higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE

BUILDING AND STRUCTURAL SURVEYING N6

(8060056)

21 November 2022 (X-paper)
09:00–12:00

Nonprogrammable calculators may be used.

This question paper consists of 5 pages, 3 addenda and 1 formula sheet.

096Q1E2221

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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. Use only a black or a blue pen.
6. Write neatly and legibly.

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QUESTION 1

1.1 Define the following surveying terms:

1.1.1 Stadia surveying

1.1.2 Swing

1.1.3 Magnetic declination

1.1.4 A grid north

1.1.5 Planimeter

(5 × 2) (10)

1.2 Complete the field-book page and direction sheet on ADDENDUM 1 (attached) to find the oriented directions RM, RN, and RP. (10)

[20]

QUESTION 2

These notes refer to observations from T in a tacheometric survey.
The elevation of survey station T2 is 150 m and the theodolite is 1,45 m above T.
The booked vertical angles are zenith distances.

STAFF STATION	HORIZONTAL ANGLE	VERTICAL ANGLE	STADIA READINGS
T1	140:10:20	82:00:10	2,00……0,63
T2	93:20:17	97:10:00	1,60……1,10
T3	130:18:34	85:30:20	2,50……1,40
T4	280:30:10	99:20:31	2,00……1,20

Use the above information to complete the tacheometric sheet ADDENDUM 1 (attached). **[20]**

QUESTION 3

3.1 FIGURE 1 below shows the traverse MNPQR.
Use the traverse sheet ADDENDUM 2 (attached) to calculate the co-ordinates.
Adjustments must be made according to the Bowditch rule.

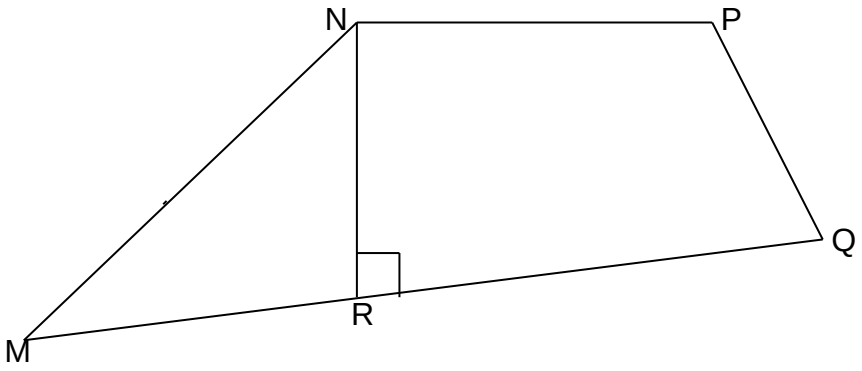

FIGURE 1 (20)

3.2 Calculate the distance NR, where R lies on the line MQ and angle MRN is a right angle. (5)
[25]

QUESTION 4

Calculate the volume of fill for a dam wall from point D to E

The following information is given:

Chainage of D = 2 340 m
Chainage of E = 1 040 m

Formation width = 6 m

Height at D = 4 m
Height at E = 2 m

Side slope = 1:2,5 (1 vertical)

Ground slope at D = 1:3 (1 vertical)
Ground slope at E = 1:4 (1 vertical) **[15]**

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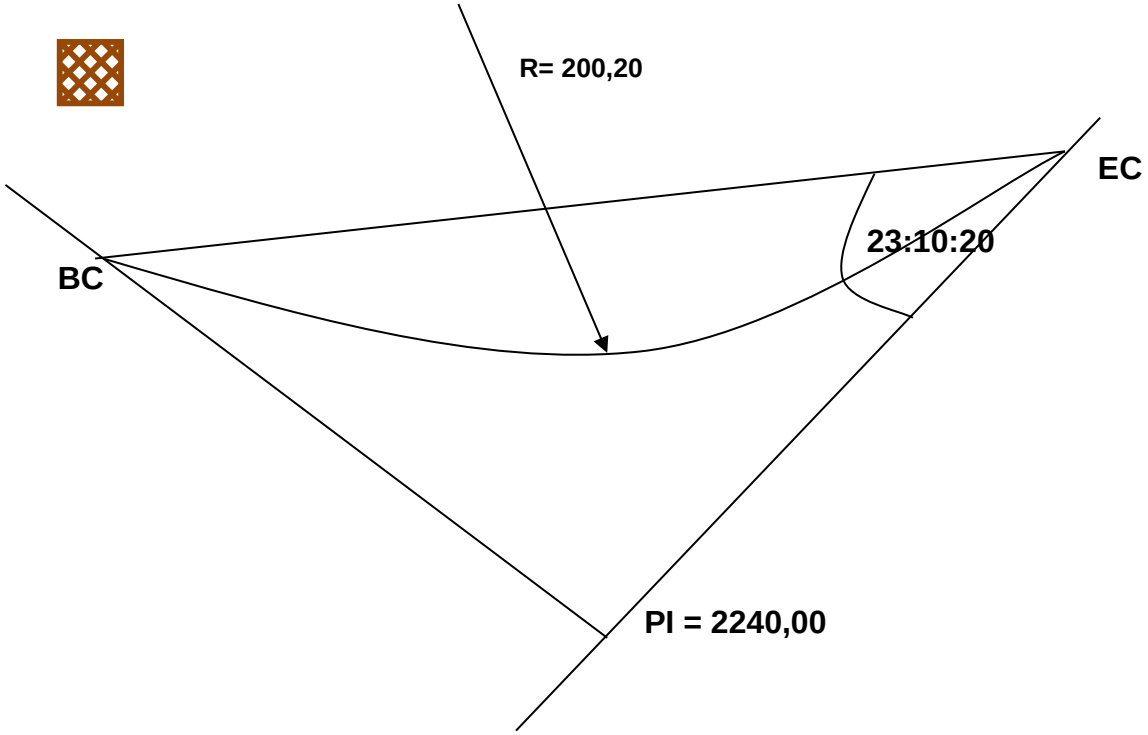
QUESTION 5

The figure below applies to a road curve. Pegs are required at every full 20 m chainage.

Calculate and tabulate the data to set out the road curve.



[20]

TOTAL: 100

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ADDENDUM 1 **EXAMINATION NUMBER:**

FIELD-BOOK PAGE OBSERVATION AT T				
CL	CR	Mean	Correction	Corrected
M 140:23:50	320:23:48			
N 174:36:40	354:36:39			
P 160:06:22	340:06:20			
Q 227:36:04	47:36:02			
M 140:23:48	320:26:06			

JOIN				
Q	-2056,30	+3760,20		
R	-7308,10	+9540,10		
Q				
R				

DIRECTION SHEET				
NAME	**CORRECTED DIRECTIONS**	**ORIENTED DIRECTIONS**	**CORRECTION**	**JOINT DIRECTION**
M				
N				
P				
Q				

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ADDENDUM 2 **EXAMINATION NUMBER:** | | | | | | | | | | | | | |

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					

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ADDENDUM 3 **EXAMINATION NUMBER:**

QUESTION 3.1

NAME	JOIN	∆Y	∆X	NAME	Y	X
M				M	+2017,40	+1389,15
210:24:00						
224,40						
N				N		
220:12:40						
154,50						
P				P		
120:20:20						
200,40						
Q				Q		
320:10:23						
120,10						
R				R	+1899,29	+1070,12

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FORMULA SHEET

Any applicable formula may be used.

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

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

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

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

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

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

$\Delta y = s.sin\alpha$

$\Delta x = s.cos\alpha$

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

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

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

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

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

$\vartheta = \frac{1718.9.\alpha}{R}$

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

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

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

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

$A = \frac{W1.W2-a^2}{S}$

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

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

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

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

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