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# education

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Department:  
Education

**REPUBLIC OF SOUTH AFRICA**

T190(E)(A6)T  
APRIL 2010

NATIONAL CERTIFICATE

**BUILDING AND STRUCTURAL SURVEYING N6**

(8060056)

**6 April (X-Paper)**  
**09:00 – 12:00**

**Calculators may be used.**

**This question paper consists of 4 pages, a formula sheet and 3 annexures.**

**DEPARTMENT OF EDUCATION  
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 correctly according to the numbering system used in this question paper.
4. Test ALL calculations.
5. Write your EXAMINATION NUMBER on the annexures and place them in the ANSWER BOOK.
6. Write neatly and legibly.

### QUESTION 1

A theodolite was set up at T2, T4 and P5 and the following readings were observed:

|    | At T2     | At T4        | At P5        |
|----|-----------|--------------|--------------|
| A1 | 320:34:22 | T2 288:40:26 | T4 86:58:02  |
| T4 | 100:54:36 | P5 130:26:14 | A2 179:24:12 |

Calculate the directions T2-T4, T4-P5 and P5-A2 if the direction of A1-T2 is 22:42:35. [10]

### QUESTION 2

- 2.1 FIGURE 1, ANNEXURE 1 (attached), shows the traverse ABCDE. Use the traverse sheet ANNEXURE 2 (attached), to calculate the co-ordinates. Adjustments must be made according to the Bowditch rule. (20)
- 2.2 Calculate the distance BV, where V lies on the line AE, and angle AVB is a right angle. (5)  
[25]

### QUESTION 3

- 3.1 Complete the tacheometric fieldbook page on ANNEXURE 3 (attached). (15)
- 3.2 Calculate the horizontal distance from K2 to K3 in the ANSWER BOOK. (5)  
[20]

### QUESTION 4

- 4.1 FIGURE 2 ANNEXURE 1, (attached) represents the plan of an area to be excavated to an elevation of 77.00 m. Surface levels at the corner of the grid are given. The sides of the excavation are vertical. The bulking factor is 13%. Calculate the volume of ground to be carted away in cubic metres. (10)
- 4.2 Reproduce FIGURE 2, ANNEXURE 1 (attached) in the ANSWER BOOK to scale 1:500. Calculate and plot the 90 m contour line. (10)  
[20]

PTO

**QUESTION 5**

Calculate and tabulate from the data given below, the setting out data for a road curve.

A peg is required at every FULL 20 m chainage.

The curve is to the right.

The direction from the beginning of the curve to the point of intersection is 186:28:18.

The direction from the end of the curve to the point of intersection is 51:22:18.

The chainage at the point of intersection is 2 404,96 m.

The radius of the curve is 195,55 m.

[21]

**QUESTION 6**

Explain the following terms used in surveying:

6.1 True meridian

(2)

6.2 Grid meridian

(2)

[4]

**TOTAL: 100**

## BUILDING AND STRUCTURAL SURVEYING N6

## FORMULA SHEET

Any applicable formula may also be used.

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

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

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

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

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

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

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

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

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

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

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

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

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

$$S = \frac{1718,9 \cdot a}{R}$$

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

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

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

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

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

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

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

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

$$\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$$

## ANNEXURE 1

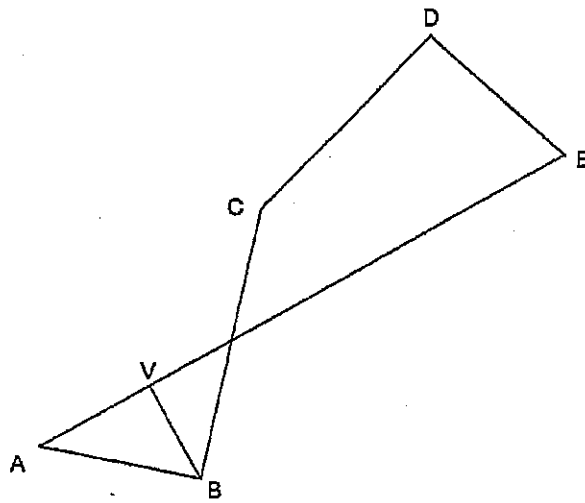


FIGURE 1

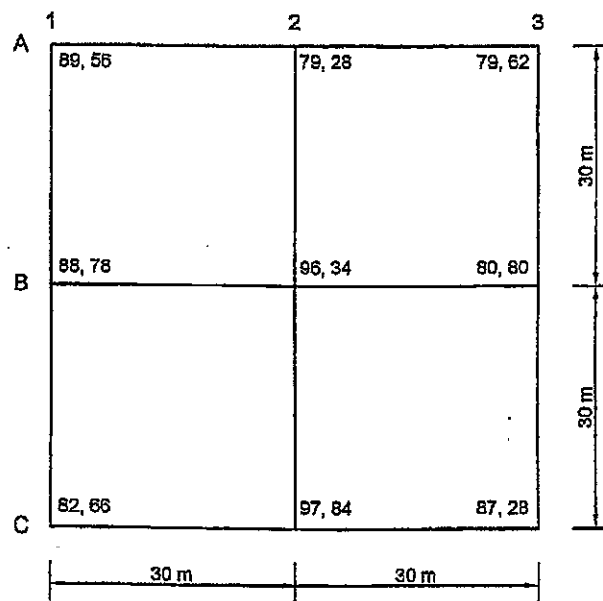


FIGURE 2

ANNEXURE 2

EXAMINATION NUMBER:

| NAME      | JOIN | $\Delta Y$ | $\Delta X$ | NAME | Y        | X        |
|-----------|------|------------|------------|------|----------|----------|
| A         |      |            |            | A    | + 820,20 | + 860,66 |
| 281:04:19 |      |            |            |      |          |          |
| 202,54    |      |            |            |      |          |          |
|           |      |            |            |      |          |          |
| B         |      |            |            | B    |          |          |
| 192:28:49 |      |            |            |      |          |          |
| 341,33    |      |            |            |      |          |          |
|           |      |            |            |      |          |          |
| C         |      |            |            | C    |          |          |
| 224:54:08 |      |            |            |      |          |          |
| 298,60    |      |            |            |      |          |          |
|           |      |            |            |      |          |          |
| D         |      |            |            | D    |          |          |
| 311:29:08 |      |            |            |      |          |          |
| 218,77    |      |            |            |      |          |          |
|           |      |            |            |      |          |          |
| E         |      |            |            | E    | + 174,66 | + 498,07 |
|           |      |            |            |      |          |          |
|           |      |            |            |      |          |          |
|           |      |            |            |      |          |          |

## ANNEXURE 3

**EXAMINATION NUMBER:**

Downloaded At: 11:53 11 September 2009

[illegible]