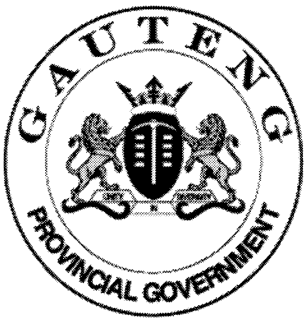
SENIOR CERTIFICATE EXAMINATION
SENIORSERTIFIKAAT-EKSAMEN



OCTOBER / NOVEMBER
OKTOBER / NOVEMBER

2004

WELDING AND METALWORKING

SWEIS EN METAAL-BEWERKING

LG **716-3/0 (LS)**

WELDING AND METALWORKING LG
Question Paper & Answer Book

10 pages
10 ***bladsye***

GAUTENGSE DEPARTEMENT VAN ONDERWYS

SENIORSERTIFIKAAT-EKSAMEN

SWEIS EN METAALBEWERKING LG

TYD: **3 uur**

PUNTE: **200**

BENODIGHEDE:

- Tekene-antwoordboek 716-3/X, tekeninstrumente en sakrekenaar.

INSTRUKSIES:

- Beantwoord Vraag 1 en enige VIER ander vrae.
- Beantwoord alle vrae in jou antwoordboek.

VRAAG 1
VERPLIGTEND

1.1 Kies die korrekte antwoord deur slegs die korrekte letter langs die ooreenstemmende vraagnommer in jou antwoordboek te skryf.

1.1.1 Wat is die kleur van 'n suurstofsilinder?

A. Rooi
B. Geel
C. Groen
D. Swart

1.1.2 Wat is die kleur van 'n asetileensilinder?

A. Rooi
B. Geel
C. Groen
D. Swart

GAUTENG DEPARTMENT OF EDUCATION

SENIOR CERTIFICATE EXAMINATION

WELDING AND METALWORKING LG

TIME: 3 hours

MARKS: 200

REQUIREMENTS:

- Drawing answer book 716-3/X, drawing instruments and calculator

INSTRUCTIONS:

- Answer Question 1 and any FOUR other questions.
- Answer all questions in your answer book.

QUESTION 1
COMPULSORY

1.1 Choose the correct answer by writing only the correct letter next to the corresponding question number in your answer book.

1.1.1 What is the colour of an oxygen cylinder?

A. Red
B. Yellow
C. Green
D. Black

1.1.2 What is the colour of an acetylene cylinder?

A. Red
B. Yellow
C. Green
D. Black

1.1.3 Staaltoue en stroppe in hyskrane word elke _____ maande geïnspekteer.

A. 2
B. 3
C. 4
D. 5

1.1.4 Van watter tipe staal word staalhake gemaak?

A. Gewalste staal
B. Sagte staal
C. Gegote staal
D. Mediumkoolstofstaal

1.1.5 Watter sweislas word deur die simbool **V** aangedui?

A. I-las
B. K-las
C. J-las
D. V-las

1.1.6 Watter sweislas word deur die simbool **K** aangedui?

A. I-las
B. K-las
C. J-las
D. V-las

1.1.7 Watter sweislas word deur die simbool  aangedui?

A. V-las
B. Geronde half-V-las
C. Geronde V-las
D. J-las

1.1.8 Watter sweislas word deur die simbool  aangedui?

A. J-las
B. U-las
C. V-las
D. I-las

1.1.3 Steelropes and slings in cranes are inspected every _____ months.

A. 2
B. 3
C. 4
D. 5

1.1.4 What type of steel are steel hooks made of?

A. Rolled steel
B. Soft steel
C. Cast steel
D. Medium-carbon steel

1.1.5 Which welding joint is represented by the symbol V?

A. I-joint
B. K-joint
C. J-joint
D. V-joint

1.1.6 Which welding joint is represented by the symbol K?

A. I-joint
B. K-joint
C. J-joint
D. V-joint

1.1.7 Which welding joint is represented by the symbol ?

A. V-joint
B. Flare bevel V-joint
C. Bold V-joint
D. J-joint

1.1.8 Which welding joint is represented by the symbol ?

A. J-joint
B. U-joint
C. V-joint
D. I-joint

1.1.9 Die koolstofinhoud van 'n hoëkoolstofstaal is

A. 0,15 - 0,30%
B. 0,13 - 0,70%
C. 0,71 - 1,50%
D. 1,0 - 1,20%

1.1.10 Watter sweisvlam word gebruik om geelkoper te sweis?

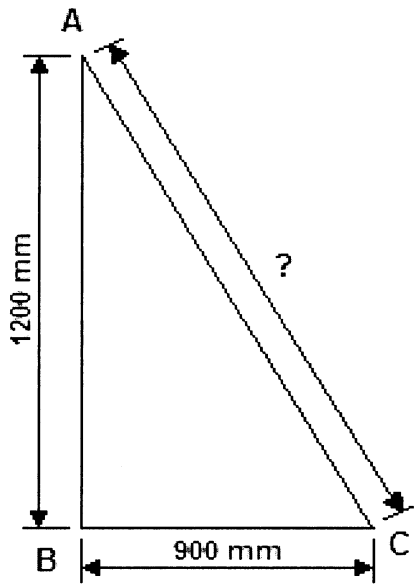
A. Aankoolvlam
B. Oksiderende vlam
C. Neutrale vlam
D. Boogsweisvlam 10x2=(20)

1.2 Maak 'n netjiese vryhandskets van 'n neutrale vlam. (4)

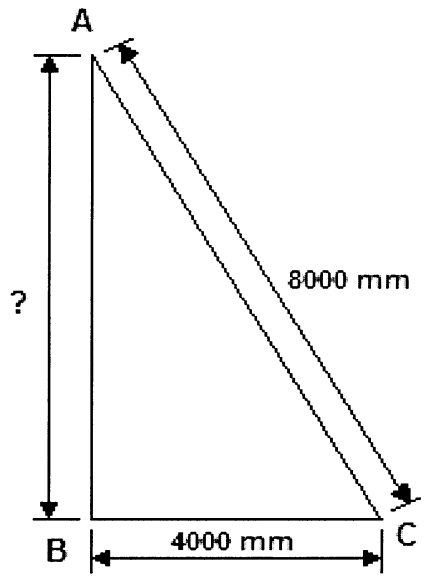
1.3 Maak netjiese vryhandsketse van die volgende groefsweislasse:

1.3.1 Dubbel-U-las (2)
1.3.2 Dubbel-J-las (2)
1.3.3 Geronde half-V-las (2)

1.4 Gebruik die stelling van Pythagoras om die lengte van **AC** in **Figuur 1** en **AB** in **Figuur 2** te bereken. (10)



Figuur 1



Figuur 2

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b.o.

1.1.9 The carbon content of high carbon steel is:

A. 0,15 - 0,30%
B. 0,13 - 0,70%
C. 0,71 - 1,50%
D. 1,0 - 1,20%

1.1.10 Which flame is used to weld yellow copper?

A. Carbonising flame
B. Oxidising flame
C. Neutral flame
D. Arc welding flame 10x2=(20)

1.2 Make a neat freehand sketch of a neutral flame. (4)

1.3 Make neat freehand sketches of the following groove welding joints:

1.3.1 Double U-joint (2)
1.3.2 Double J-joint (2)
1.3.3 Flare bevel V-joint (2)

1.4 Use the theorem of Pythagoras to calculate the length of **AC** in **Figure 1** and **AB** in **Figure 2.**

(10)

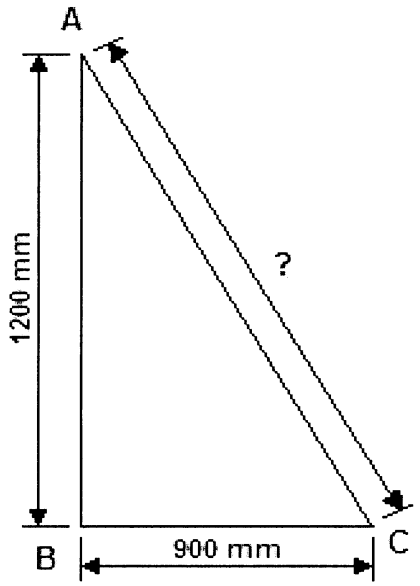

Figure 1

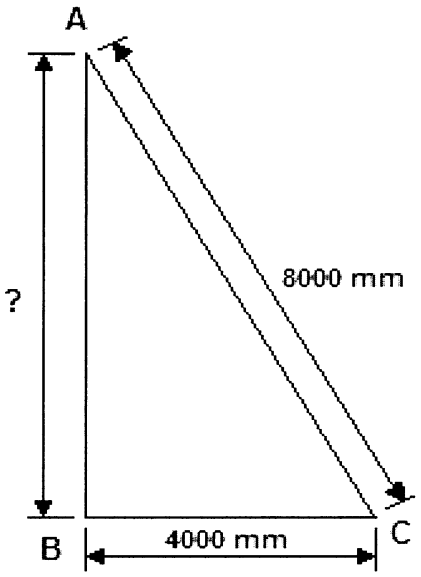

Figure 2

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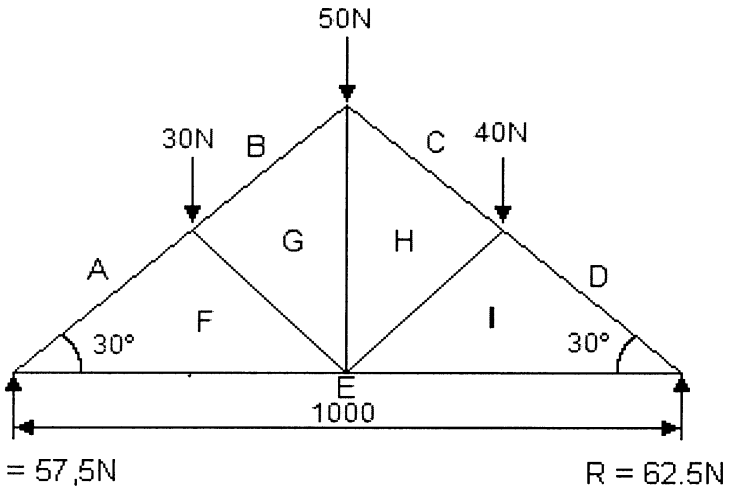
P.T.O.

VRAAG 2

2.1 **Figuur 3** toon 'n lyndiagram van 'n raamwerk met DRIE vertikale belastings.



Onderdeel	Afmeting	Krag	Aard
AF			
BG			
CH			
DJ			
FG			
HI			
FE			
GH			
IE			

Figuur 3

2.1.1 Dui deur middel van <u>berekening</u> aan dat die volgende reaksies by steunpunte R en L 62,5N en 57,5N onderskeidelik sal wees. (4)

2.1.2 Teken die ruimtediagram volgens 'n skaal van 1:10 en dui die aard van die kragte in elke onderdeel aan. (9)

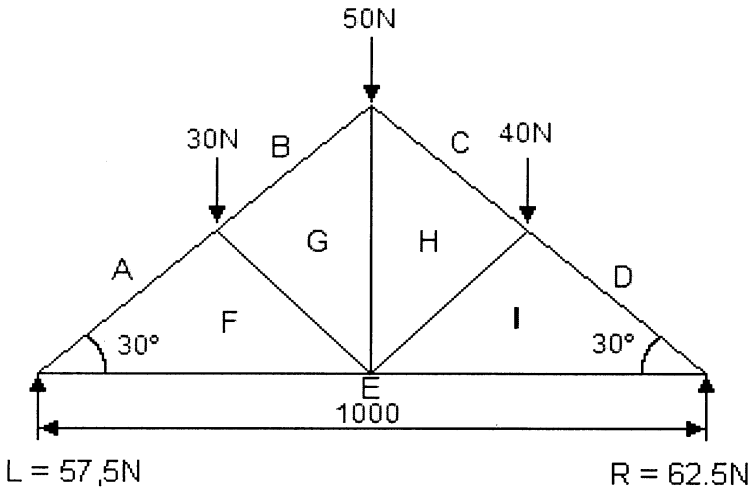
2.1.3 Teken die kragtediagram volgens 'n skaal van 1mm = 1N (9)

2.1.4 Bepaal grafies met 'n kragtediagram die grootte en aard van die kragte in elke onderdeel van die raamwerk. Teken die tabel oor en voltooi dit. (18)

[40]

QUESTION 2

2.1 **Figure 3** shows a line diagram of a framework with three vertical loads.



Member	Measurement	Force	Nature
AF			
BG			
CH			
DJ			
FG			
HI			
FE			
GH			
IE			

Figure 3

2.1.1 Indicate by means of <u>calculation</u> that the following reactions at R and L will read: 62,5N and 57,5N respectively. (4)

2.1.2 Draw the space diagram to a scale of 1:10 and indicate the nature of the force in each component. (9)

2.1.3 Draw the force diagram to a scale of 1mm = 1N. (9)

2.1.4 Determine graphically by means of a force diagram the magnitude and the nature of the forces in each member of the framework. Copy and complete the table. (18)

[40]

VRAAG 3

3.1 **Figuur 4** toon 'n balk wat by albei sy ente gesteun word. Die balk word aan drie puntbelastings onderwerp.

3.1.1 Toon deur <u>berekening</u> aan dat die reaksies by steunpunt L en R onderskeidelik 67,27N en 52,73N is. (10)

3.1.2 Bereken die buigmomente by punt A, B, C, D en E. (10)

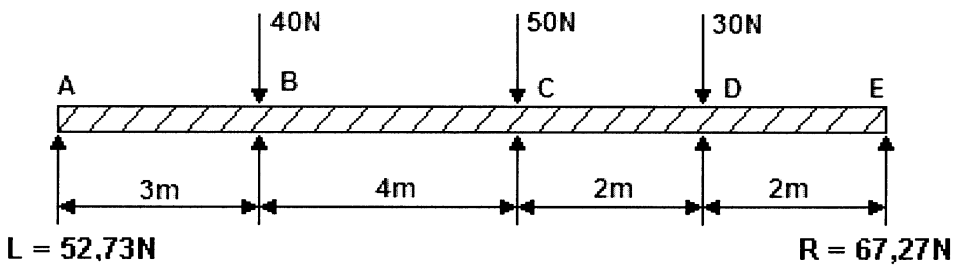
3.1.3 Bereken die skuifkragte by punt A, B, C, D en E. (10)

3.1.4 Teken die buigmoment- en skuifkragdiagramme vir die balk. (10)

[40]

<u>Gebruik die volgende skale:</u>

Ruimtediagram	Skaal	10mm = 1m
Buigmomentdiagram	Skaal	2mm = 1Nm
Skuifkragdiagram	Skaal	2mm = 1N



Figuur 4

QUESTION 3

3.1 **Figure 4** shows a beam supported at both ends. The beam is subjected to three points loads.

3.1.1 Indicate by means of calculation that the reactions at supports L and R will read 67,27N and 52,73N respectively. (10)

3.1.2 Calculate the bending-moments at points A, B, C, D and E. (10)

3.1.3 Calculate the shear forces at points A, B, C, D and E. (10)

3.1.4 Draw the bending moment and shear-force diagrams for the beam. (10)

[40]

Use the following scales:

Space diagram	Scale	10mm = 1m
Bending-moment diagram	Scale	2mm = 1Nm
Shear-force diagram	Scale	2mm = 1N

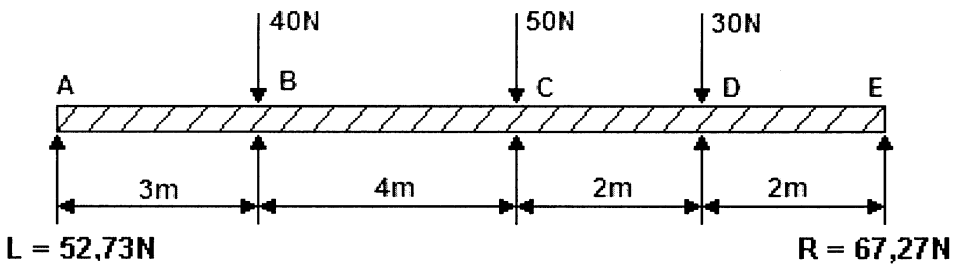


Figure 4

VRAAG 4

4.1 Noem SES eienskappe van metale. (6)

4.2 Noem SES hittebehandelings vir metale. (6)

4.3 Noem VYF toetse vir sweislasse. (5)

4.4 Noem SES elektriese aspekte. (6)

4.5 Noem TWEE klinknaelkoppe. (2)

4.6 Noem VYF masjiene in die maatvormsolder. (5)

4.7 Noem VYF gereedskapstukke in die maatvormsolder. (5)

4.8 Noem VYF elemente van 'n sweissimbool. (5)

[40]

VRAAG 5

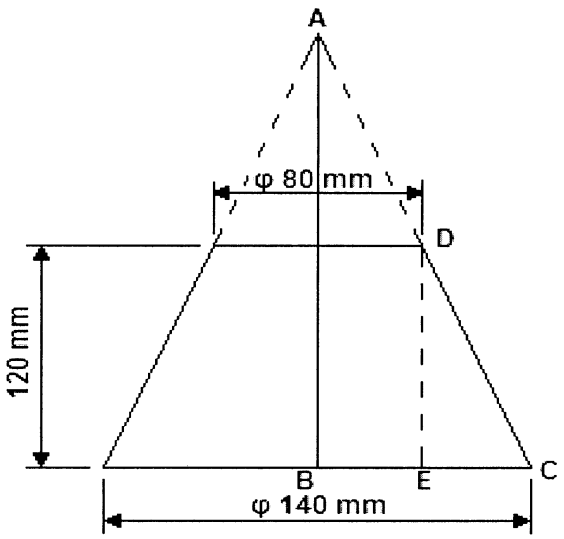
5.1 **Figuur 5** toon 'n keëlvormige stortgeutbak. Bereken die volgende:

5.1.1 Hoofstraal Formule: $AC = \frac{BC \times DC}{CE}$ (12)

5.1.2 Kleinstraal (3)

5.1.3 Omtrek (5)

[20]



Figuur 5

b.o.

QUESTION 4

4.1 Name SIX properties of metals. (6)

4.2 Name SIX heat treatments for metals. (6)

4.3 Name FIVE tests for welding joints. (5)

4.4 Name SIX electrical aspects. (6)

4.5 Name TWO rivet heads. (2)

4.6 Name FIVE machines in the template loft. (5)

4.7 Name FIVE types of tools in the template loft. (5)

4.8 Name FIVE elements of a welding symbol. (5)

[40]

QUESTION 5

5.1 **Figure 5** shows a conical hopper. Calculate the following:

5.1.1 Main radius Formula: $AC = \frac{BC \times DC}{CE}$ (12)

5.1.2 Small radius (3)

5.1.3 Circumference (5)

[20]

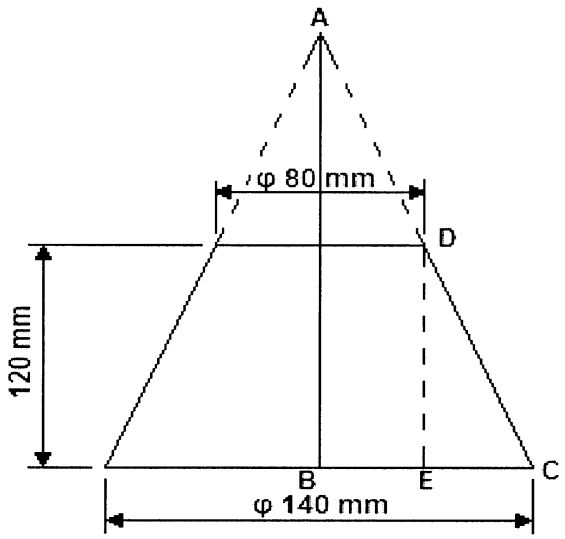


Figure 5

P.T.O.

5.2 **Figuur 6** toon die voor- en bo-aansigte van 'n vierkant-geutbak. Gebruik Pythagoras se stelling en bereken die volgende:

5.2.1 Die planlengte X - X¹ (3)

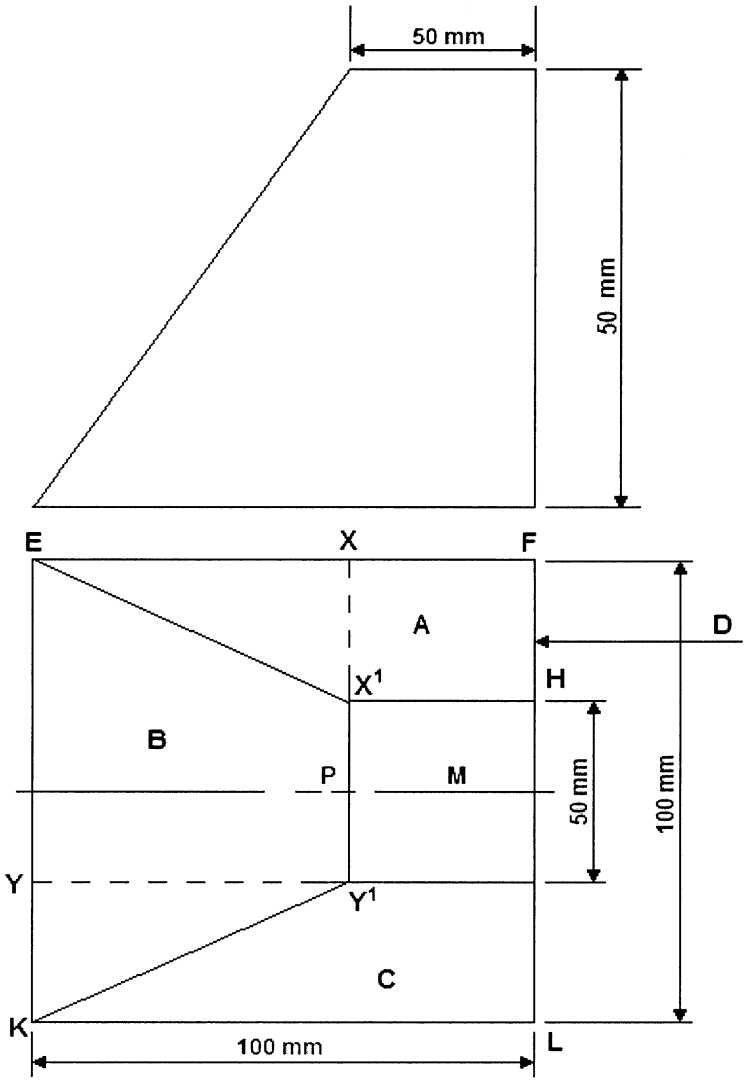
5.2.2 Die warelengte X - X¹ (5)

5.2.3 Die planlengte Y - Y¹ (3)

5.2.4 Die warelengte Y - Y¹ (5)

5.2.5 Teken A en B volgens 'n skaal van 1:1. (4)

[20]



Figuur 6

b.o

5.2 **Figure 6** shows the top and front views of a square hopper. By using the Theorem of Pythagoras, calculate the following:

5.2.1 The plan length of X - X¹ (3)

5.2.2 The true length of X - X¹ (5)

5.2.3 The plan length of Y - Y¹ (3)

5.2.4 The true length of Y - Y¹ (5)

5.2.5 Draw A and B according to a scale of 1:1. (4)

[20]

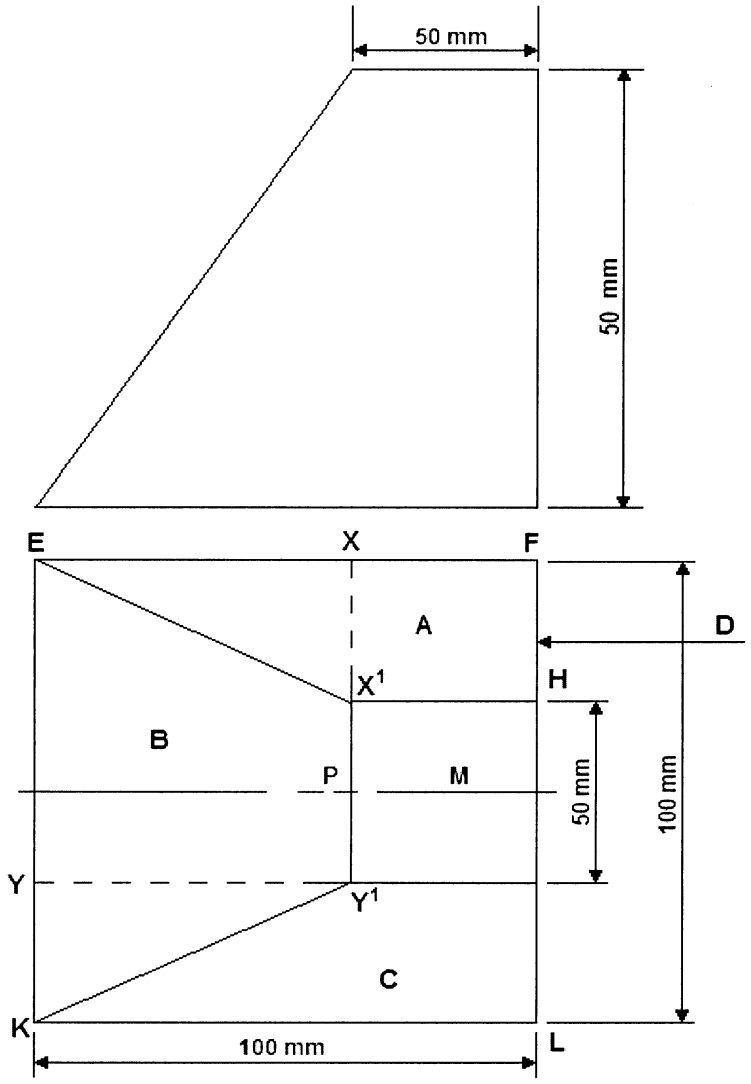


Figure 6

VRAAG 6

6.1 Maak netjiese vryhandsketse van die volgende sweisdefekte:

6.1.1 Inkarteling (3)

6.1.2 Sweiskraters (3)

6.1.3 Slakinsluiting (3)

6.1.4 Gasholtes (3)

6.1.5 Poreusheid (3)

6.1.6 Spatsels (3)

6.1.7 Barste (3)

6.2 Maak netjiese vryhandsketse van die volgende gewalste profiele:

wat gesweis word deur middel van 'n T-las:

6.2.1 I - balk aan I - balk (4)

6.2.2 Kanaal aan kanaal (4)

6.2.3 Kanaal aan T- balk (4)

6.2.4 Hoekprofiel aan kanaal (4)

6.3 Maak 'n netjiese vryhandskets van 'n karbonerende vlam. (3)

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b.o.

QUESTION 6

6.1 Make neat freehand sketches of the following welding defects:

6.1.1 Undercut (3)

6.1.2 Weld craters (3)

6.1.3 Slag inclusion (3)

6.1.4 Blow holes (3)

6.1.5 Porosity (3)

6.1.6 Weld spatter (3)

6.1.7 Cracks (3)

6.2 Make neat freehand sketches of the following rolled sections welded by means of a T-joint:

6.2.1 I - beam to I - beam (4)

6.2.2 Channel to channel (4)

6.2.3 Channel to I - beam (4)

6.2.4 Angle to channel (4)

6.3 Make a neat freehand sketch of a carbonising flame. (3)

[40]

VRAAG 7

7.1 Bereken Young se Modulus (E) vir 'n staalstaaf met 'n deursnee-oppervlakte van 1 200mm² as die oorspronklike lengte 3,2 meter is en dit met 1,2mm verleng as 'n belasting van 15kN toegepas word. (25)

$$\text{SPANNING} = \frac{\text{BELASTING}}{\text{DEURSNEE-OPPERVLAKTE}}$$

$$\text{VORMVERANDERING} = \frac{\text{VERVORMING}}{\text{OORSPRONKLIKE LENGTE}}$$

$$E = \frac{\text{SPANNING}}{\text{VORMVERANDERING}}$$

7.2 Teken die korrekte sweissimbole vir die volgende sweislasse:

7.2.1 `n Enkel-V-stuiklas aan die anderkant met 'n wortelgaping van 3mm en 'n ingeslote hoek van 60º. (5)

7.2.2 `n Hoeksweislas in 'n T-las met verspringende onderbroke sweiswerk. (5)

7.2.3 `n Hoeksweislas in 'n T-las met onderbroke sweiswerk. (5)

[40]

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QUESTION 7

7.1 Calculate Young's Modulus (E) for a steel bar with a cross-sectional area of 1 200mm² if the original length is 3,2 metres and it stretches by 1,2mm when a load of 15kN is applied. (25)

$$\text{STRESS} = \frac{\text{LOAD}}{\text{CROSS-SECTIONAL AREA}}$$

$$\text{STRAIN} = \frac{\text{DEFORMATION}}{\text{ORIGINAL LENGTH}}$$

$$E = \frac{\text{STRESS}}{\text{STRAIN}}$$

7.2 Draw the correct welding symbols for the following welded joints:

7.2.1 A singel V-butt weld on the other side with a root gap of 3mm, and an included angle of 60°. (5)

7.2.2 A fillet weld in a T-joint with staggered intermittent welding. (5)

7.2.3 A fillet weld in a T-joint with intermittent welding. (5)

[40]

TOTAL: 200

END