higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE

BUILDING AND STRUCTURAL SURVEYING N6

21 November 2022

This marking guideline consists of 8 pages.

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QUESTION 1

1.1 1.1.1 It also known as tacheometry.✓ In this method of surveying horizontal and vertical distances are obtain optically (by using surveying staff and theodolite).✓

1.1.2 It is the process of turning the telescope✓ about the vertical axis in a horizontal plane.✓

1.1.3 This is the angular difference✓ between the direction of true north and magnetic north. ✓

1.1.4 Is the direction of the grid line✓ which is parallel to the central meridian on the national grid.✓

1.1.5 Is a mechanical instrument✓ used to calculate irregular areas for which there is no formula, such as the area of a lake on a map.✓

(5 × 2) (10)

1.2

FIELD-BOOK PAGE OBSERVATION AT T				
CL	CR	Mean	Correction	Corrected
M 140:23:50	320:23:48	140:23:49	0:00:00	✓140:23:49
N 174:36:40	354:36:39	174:36:40	-0:00:17	✓174:36:23
P 160:06:22	340:06:20	160:06:21	-0:00:34	✓160:05:47
Q 227:36:04	47:36:02	227:36:03	-0:00:51	✓227:35:12
M 140:23:48	320:26:06	140:24:57	-0:01:08	✓140:23:49

JOIN				
Q	-2056,30	+3760,20		√317:44:27
R	-7308,10	+9540,10		√7809,52
	-5251,80	+5779,90		
Q			√-2056,30	√+3760,20
317:44:27	-0,6724852	+0,7401105	√-5251,80	√+5779,90
7809,52				
R			√-7308,10	√+9540,10

DIRECTION SHEET				
NAME	**CORRECTED DIRECTIONS**	**ORIENTED DIRECTIONS**	**CORRECTION**	**JOINT DIRECTION**
M	140:23:49	230:33:04		
N	174:36:23	264:45:38		
P	160:06:47	250:16:02		
Q	227:35:12		√+90:09:15	√317:44:27

√ × 10 = 5
√ × 5 = 5 (10)
[20]

QUESTION 2

Station		Distance		HI or Middlehair MH	Angles		HI – MH + -	Height Component + -	Height Difference + -	Elevation of point	Remarks
From	To	Stadia	Hor		Hor	Vert					
T				1.45						✓156,09	
	T1	2,00 0,63	✓134,35	✓1,32	140:10:20	82:00:10	√+0,13	✓+18,87	√+19,00	✓175,09	
	T2	1,60 1,10	✓49,22	✓1,35	93:20:17	97:10:00	√+0,10	✓-6,19	√-6,09	150,00	
	T3	2,50 1,40	✓109,32	✓1,95	130:18:34	85:30:20	√-0,50	✓+8,59	√+8,09	✓164,18	
	T4	2,00 1,20	✓77,89	✓1,60	280:30:10	99:20:31	√-0,15	✓-12,81	√-12,96	✓143,13	
			4	4			2	4	2	4	

[20]

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QUESTION 3

3.1

NAME	JOIN	∆Y	∆X	NAME	Y	X
M				M	+2017,40	+1389,15
210:24:00		√-113,55	√-193,55			
224,40		√-0,27	√+0,48			
N				N	✓+1903,58	✓+1196,08
220:12:40		√-99,75	√-177,99			
154,50		√-0,19	√+0,33			
P				P	✓+1803,64	✓+1078,42
120:20:20		√+172,96	√-101,22			
200,40		√-0,24	√+0,43			
Q				Q	✓+1976,36	✓+977,63
320:10:23		√-76,92	√+92,23			
120,10		√-0,15	√+0,26			
R				R	+1899,29	+1070,12
✓699,40		√-117,26	√-320,53		√-118,11	√-319,03
		√-118,11	√-319,03			
		√-0,85	√+0,58			

$\sqrt{\frac{-0,85}{699,40}}$ × leg $\sqrt{\frac{1,50}{699,40}}$ × leg

√ × 26 = 13 + ✓ × = 7 : (20)

3.2 Direction Q-M = $\tan^{-1}\frac{-41,04}{-411,52}$
= 5:41:43 + 180° (3rd quadrant)
= 185:41:43✓
Direction M-N = $\tan^{-1}\frac{-113,82}{-193,07}$
= -30:31:14+ 180° (3rd quadrant)
= 210:31:14✓
Angle QMN = 210:31:14 – 185:41:43
= 24:49:31✓
Distance NM = $\sqrt{(-113,82)^2 + (-193,07)^2}$
= 224,12 m✓
Distance NR = NM $\sin\theta$
= 224,12 $\sin 24:49:31$
= 94,10 m ✓ (5)
[25]

QUESTION 4

Area for chainage D	Area for chainage E
W1 = $\frac{g\{a + (h.s)\}}{g - s}$ W1 = $\frac{3\{3 + (4 \times 2,5)\}}{3 - 2,5}$ ✓ = 78 m✓	W1 = $\frac{g\{a + (h.s)\}}{g - s}$ W1 = $\frac{4\{3 + (2 \times 2,5)\}}{4 - 2,5}$ ✓ = 21,33 m✓
W2 = $\frac{g\{a + (h.s)\}}{g - s}$ W2 = $\frac{3\{3 + (4 \times 2,5)\}}{3 + 2,5}$ ✓ = 7,09 m✓	W2 = $\frac{g\{a + (h.s)\}}{g - s}$ W2 = $\frac{4\{3 + (2 \times 2,5)\}}{4 + 2,5}$ ✓ = 4,92 m✓
Area = $\frac{(W1 \times W2) - a^2}{S}$ = $\frac{(78 \times 7,09) - 3^2}{2,5}$✓ = 217,61 m²✓	Area = $\frac{(W1 \times W2) - a^2}{S}$ = $\frac{(21,33 \times 4,92 - 3^2}{2,5}$✓ = 38,38 m²✓

Mean area = $\frac{\text{Area 1 + Area 2}}{2}$
= $\frac{217,61 + 38,38}{2}$
= 128 m²✓

Height = Chainage of D – Chainage of E
= 2 340 – 1 040
= 1 300 m ✓

Volume = Mean area × Height
= 128 × 1 300
= 166 400 m³✓ **[15]**

QUESTION 5

$\frac{\Delta}{2}$ = 23:10:20✓
$\Delta = 2 \times 23:10:20$
= 46:20:40✓ (2)

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

= $\frac{\pi \times 46:20:40 \times 200,20}{180}$✓

= 161,93 m✓ (2)

T = R. tan $\frac{\Delta}{2}$
= 200,20 tan 23:10:20✓
= 85,69 m✓ (2)

BC = PI – T
= 2240,00 – 85,69✓
= 2154,31 m✓ (2)

EC = BC + La
= 2154,31 + 161,93✓
= 2316,24 m✓ (2)

(a – 5,69) = $\frac{1718,9 \times 5,69}{200,20 \times 60}$ = 0:48:51✓ (1)

(a – 20) = $\frac{1718,9 \times 20}{200,20 \times 60}$ = 2:51:43✓ (1)

(a – 16,24) = $\frac{1718,9 \times 16,24}{200,20 \times 60}$ = 2:19:26✓ (1)

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CHAINAGE	CHORD	DEFLECTION ANGLE	OFF-SET ANGLE
BC √ 2154,31			√00:00:00
2160	5,69	0:48:51	√0:48:51
2180	20,00	2:51:43	√3:40:34
2200	20,00	2:51:43	√6:32:17
2220	20,00	2:51:43	√9:24:00
2240	20,00	2:51:43	√12:15:43
2260	20,00	2:51:43	√15:07:26
2280	20,00	2:51:43	17:59:09
2300	20,00	2:51:43	20:50:52
EC √2316,24	16,24	2:19:26	√ 23:10:18
√161,93	√118,16	√22:29:59	√ 22:29:59

(√ × 14) = 7
(✓× 13) = 13
20 **[20]**

TOTAL: 100

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