higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE

BUILDING AND STRUCTURAL SURVEYING N6

(8060056)

6 April 2020 (X-paper)
09:00–12:00

This question paper consists of 6 pages, four addenda of 5 pages and 1 formula sheet.

094Q1A2006

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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. Sketches must be large, neat and fully labelled.
5. Write neatly and legibly.

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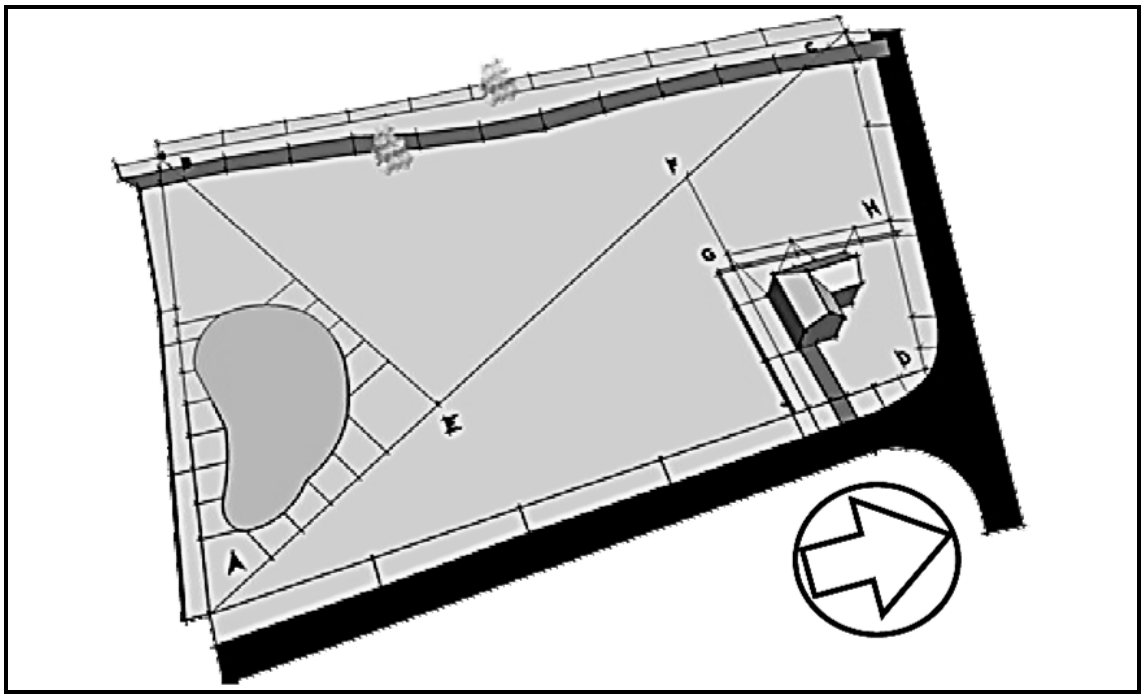
QUESTION 1

Below is a map of a residential plot. A chain survey was conducted to plot the map and details were recorded in the field books on ADDENDUM A (attached).



Calculate the:

1.1	Area covered by main survey lines forming a triangle ABC	(4)
1.2	Area covered by main survey lines forming a triangle CDA	(4)
1.3	Area between chainage AB and the close-boarded boundary fence	(2)
1.4	Area between chainage BC and the beach hedge using Simpson's rule	(4)
1.5	Area between chainage CD and the 1,2 m high post and wire fence	(3)
1.6	Area between chainage DA and the 1,2 m high post and wire fence	(2)
1.7	Total area of plot in hectares	(3)

[22]

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QUESTION 2

The chainage of the intersection point of two straights is 1 060 m and the angle of intersection is 60°. The radius of a circular curve to be set out is 570 m and the peg intervals are 30 m.

Determine:

2.1 The tangent length (5)

2.2 The length of the curve (4)

2.3 The chainage at the beginning and end of the curve (6)

2.4 The length of the long chord (3)

[18]

QUESTION 3

The table below shows spot shots recorded in a tachometric level book.

STATION		DISTANCE		HI/ MH	ANGLE		HI-MH	HEIGHT COMPONENT	HEIGHT DIFF	ELEVATION OF POINT
FROM	TO	STADIA	HOR		HOR	VER				
A				1,50						175,2
	1	2,97 1,42	154,69	2,20	22:47:00	-2:35:00	-0,70	-6,98	-7,68	167,53
	2	3,19 1,20	197,66	2,20	36:22:00	-4:42:00	-0,70	-16,25	-16,95	150,58
	3	2,53 1,00	151,12	1,77	93:42:00	-6:22:00	-0,27	-16,86	-17,13	133,46
	4	1,62 0,50	111,28	1,06	182:20:20	+4:36:00	0,44	8,95	9,39	142,85
	5	1,44 0,40	103,05	0,92	200:35:00	+5:29:00	0,58	9,89	10,47	153,32
	6	3,68 1,20	246,91	2,44	274:19:00	-3:48:00	-0,94	-16,40	-17,34	135,98
	7	3,82 1,00	280,20	2,41	300:21:00	-4:35:00	-0,91	-22,46	-23,37	112,61
	8	2,69 1,22	145,63	1,96	352:15:00	+5:32:00	-0,46	14,11	13,66	126,26
	9	2,54 1,00	153,49	1,77	9:24:00	+3:18:00	-0,27	8,85	8,58	134,84

Plot the reduced levels shown in the level book above on ADDENDUM B (attached) and record elevations of each station on the plan. Use a scale of 1:2 000 and perform the necessary calculations on ADDENDUM C (attached) to plot a 160 m contour on ADDENDUM B. **[20]**

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QUESTION 4

The field book below shows a closed traverse for which the height of collimation method was used to determine the reduced levels.

BS	FS	HOC	RL	CORRECTION	ADJUSTED RL	REMARK
0,805			100,000			BM 101
1,380	3,090					
1,360	1,385					
1,365	1,440					
1,485	1,435					
1,225	1,195					
1,305	1,275					
1,400	1,545					
1,205	1,155					
2,615	1,300					
1,370	0,355					
	1,365					BM101

Determine the:

4.1 Reduced levels for all stations (10)

4.2 Error of misclosure (1)

4.3 Corrections to be applied to all reduced levels (1)

4.4 Adjusted reduced levels (8)

[20]

NOTE: All corrections should be done to four decimal places.

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QUESTION 5

Calculate the following traverse fully on ADDENDUM D (attached) and use Bowditch's rule for adjustments.

Station	Join	ΔY	ΔX	Station	Y	X
A				**A**	+6316.800	+1032.200
234:26:40						
827.632						
B				**B**		
295:01:26						
1061.641						
C				**C**		
254:29:40						
797.345						
D				**D**		
268:48:43						
936.164						
				E	+2910.30	+878.300
∑P=		∑ΔY =	∑ΔX =		$Y_E - Y_A$	$X_E - X_A$
		eΔY =	eΔX =			

[20]

TOTAL: 100



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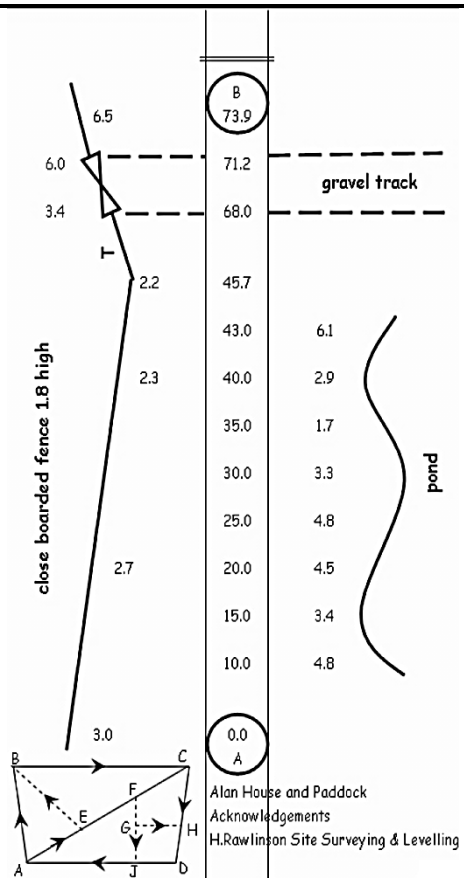
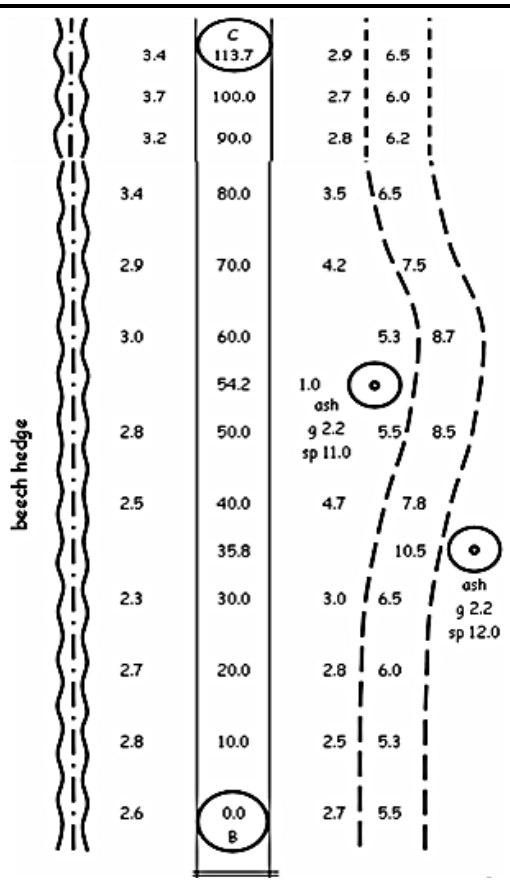
ADDENDUM A



Page 1



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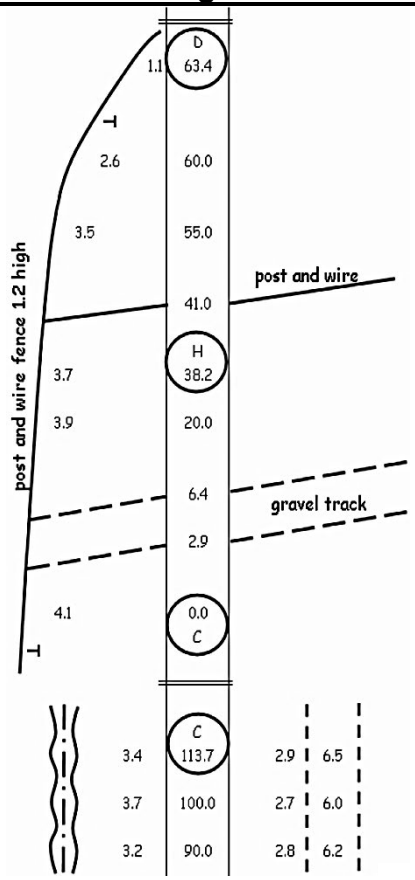
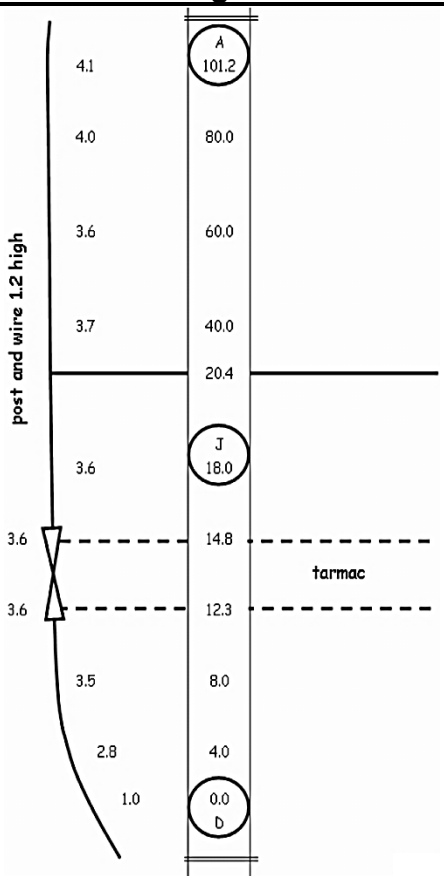


Page 3



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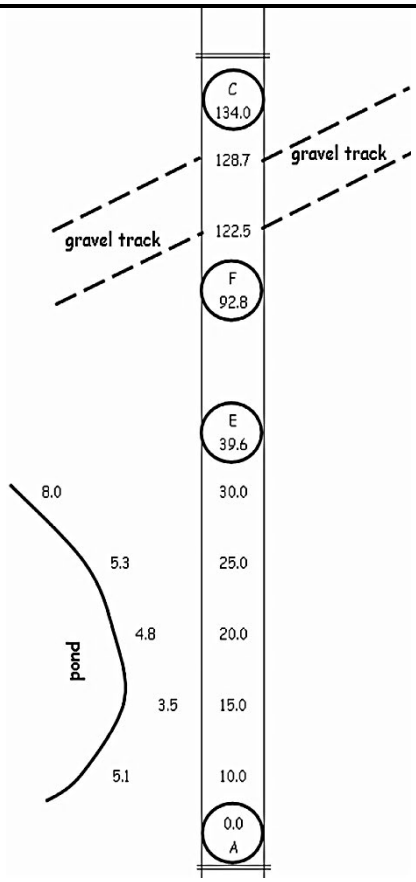

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ADDENDUM B

QUESTION 3 **EXAMINATION NUMBER:**

ADDENDUM C

QUESTION 4 **EXAMINATION NUMBER:**

Join	Gradient	Intercept (m)	Scaled intercept (mm)
A2			
A3			
A4			
A5			
A6			
A7			
A8			
A9			
21			
91			

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ADDENDUM D

QUESTION 5 **EXAMINATION NUMBER:** | | | | | | | | | | | | | |

Station	Join	∆Y	∆X	Station	Y	X
A				A	+6316.800	+1032.200
234:26:40						
827.632						
B				B		
295:01:26						
1061.641						
C				C		
254:29:40						
797.345						
D				D		
268:48:43						
936.164						
E				E	+2910.30	+878.300
∑P=		**∑∆Y =**	**∑∆X =**		**$Y_E - Y_A$**	**$X_E - X_A$**
		e∆Y =	**e∆X =**			

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FORMULA SHEET

Any other applicable formula may also be used.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

$$a^2 = b^2 + c^2 - 2bc.\cos A$$

$$b^2 = a^2 + c^2 - 2ac.\cos B$$

$$c^2 = a^2 + b^2 - 2ab.\cos C$$

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

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