higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

T170(E)(J22)T
AUGUST 2010

NATIONAL CERTIFICATE

BUILDING AND STRUCTURAL SURVEYING N6

(8060056)

22 July (X-Paper)
09:00 – 12:00

Calculators may be used.

This question paper consists of 5 pages, 4 annexures and a 2-page formula sheet.

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

QUESTION 1

Given the following information:

Observed angles	Distances
BCD 109° 21' 17"	CD 295,37 m
CDE 225° 22' 59"	DE 313,70 m
DEF 156° 30' 15"	EF 312,68 m
EFG 302° 35' 52"	FG 134,80 m
FGH 101° 14' 27"	
Co-ordinates	**Directions**
C + 1 266,28 + 1 480,68	BC 300° 25' 37"
G + 465,92 + 1 352,10	GH 295° 35' 52"

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

1.2 Use the oriented directions to calculate the traverse on the attached ANNEXURE 1. (20)
[30]

QUESTION 2

2.1 The notes refer to observations from F in a tacheometric survey.
The elevation of survey station F2 is 436,28 m and the theodolite is 1,54 m above F.
The booked vertical angles are zenith distances.

STAFF STATION	HORIZONTAL ANGLE	VERTICAL ANGLE	STADIA READINGS
F1	197° 52' 38"	80° 16' 44"	1,50 ------- 0,70
F2	236° 12' 54"	96° 28' 18"	3,00 ------- 1,32
F3	296° 58' 34"	86° 50' 40"	1,62 ------- 0,74

Use the above information to complete the tacheometric sheet on the attached ANNEXURE 2. (15)

2.2 Calculate the horizontal distance F1 to F3 in the ANSWER BOOK. (5)
[20]

QUESTION 3

Plot the cutting and embankment line on the attached ANNEXURE 3, if the area within the solid lines (A B C D) is to be brought to a formation level of 100 m.
The side slope is 1:2 (1 vertical). **[10]**

PTO

QUESTION 4

Calculate the area of a road cross section given the following information:

Formation width	11 m
Central height	4,78 m
Cross slope	1:7 (1 vertical)
Side slopes	1:1,5 (1 vertical)

[7]

QUESTION 5

A road curve is to be staked out from the B.C. (beginning of curve) to the E.C. (end of curve).
The chainage at the interception point is 2 894,06 m.
The radius is 210,80 m.
The angle of intersection (Δ) is 43:09:04.
The curve is to the right.
Pegs are required at every full 20 m chainage.

Calculate the following:

5.1 Tangent length (3)

5.2 Arc length (3)

5.3 Chainage at beginning of curve (2)

5.4 Chainage at end of curve (2)

5.5 The complete setting-out data from B.C to E.C. Tabulate the setting-out data (11)

[21]

QUESTION 6

ANNEXURE 4 (attached) shows the plan of a steel framed building on level ground.

To set out the building steel pegs are to be inserted in the ground 2,5 m away from the center lines on each side of the building.

Use the ANSWER BOOK to explain how you would set out the building by using a theodolite and a tape.

Do the necessary sketches on the attached ANNEXURE 4 to aid your explanation. **[10]**

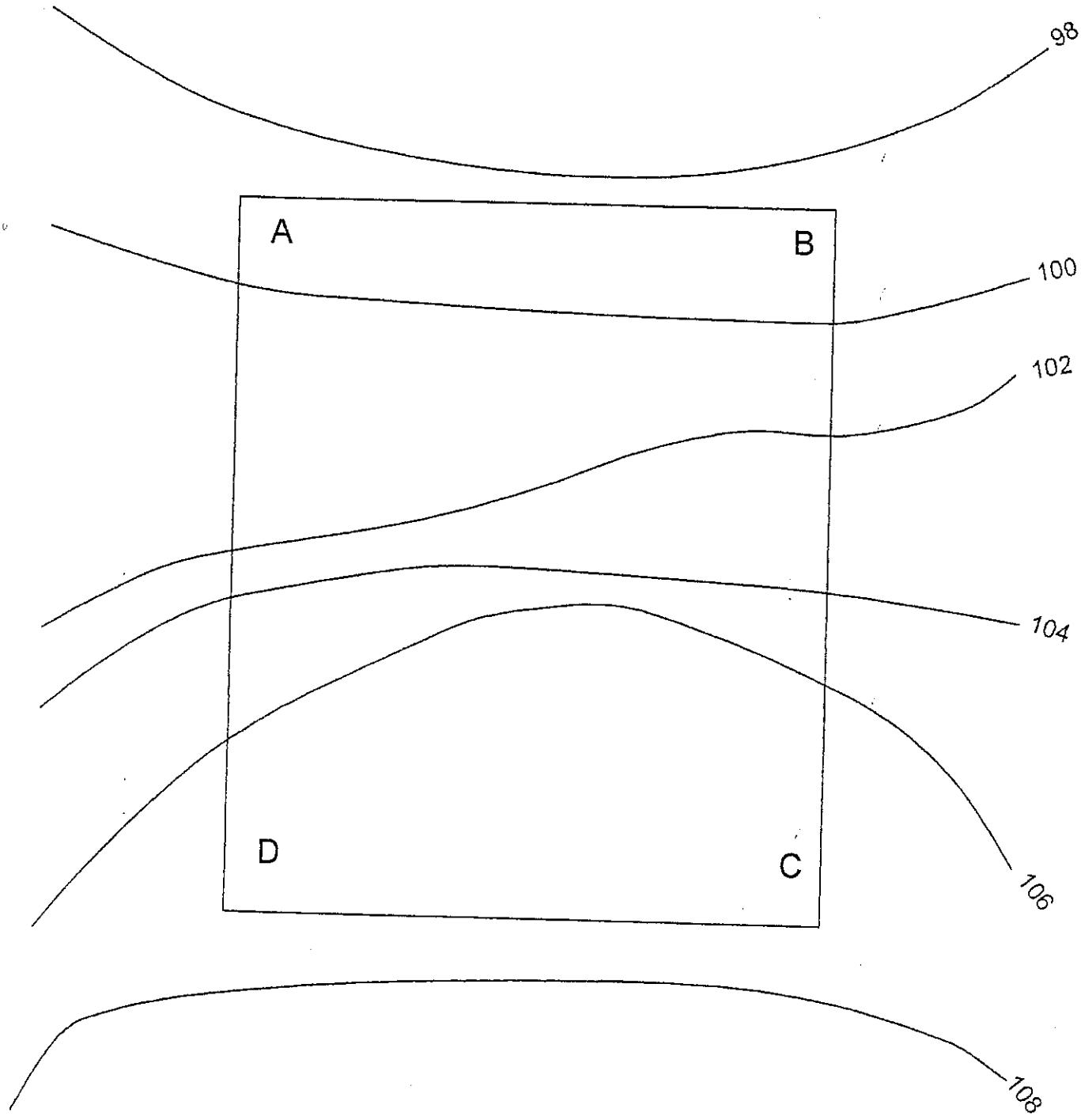
QUESTION 7

Explain the term *bisecting of a target angle* used in surveying. **[2]**

TOTAL: 100

ANNEXURE 3

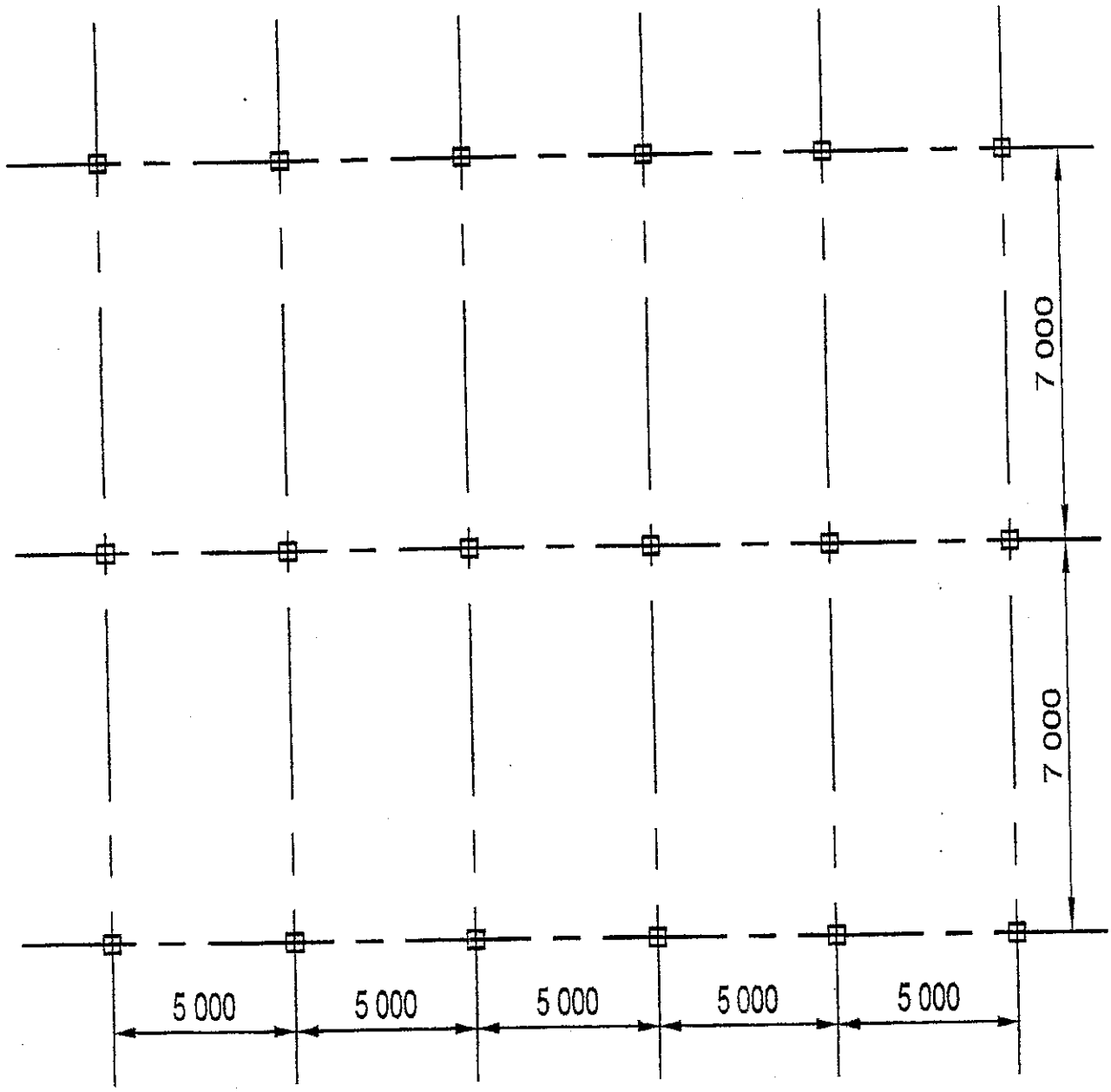
EXAMINATION NUMBER:



SCALE 1:500

ANNEXURE 4

EXAMINATION NUMBER:



ANNEXURE 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					
F											
	F1										
	F2										
	F3										

ANNEXURE 1 **EXAMINATION NUMBER:**

NAME	JOIN	ΔY	ΔX	NAME	Y	X
C				C		
D				D		
E				E		
F				F		
G				G		

BUILDING AND STRUCTURAL SURVEYING N6

FORMULA SHEET

Any applicable formula may also be used.

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

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

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

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

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

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

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

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

$$C = \frac{\text{Distance}}{\text{Total distance}} X_\ell$$

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

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

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

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

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

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

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

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

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

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

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

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

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

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