higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE

BUILDING AND STRUCTURAL SURVEYING N5

19 November 2024

This marking guideline consists of 5 pages.

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SECTION A

QUESTION 1: BASIC CONCEPTS

1.1 False,✓ A plane is a surface on which any straight line joining two points on it will touch the plane completely.✓

1.2 False✓ Cadastral surveying is for preparation of plans showing and defining legal property boundaries.✓

1.3 True✓ A compass is used to locate points by measurement of compass angles.✓

1.4 True✓ A horizontal plane is perpendicular to the direction of gravity at any one point.✓

1.5 False✓ A vertical plane is at 90° angles to a horizontal plane.✓

(5 × 2) **[10]**

QUESTION 2: LINEAR MEASUREMENT

2.1
- The tape must be held horizontally.
- Tape must be held at the correct zero mark.
- The correct tension must be applied to the tape.
- Any kinks should be removed before taping.
- The tape must be held at the correct peg.
- View the tape vertically over the peg.
- Measure from and to the centre of the ranging rod.

(Any 5 × 1) (5)

2.2
- It is a robust instrument.
- The chain can be dragged around over the ground.
- Reading the chain can be fairly easy.
- The chain is easy to clean.
- It is fairly easy to repair.
- The chain can be read from both sides.

(Any 4 × 1) (4)

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2.3 $Ct = L.\ e\ .(Tm - Ts)$
$= 198,57 \times 1,13 \times 10^{-5} (25 - 20)$ ✓
$= 0,011$ m✓

$Cs = \frac{W^2 \times (L/3)^3}{24 \times 7^2} \times 3$
$= \frac{(0,\ 015)^2 \times (198,57/3)^3}{24 \times 7^2} \times 3$ ✓

$= 0,166$ m✓

$Sc = L(1 - Cos\Theta)$
$= 198,57\ (1 - Cos86°35'10'')$ ✓
$= 0,350$ m✓

$Mslc = \frac{L \times H}{R}$
$= \frac{198,57 \times 2000}{6\ 373\ 000}$✓
$= 0,062$m✓

Therefore, RHD = 198,57 + 0,011 – 0,166 – 0,350 + 0,062✓✓
= 198,127 m✓ (11)
[20]

QUESTION 3: HEIGHT MEASUREMENT

3.1
- The instrument may not be levelled perfectly.
- The focus of the eyepiece and object glass may not be perfect.
- The parallax error may not be eliminated.
- The position of the staff may be displaced at change-point when taking foresight and back-sight readings.
- Bookings and recording in the field-book may be incorrect.
- The staff may not be fully extended, or may not be held vertically. (5)

3.2 TABLE 1

BACK SIGHT	INTER. SIGHT	FORE SIGHT	RISE	FALL	REDUCED LEVEL	REMARKS
2,51					67, 65	BM 67, 65
1,54		2,32	0,19✓		67,84✓	A
	1,47		0,07✓		67,91✓	B
1.32		2,92		1,45✓	66,46✓	C
	1,43			0,11✓	66,35✓	D
1,32		1,52		0,09✓	66,26✓	E
		1,05	0,27✓		66,53✓	F
6,69		7,81	0,53	1,65	66,53	
7,81			1,65		-67,65	
-1,12✓			-1,12✓		-1,12✓	

(15)
[20]

QUESTION 4: ANGULAR MEASUREMENT

4.1

- Centring: A process of setting up a theodolite at a ground station.
- Circle left: It refers to the situation when the vertical circle of the instrument is on the left of the observer when the reading is taken.
- Swinging the telescope: A process of rotating the telescope, clockwise or anti-clockwise about the vertical axis.
- Change face: An operation of bringing the vertical circle from one side (left side) of the observer to the other side (right side) of the observer.
- Transiting the telescope: A process of turning the telescope through 180° on the vertical plane. (5 × 2) (10)

4.2

Target station	Circle left	Circle right	Mean angle	Corrections	Correct angle
B	07:00:40	187:01:00			
	96:43:20	276:43:00			
	89:42:40✓	89:42:00✓	89:42:40✓	-00:00:05	89:42:35✓
C	96:43:20	276:43:00			
D	187:22:10	07:21:50			
	90:38:50✓	90:38:50✓	90:38:50✓	-00:00:05	90:38:45✓
D	187:22:10	07:21:50			
E	204:15:15	24:15:40			
	16:53:05✓	16:53:50✓	16:53:50✓	-00:00:05	16:53:45✓
E	204:15:15	24:15:40			
B	07:01:00	187:00:40			
	162:45:45✓	162:45:00✓	162:45:00✓	-00:00:05	162:44:55✓
			360:00:20✓	-00:00:20✓	360:00:00✓

Correction = 360:00:00 - 360:00:20
= - 00:00:20/4
= 00:0:05✓ (✓ × 20/2) (10)
[20]

SECTION B

QUESTION 5: BUILDING SURVEYS

	Chainage	Ground levels	Invert levels	Cut (+)	Fill (-)
A	0	50,76	48,92✓	1,84✓	
	20	50,00	48,52✓	1,48✓	
	40	47,16	48,12✓		0,96✓
	45	48,75	48,02✓	0,73✓	
B	60	49,57	47,72✓	1,85✓	

[10]

QUESTION 6: SETTING OUT

6.1 CH = 1,60 + 230,31
= 231,91 m✓

$\Delta H = \frac{0,95}{100} \times 225 = 2,14$ m✓

IL @ M1 = 229,38 – 0,90 = 228,48 m✓✓

IL @ M2 = 228,48 – 2,14 = 226,34 m✓✓

SR @ M1 = 231,91 – (228,48 + 1,90) = 1,53 m✓✓

SR @ M2 = 231,91 – (226,34 + 1,90) = 3,67 m✓✓ (10)

6.2
- The overall outline of the reduced level area is set out from a baseline, using a theodolite, ranging rod, tapes and pegs.
- Pegs are driven at each corner.
- To control the depth of the excavation, sight rails or profiles are placed opposite each other at the end at the excavation.
- The depth of the excavation is then controlled by dipping the traveller such that the line of sight between the sight rails are in line with that traveller. (10)

[20]

TOTAL SECTION B: 30
GRAND TOTAL: 100

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