higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE

BUILDING AND STRUCTURAL SURVEYING N6

(8060056)

30 July 2021 (X-paper)
09:00–12:00

Nonprogrammable calculators may be used.

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

100Q1G2130

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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. Start each question on a new page.
5. Only use a black or blue pen.
6. Write neatly and legibly.

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QUESTION 1

Discuss the following surveying terms:

1.1 Bisecting of target angle

1.2 Transit survey

1.3 Swing

1.4 Whole-circle bearing

1.5 Face left

(5 × 2) **[10]**

QUESTION 2

The following information is given:

OBSERVED ANGLES		**DISTANCES**	
SAB	108:57:44	AB	450,56 m
ABC	290:01:06	BC	227,28 m
BCD	104:00:36	CD	142,62 m
CDE	225:27:42	DE	224,17 m
DEK	116:51:32		

	COORDINATES		**DIRECTIONS**
A	+306.36	+1 476.18	AS 86:12:50
E	-330.76	+1 098.60	EK 211:36:55

2.1 Calculate the oriented directions in the ANSWER BOOK. (10)

2.2 Use the oriented directions to calculate the traverse on ANSWER SHEET 1. (20)
[30]

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QUESTION 3

The following notes refer to observations from P in a tacheometric survey. The elevation of survey station P4 is 840,27 m and the theodolite is 1,50 m above P. The booked vertical angles are zenith distance.

Staff station	Horizontal angle	Vertical angle	Stadia readings
P1	60:20:37	94:30:48	3,30…..……..2,41
P2	200:18:50	85:30:23	2,04…….....1,34
P3	167:36:49	97:40:20	2,98…..……..1,09
P4	228:39:39	88:06:09	3,23……..……0,93

Use the information to complete the tacheometric sheet on ANSWER SHEET 2. **[20]**

QUESTION 4

Calculate the volume of material to be excavated for a channel between two points Y1 and Y2.

The following information is given:

Chainage of Y1	= 1 987,65
Chainage of Y2	= 2 386,67
Formation width	= 10 m
Depth of Y1	= 2,45 m
Depth of Y2	= 1,98 m
Side slopes	= 1:2,0 (1 vertical)
Ground slope at Y1	= 1:4,5 (1 vertical)
Ground slope at Y2	= 1:6,0 (1 vertical)

[15]

QUESTION 5

A left circular curve connects two straights, XY and YZ. Point Y is the intersection point (PI). Point Z is the start of the chainage measure. The radius of the curve is 300,00 m. A peg is required at every full 20-m chainage.

The coordinates are:

X	+196,00	+640,00
Y	+1150,00	+1033,78
Z	+1478,20	+927,50

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Calculate the following:

5.1	The deflection angle	(7)
5.2	The	(2)
5.3	The length of the arc	(2)
5.4	The chainage at the beginning of the curve	(2)
5.5	The chainage at the end of the curve	(2)
5.6	The complete setting-out data from the beginning of the curve to the end of the curve. Tabulate the setting-out data.	(10)
		[25]

TOTAL: 100

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FORMULA SHEET

Any applicable formula may also be used.

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

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

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

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

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

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

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

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

$$C = \frac{\text{Distance}}{\text{Total distance}}\ X_1$$

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

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

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

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

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

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

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

$Ah = 50I \sin 22 + HI - MH = 100I \sin 2 \cos 2 + HI - MH$

$HD = 100I \cos^2 2$

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

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

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

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

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

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ANSWER SHEET 1 **EXAMINATION NUMBER:**

NAME	JOIN	∆Y	∆X	NAME	Y	X
A				A		
B				B		
C				C		
D				D		
E				E		

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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					

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