,16 m√
C3 and B3 = 136,00 – 132,00 = 4,00 m√

Horizontal distance to contour (from lower level):

B4 and C4 = $^{5,84}/_{14,90}$ × 30 m = 11,76 m√
D4 and C4 = $^{5,84}/_{16,54}$ × 30 m = 10,60 m√
B3 and C3 = $^{5,16}/_{11,64}$ × 30 m = 13,30 m√
D3 and C3 = $^{5,16}/_{9,58}$ × 30 m = 16,16 m√
C2 and C3 = $^{4,00}/_{14,18}$ × 30 m = 8,46 m√

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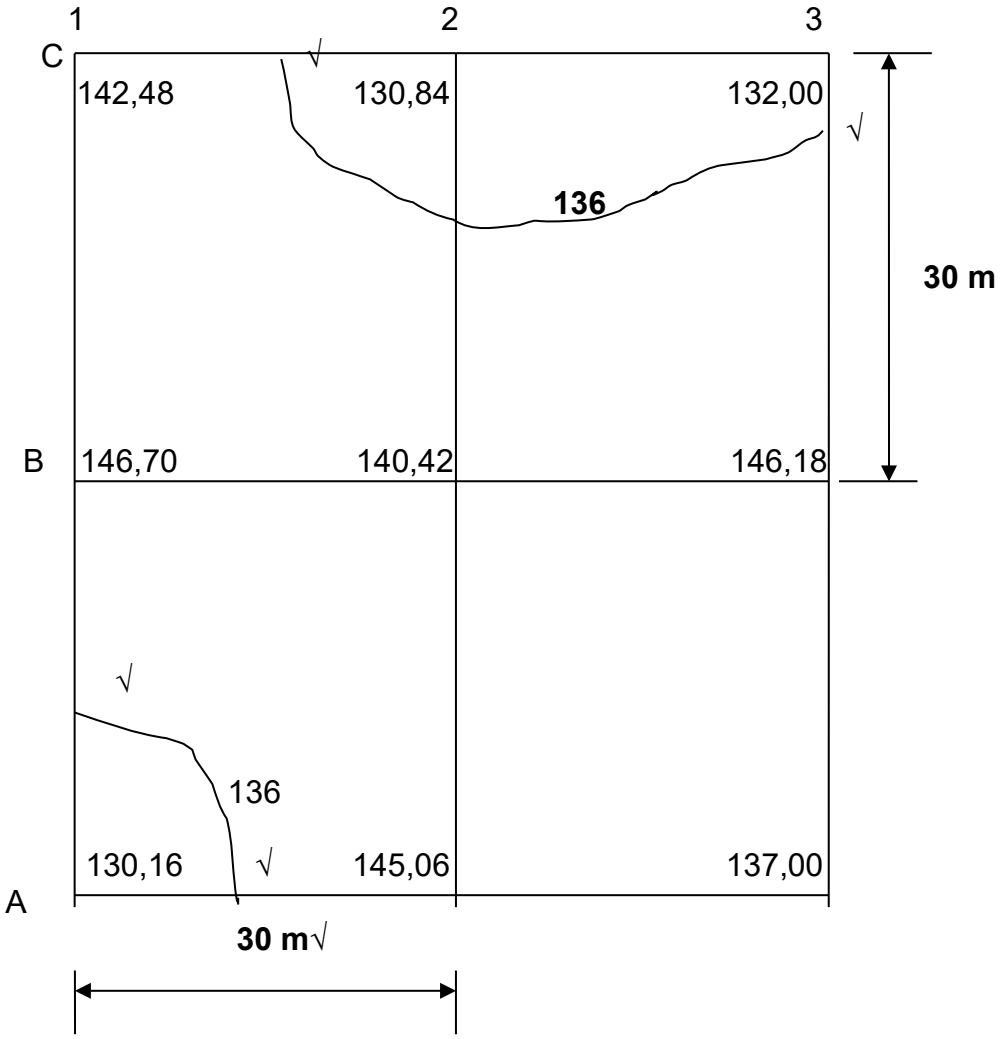
1
2
3
C
142,48
130,84
132,00
136
30 m
B
146,70
140,42
146,18
136
130,16
145,06
137,00
A
30 m

20 × 0,5 (10)
[20]

QUESTION 6

6.1 Δ = 123:08:56 – 86:28:36
= 36:40:20

$$La = \frac{\pi \Delta R}{180}\checkmark$$
$$= \frac{\pi \times 36:40:20 \times 249,45}{180}\checkmark$$
= 159,66 m✓

BC = EC – LA✓
= 1 727,36 – 159,66✓
= 1 567,70 m✓

(a = 12,30) $= \frac{1\,718,9 \times 12,30}{249,45 \times 60} = 01:24:45\checkmark$

(a = 20, 00) $= \frac{1\,718,9 \times 20,00}{249,45 \times 60} = 02:17:49\checkmark$

(a = 7,36) $= \frac{1\,718,9 \times 7,36}{249,45 \times 60} = 00:50:43\checkmark$

CHAINAGE	CHORD	ϑ	α
BC 1 567,70		00:00:00	360:00:00√
580,00	12,30	01:24:45	358:35:15√
600,00	20,00	02:17:49	356:17:26√
620,00	20,00	02:17:49	353:59:37√
640,00	20,00	02:17:49	351:41:48√
660,00	20,00	02:17:49	349:23:59√
680,00	20,00	02:17:49	347:06:10√
700,00	20,00	02:17:49	344:48:21√
720,00	20,00	02:17:49	342:30:32√
EC 1 727,36	7,36	00:50:43	341:39:49√
159,66√	159,66√	18:20:11√	18:20:11√

9 × 1 = 9
14 × 0,5 = 7
= 16 (16)

6.2 $Cd = T\tan\frac{\Delta}{4}$

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

$T = 249{,}45 \times \tan 18:20:10$ ✓

T = 82,67✓

$Cd = 82{,}67 \times \tan 09:10:05$ ✓

Cd = 13,34 m✓ (4)

[20]

TOTAL: 100

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