GAUTENG DEPARTMENT OF EDUCATION

SENIOR CERTIFICATE EXAMINATION

TECHNIKA (MECHANICAL) HG

Any other acceptable answer not mentioned below, may be accepted as correct.

QUESTION 1

1.1 7,38 rad/s $= \frac{7,38 \times 60}{2\pi}$

$= \frac{442,8}{2\pi}$

= 70,47 r/min (2)

1.2.1 Torque (T) = F x r

= 200 x 0,5

= 100 N.m (2)

1.2.2 W = F x s where s = $2\pi r \times 30°$

= 200 x 0,26 = $2\pi\ (0,5)\frac{(1)}{12}$

= 52,3 J = 0,26 m (4)

1.3 **Boyle's Law**
The volume of a given gas mass is reversely equal to the pressure exerted on it if the temperature remains constant. (4)

1.4 **Thermodynamics** is the branch of physics which relates to heat and work done. (2)

1.5 **Ergonomics**
It is the systematic study or the value estimation of man's productivity in relation to his workplace and his environment.

Its purpose is to reduce exertion and tension of the worker, caused by an incorrect man-machine relationship, which causes in its turn low morale, judgement errors and substandard production.

(4)

1.6 $\text{Sin } Ø = \frac{R - r}{2} = \frac{\frac{M-n}{2} + r - R}{}$

Where R = $\frac{1,01 \times 6}{2}$ = 3,03 $\quad r = \frac{0,5 \times 6}{2}$ = 1,5

$\text{Sin } Ø = \frac{3,03 - 1,5}{\frac{9}{2} + 1,5 - 3,03}$

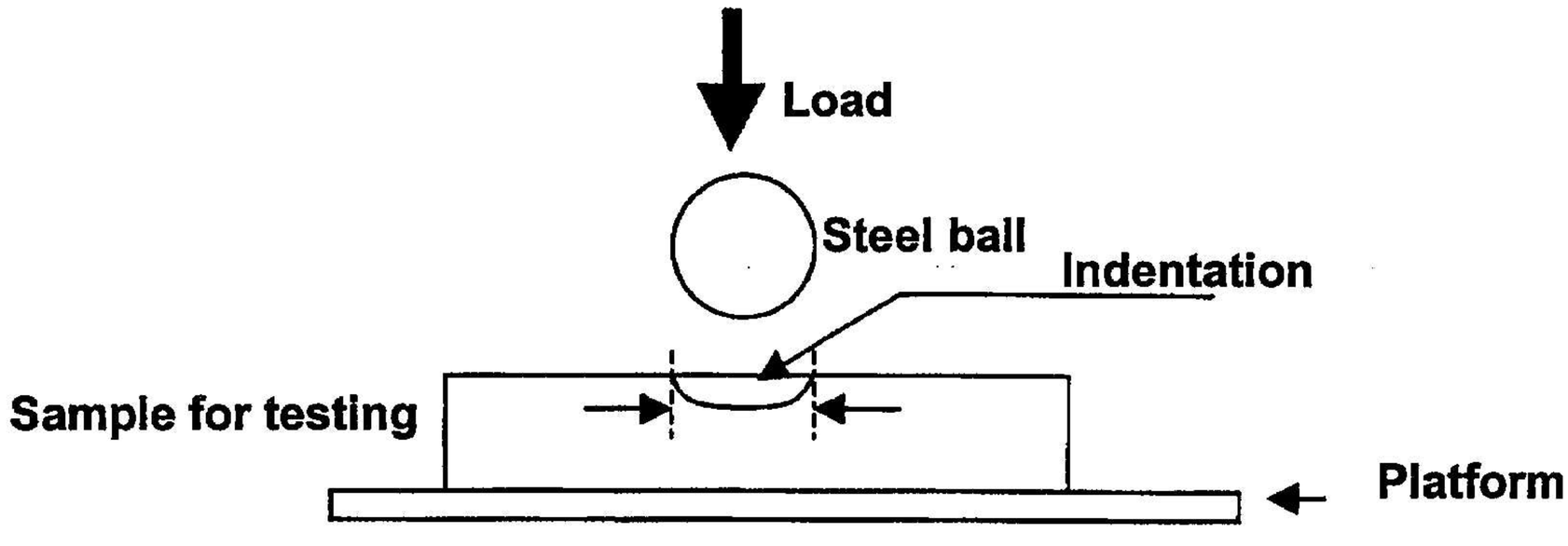
= 0,515

$\frac{\theta}{2} = 31°$ $\quad Ø = 62°$

Error in corner = 62° - 60 = 2° (8)

1.7 **The Brinell hardness test**

Place the workpiece in position.
Choose the correct load for the type of material.
Activate the lever which forces the steel ball into the material.
Calculate indentation by means of microscope. (4)



(4)

1.8 Index plate

- Fit grooved drive plate onto the axle.
- Sharpen and set up tool.
- Cut first thread to the required depth.
- Remove the workpiece from the lathe with the driver plate still attached.
- Replace the workpiece with the driver plate in the groove opposite that of the first thread.
- Cut and complete the second thread. (6)

1.9 **Qualities of an ideal gas:**

- The molecules are identical.
- Distance between molecules is very big.
- Gas only takes up volume because of movement and collisions of molecules.
- No power between molecules except between collisions.
- Collisions are fully elastic. (Any 3) (3)

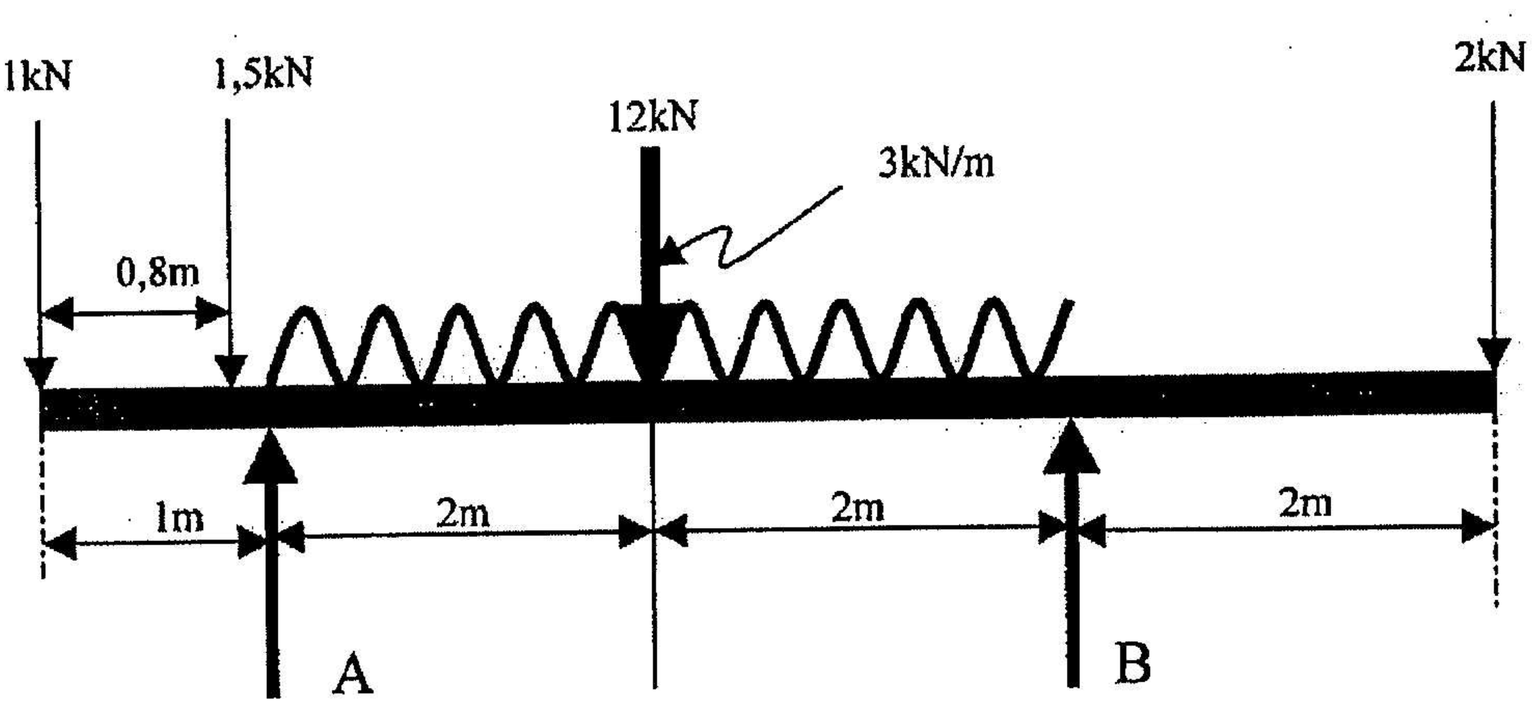
1.10 A power must be exerted.
There must be movement in the direction of the applied power.
There must be resistance. (3)

1.11 To control pressure in the system. Permits liquid to flow to the collection tank as soon as pressure in the system becomes too big. (1)

1.12 Collection tank
Gear pump
Electrical motor
Pressure release valve (3)
[50]

QUESTION 2

2.1



Take moments to A

$\sum LOM = \sum ROM$

$(B \times 4) + (1 \times 1) + (1{,}5 \times 0{,}2) = (12 \times 2) + (2 \times 6)$

$B4 + 1 + 0{,}3 = 24 + 12$

$B4 = 36 - 1{,}3$

$B4 = 34{,}7\ kN$

$B = 8{,}675\ kN$

Take moments to B

$\sum LOM = \sum ROM$

$(2 \times 2) + (A \times 4) = (12 \times 2) + (1{,}5 \times 4{,}2) + (1 \times 5)$

$4 + A4 = 24 + 6{,}3 + 5$

$A4 = 35{,}3 - 4$

$A4 = 31{,}3$

$A = 7{,}825$ kN

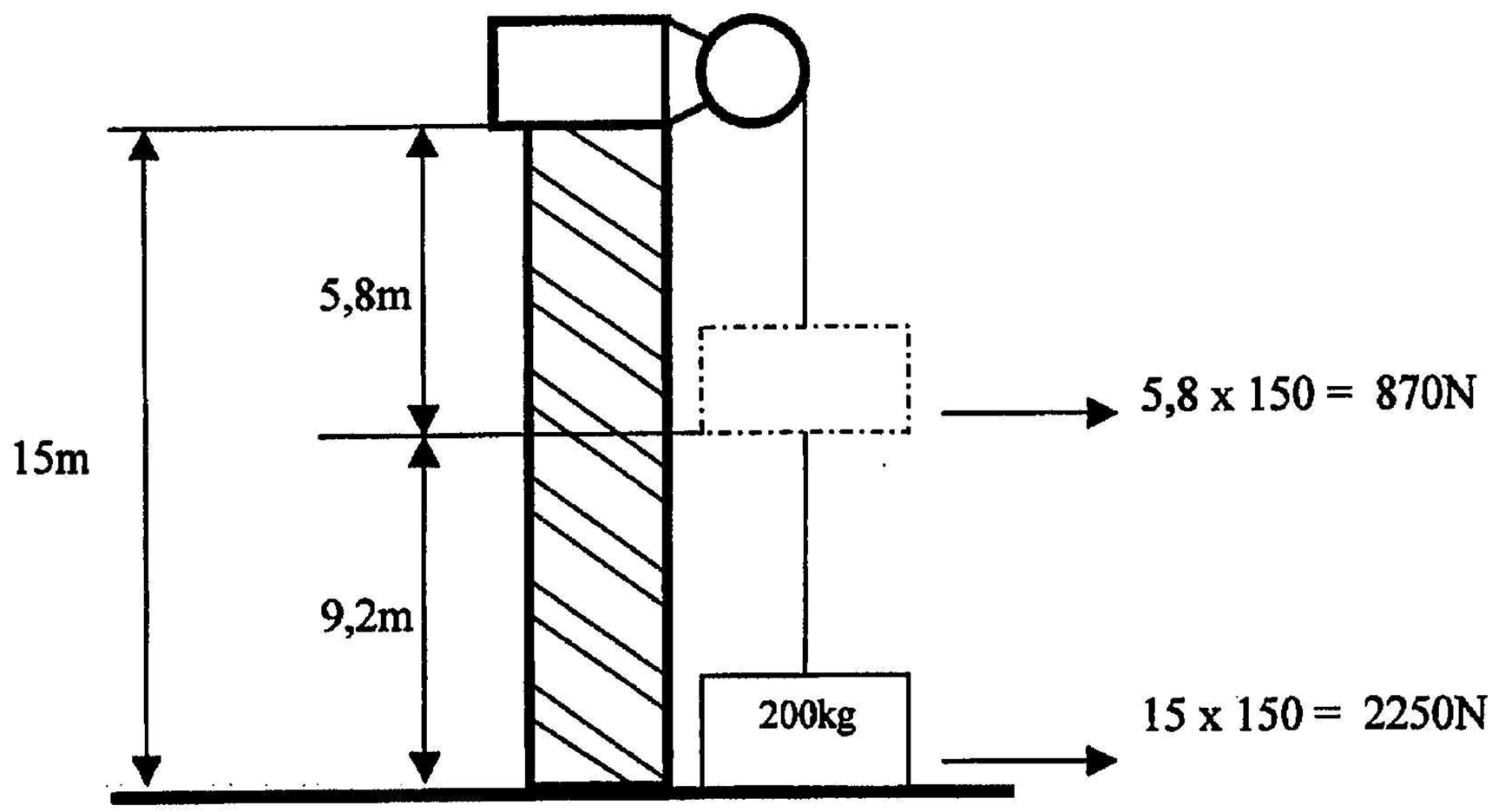
Test:

Upwards F = Downwards F

$8{,}675 + 7{,}825 = 1 + 1{,}5 + 12 + 2$

$16{,}5$ kN = $16{,}5$ kN (2)

2.2



Work done (W) = F for lift + average F for cable x distance

$= 2\,000 \text{ N} + \frac{2250 + 870}{2} \times 9{,}2$

$= \underline{32\,752 \text{ J}}$ (8)

2.3.2 $E = \frac{52{,}81 \times 10^{6}}{4{,}87 \times 10^{-4}}$

$= 108{,}3$ GPa (5)

2.3.3 Span $= \frac{F}{A}$

$= \frac{14{,}01 \times 10^{3}}{1{,}6 \times 10^{-4}}$

$= 87{,}6$ MPa (5)

[50]

QUESTION 3

3.1 **Radian** – it is the corner which is formed in the middle of a circle when the radius is measured on the circumference. (4)

3.2.1 Angular displacement (θ) = $2\pi \frac{1}{3}$
= $\frac{2}{3}\pi$ rad
= 2,09 rad (4)

3.2.2 Displacement (s) = $2\pi r \times \frac{1}{3}$
= $2(\pi)(1,2)\frac{1}{3}$
= 2,51 m (4)

3.2.3 Angular velocity (ω) = $\frac{\theta}{t}$

= $\frac{2,094395}{1200}$

= 0,001745 rad/s (4)

3.2.4 Linear velocity (v) = ωr
= 0,001745 x 1,2
= 0,00209 m/s
= 2,09 mm/s (3)

3.3 Well trained and intelligent
Be fair
Have good judgement
Be consistant (4)

3.4 Planning
Organisation
Leadership
Control (4)

3.5 Factors such as noise, ventilation, lighting and climate must be kept in mind.
Hygiene also plays an important role.
Impure air must be vented away.
Good illumination alleviates stress on the eyes and accidents. (5)

3.6 Root
Peak
Pitch
Acceleration
Flank
Root diameter
Peak diameter (Any 5) (5)

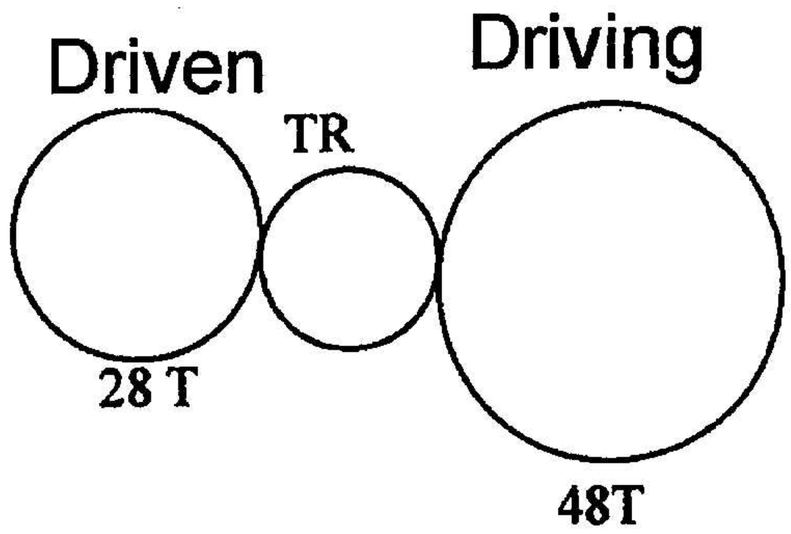
3.7 Indexing = $\frac{40}{A} = \frac{40}{70} = \frac{4}{7}\frac{(x4)}{x4}$ = 16 holes on a 28 hole circle (2)

Change gears: $\frac{\text{driving}}{\text{driven}} = \frac{(A-N)\,x\,40}{A}$

$= \frac{3\,x\,4}{7} = \frac{12(x4)}{7}$

$= \frac{48}{28}$ (5)

Direction of turning positive (same direction as index lever) (2)



(4)
[50]

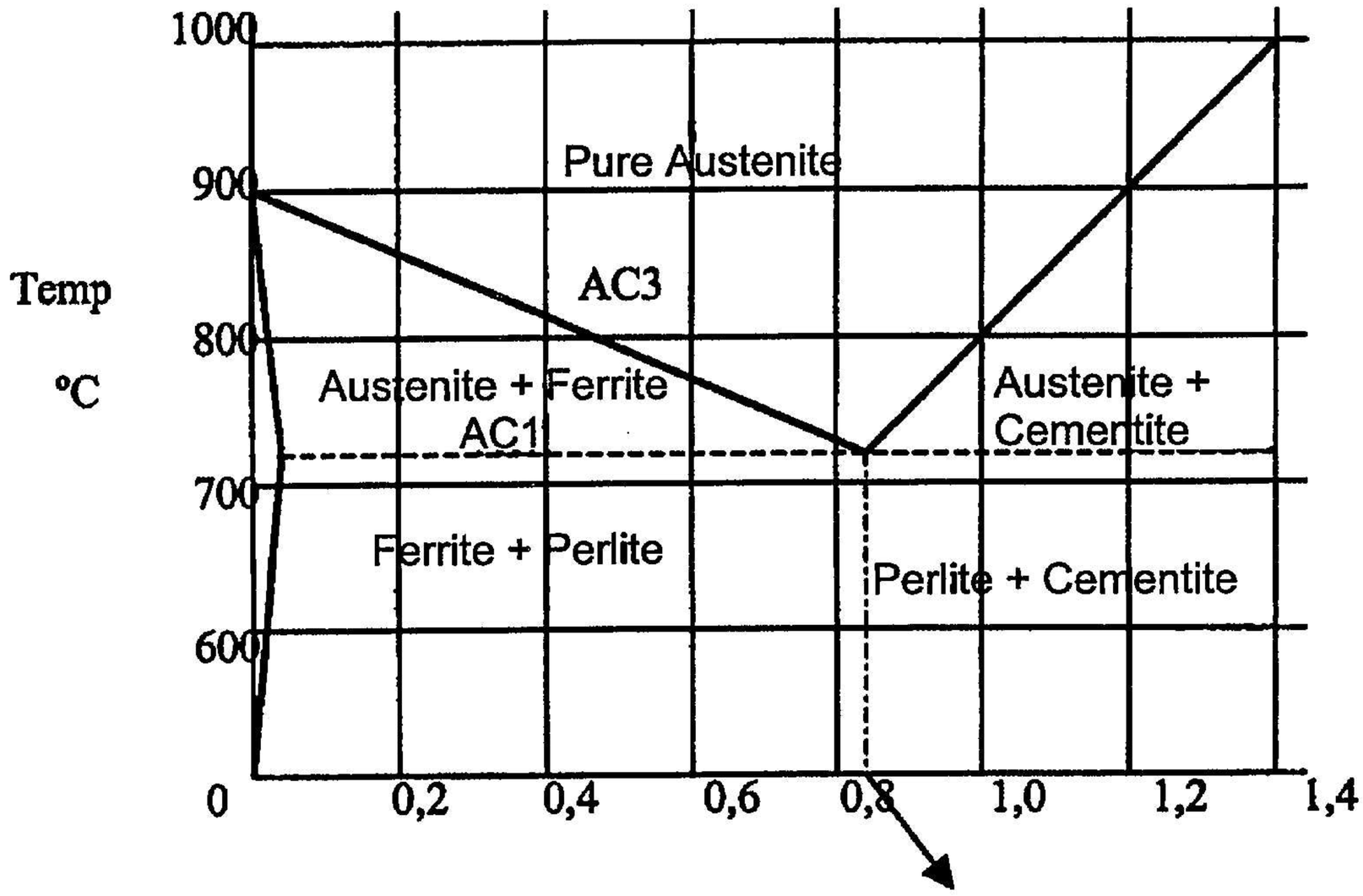
QUESTION 4

4.1 Normalising

- Simple structure to obtain
- Improve mechanical aspects
- To remove internal stresses that may have arisen due to cold working
- Improve strength (4)

4.2 Stretchability (1)

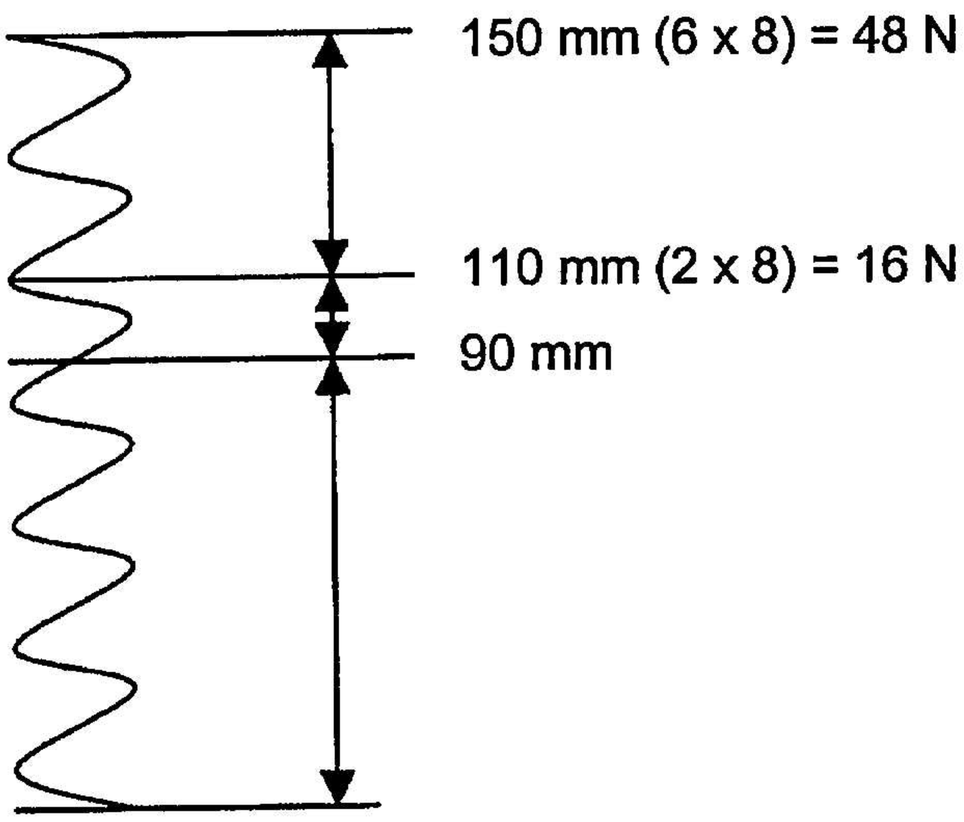
4.3



(12)

4.4 Cubic, piramidal, calcite (3)

4.5



$W = F \times s$

$W = \frac{16+48}{2} \times 0,04$

$W = 32,5 \times 0,04$

$= 1,28 \text{ J}$ (5)

4.6 **Cubic dense packing atom arrangement**
Atom number = 9
Iron, Chrome, Molibdene, Tungsten, Vanadium

Cubic plane-centred atom arrangement
Atom number = 14
Aluminium, Copper, Lead, Nickle, Platina

Hexagonal dense packaging atom arrangement
Atom number = 17
Cobalt, Cadmium, Magnesium, Litanium, Zinc (6)

4.7 $$\frac{PV}{T} = \frac{PV}{T}$$

$$T_2 = \frac{T \times P \times V}{P \times V}$$

$$T_2 = \frac{293 \times 600\,000 \times 1{,}1}{125\,000 \times 2{,}4}$$

$$= 644{,}6 \text{ K}$$

Final temperature **t** = K – 273

= 644,6 – 273

= 371,6°C (5)

4.8 **Isothermic compression**
If the volume of an ideal gas decreases at a constant temperature, pressure will increase. This takes place at a constant temperature and is in accordance with Boyle's law. (4)

4.9 Pulling scale
Wooden blocks
Setting screw
Balance mass
Fly wheel
Brake arm length (6)

4.10 **Hooke's Law**

To an elastic object, form change is directly proportional to applied tension which it causes as long as the equilibrium border is not exceeded. (3)
[50]

QUESTION 5

5.1 For the 15H7-p6 fit

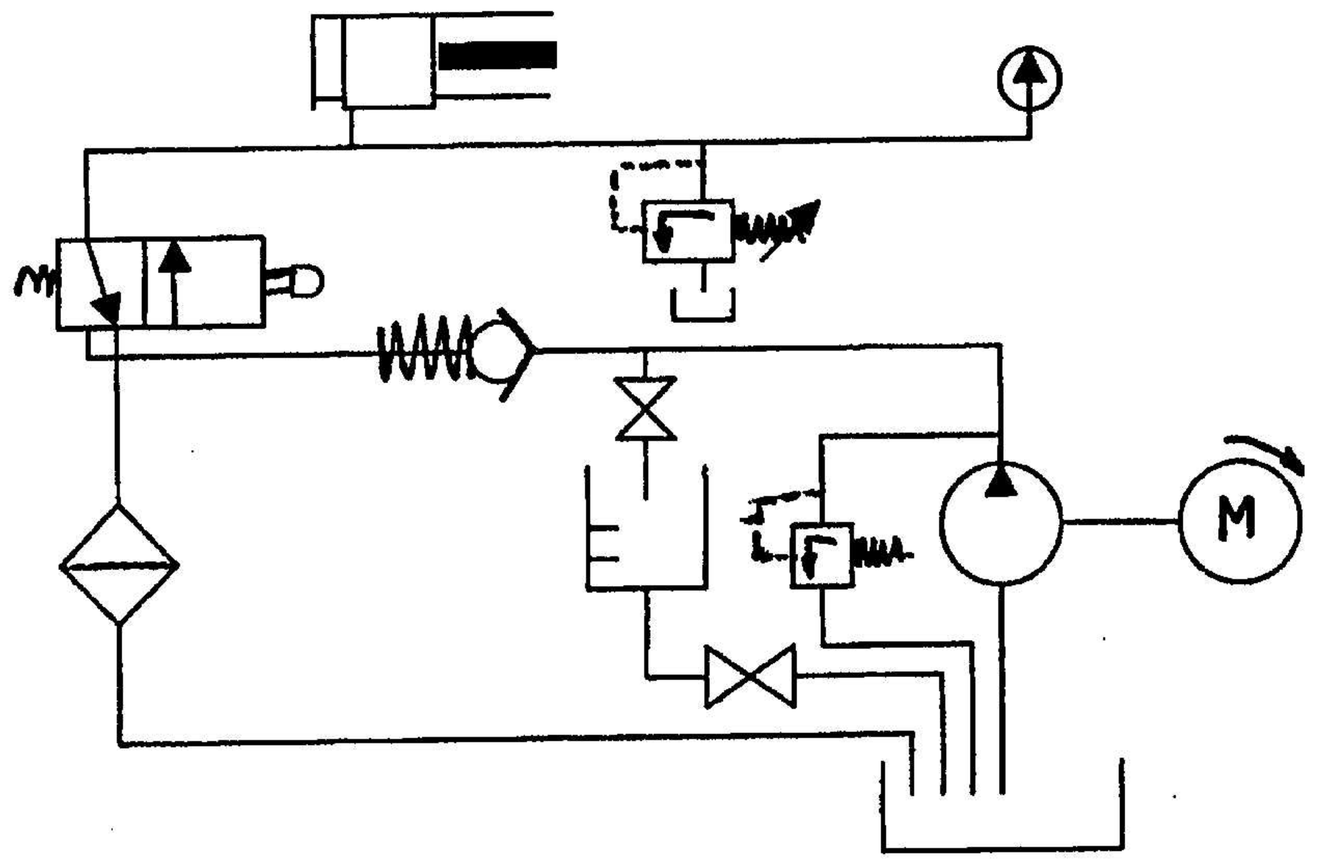
	Hole	Axle
High	15 + 0,018 = 15,018 mm	15 + 0,029 = 15,029
Low	15 + 0 = 15,00 mm	15 + 0,018 = 15,018 mm

(4)

Type of fit: Stop fitting (11)

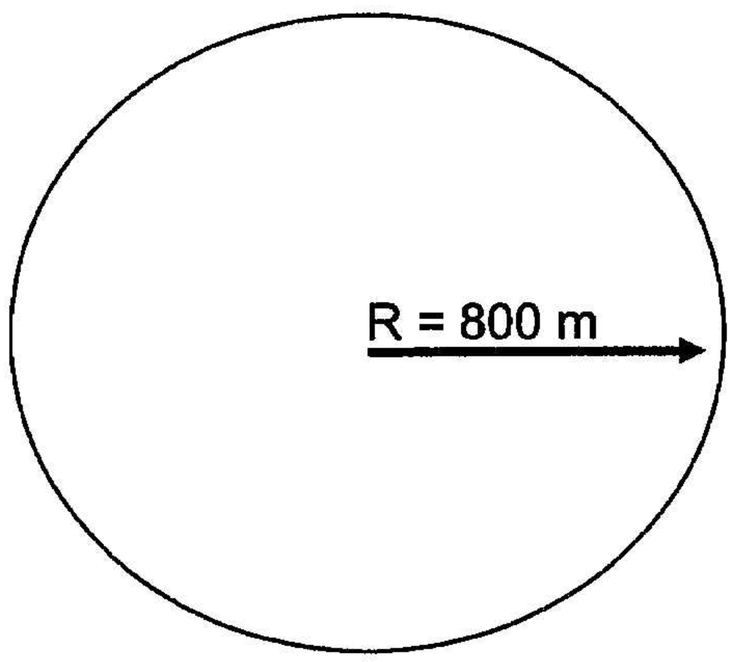
Allowance: It is the high tolerance border of the axle minus the low border of the hole,
i.e. Allowance = 15,029 – 15,00
= 0,029 mm (3)

5.2



(12)

5.3



56 km/h Circumference of circle = $2\pi r$
= 2 x π x 800
= 5 026,5 m

$$\frac{56\,000\text{ m}}{3\,600\text{ s}} = 15{,}55\text{ m/s}$$

Displacement = 15,55 x 60 x 5 = 4 666,6 m (5)

5.4.1 **Gear reduction ratio**

The planet gear frame is connected to the output axle. One of the two other components is closed and the third is driven. Reduction occurs at the planet frame. (4)

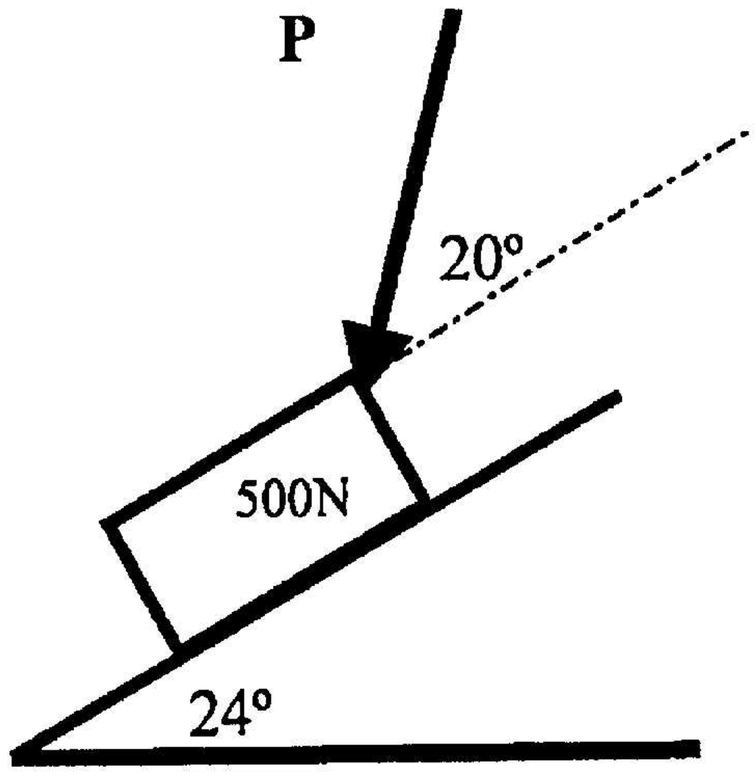
5.4.2 **Overdrive**

When the planet frame is driven, while the other two components are closed, an overdrive or increased speed will occur at the third component. (3)

5.5.1 When the temperature increases, the gas molecules gain more kinetic energy. The molecules then move faster and heavier collisions occur, which increases the pressure. (5)

5.5.2 The molecules of a gas are relatively far apart. When a gas is compressed, the molecules move closer together because the volume decreases. Gases are therefore compressible. (4)

5.6



PCos 20	=	$F\mu$ – 500Sin24
PCos 20	=	0,4 (500Cos24 + PSin20) – 500Sin24
P0,9397	=	0,4 (456,77 + P0,342) – 203,368
P0,9397	=	182,7 + P0,1368 – 203,368
P0,9397 – P0,1368	=	-20,668 N
P0,8029	=	-20,668 N
P	=	$\frac{-20,668\ N}{0,8029}$
P	=	**-25,74 N**

(10)
[50]

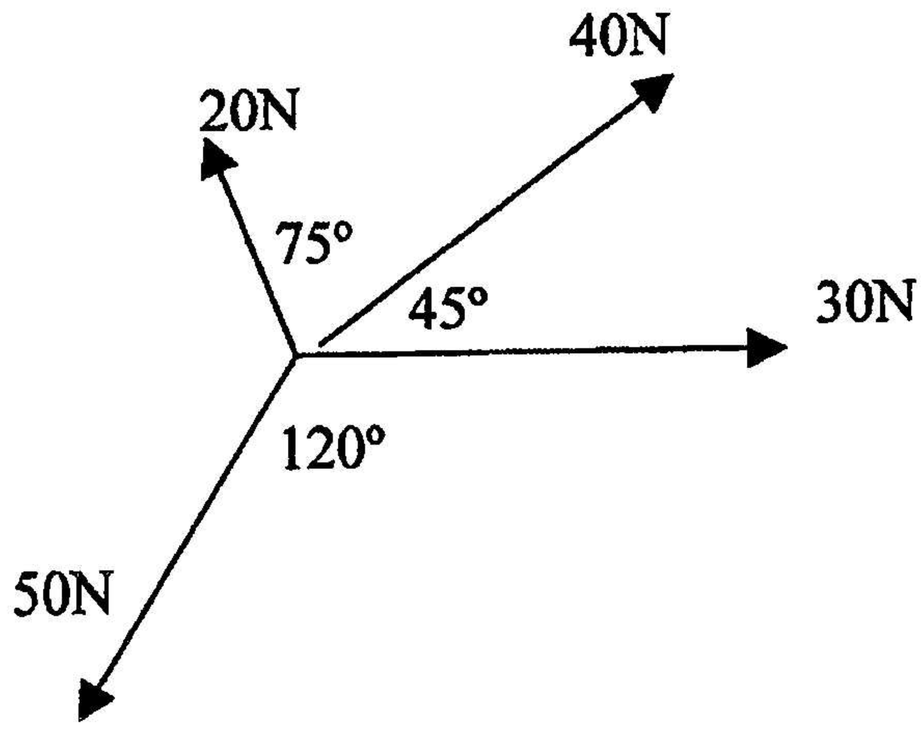
QUESTION 6

6.1 Carbon and hydrogen connect keenly with oxygen from the atmosphere. The end products are carbon dioxide and water. Large quantities of energy are released in the form of heat and light.

Octane petrol + oxygen → Carbon dioxide + Water + Energy

$C_8H_{18} + 0 \rightarrow CO_2 + H_20 + Energy$ (6)

6.2



Sum of the VK
VK = 20 Sin 60° + 40 Sin 45° - 50 Sin 60°
VK = 17,32 + 28,28 – 43,3

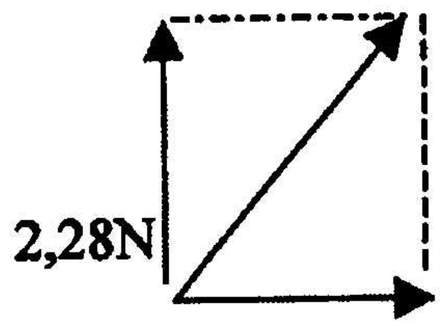
VK = 2,28 N ↑

Sum of the HK
HK = 30 + 40 Cos 45° - 20 Cos 60° - 50 Cos 60°
HK = 30 + 28,28 – 10 -25
HK = 58,28 – 35
HK = 23,8 N ⟶

$R = \sqrt{(2,28)^2 + (23,8)^2}$

$R = \sqrt{5,19 + 541,958}$

R = 23,39 N East 5,47° North



$\text{Tan } Ø = \frac{2,28}{23,39}$

$= 0,0957$

$Ø = 5,47°$

(18)

6.3.1 AD = $PLAN_n$

$$AD = 1\,200 \times 10^3 \times 0,105 \times \frac{\pi \times 45 \times 45}{1000 \times 1000} \times \frac{3500}{60 \times 2} \times 6$$

AD = 1 200 x 10^3 x 0,105 x 0,006361725 x 29,16 x 6

AD= 1 kW

AD = 140,243 kW (7)

6.3.2 Work performed for ONE stroke

W = PLA

$$W = 1\,200 \times 10^2 \times 0,105 \times \frac{\pi \times 45 \times 45}{1000 \times 1000}$$

W = Joule

W = 801,57 J (3)

6.3.3 Brake Power

RD = 2πN T

Where T = FR

T = 220 x 1,2

= 264 Nm

$$RD = 2 \times \pi \times \frac{3\,500}{60} \times 264$$

RD = 96,761 kW (4)

6.3.4 Mechanical Efficiency

$$\text{Efficiency} = \frac{RD}{AD} \times 100$$

$$= \frac{96{,}761\,kW}{140{,}243\,kW} \times \frac{100}{1}$$

= 68,99 %

= 69 % (3)

6.4 Disengaging

- The thrust bearing is moved by the operator in the direction of the fly wheel.
- The disengaging lever moving around the support point, pulls the pressure plate against the tension of the springs and away from the fly wheel.
- The clutch plate is released and is no longer in contact with the fly wheel or the pressure plate.
- The lead bearing comes into operation and enables the fly wheel to rotate around the stationary output axle (clutch plate). (9)

[50]

TOTAL: 300

EXAMINATION NUMBER / *EKSAMENNOMMER* | | | | | | | | | | | | |

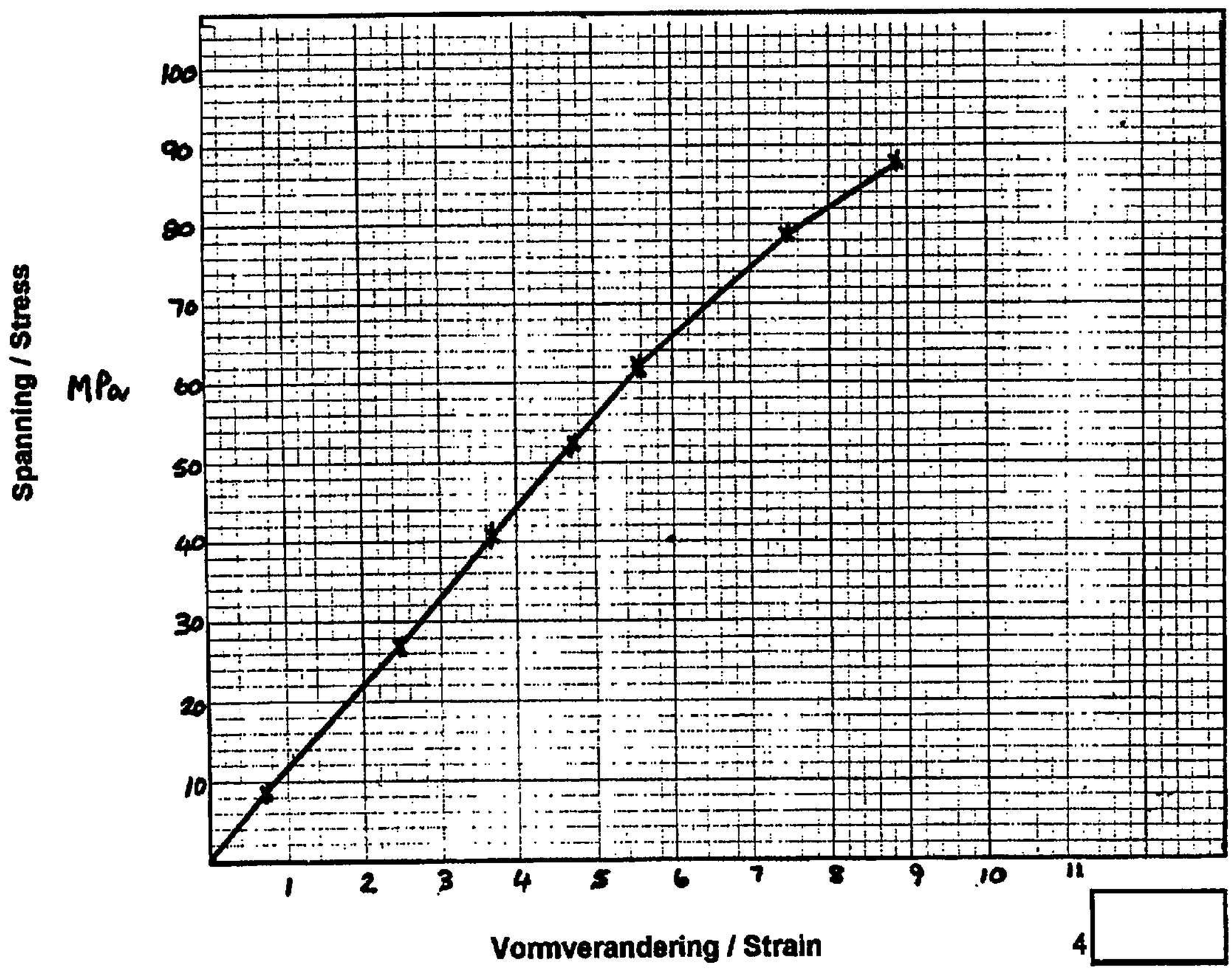
Annexure/ Bylaag A

Question / Vraag 2.3.1

TABLE FOR STRESS AND STRAIN ***TABEL VIR SPANNING - VORMVERANDERING***

Stress / Spanning MPa	**Strain**/ Vormverandering
8,313	$0{,}76 \times 10^{-4}$
26,44	$2{,}44 \times 10^{-4}$
41,69	$3{,}66 \times 10^{-4}$
52,81	$4{,}87 \times 10^{-4}$
62,58	$5{,}48 \times 10^{-4}$
69,5	$6{,}095 \times 10^{-4}$
79,25	$7{,}52 \times 10^{-4}$
87,56	$8{,}94 \times 10^{-4}$

(8 X 2) = 16



4

GAUTENGSE DEPARTEMENT VAN ONDERWYS

SENIORSERTIFIKAAT-EKSAMEN

TECHNIKA (MEGANIES) HG

Enige aanvaarbare antwoord wat nie hieronder genoem word nie, mag as korrek aanvaar word.

VRAAG 1

1.1 7,38 rad/s $= \frac{7,38 \times 60}{2\pi}$

$= \frac{442,8}{2\pi}$

$=$ 70,47 r/min (2)

1.2.1 Draaimoment (T) = F x r

= 200 x 0,5

= 100 N.m (2)

1.2.2 W = F x s

= 200 x 0,26

= 52,3 J

waar s = 2πr x 30°

= $2\pi\ (0,5)\frac{(1)}{12}$

= 0,26 m (4)

1.3 **Die wet van Boyle**
Die volume van 'n gegewe gasmassa is omgekeerd eweredig aan die druk wat daarop uitgeoefen word indien die temperatuur konstant bly. (4)

1.4 **Termodinamika** is die vertakking van fisika wat betrekking het op die verband tussen hitte en arbeid verrig. (2)

1.5 **Ergonomie**
Dit is die sistematiese studie of waardebepaling van die produktiwiteit van die mens in verhouding tot sy werkplek en sy omgewing.

Die doel is om vermoeienis en spanning van die werker te verminder, wat veroorsaak word deur verkeerde man-masjienverhouding, wat op hulle beurt aanleiding gee tot 'n lae moraal, oordeelsfoute en substandaard produksie.

(4)

1.6 $\text{Sin } Ø = \frac{R-r}{2} = \frac{M-n}{2}+r-R$

Waar R = $\frac{1,01 \times 6}{2}$ = 3,03 $\quad r = \frac{0,5 \times 6}{2}$ = 1,5

$\text{Sin } Ø = \frac{3,03-1,5}{\frac{9}{2}+1,5-3,03}$

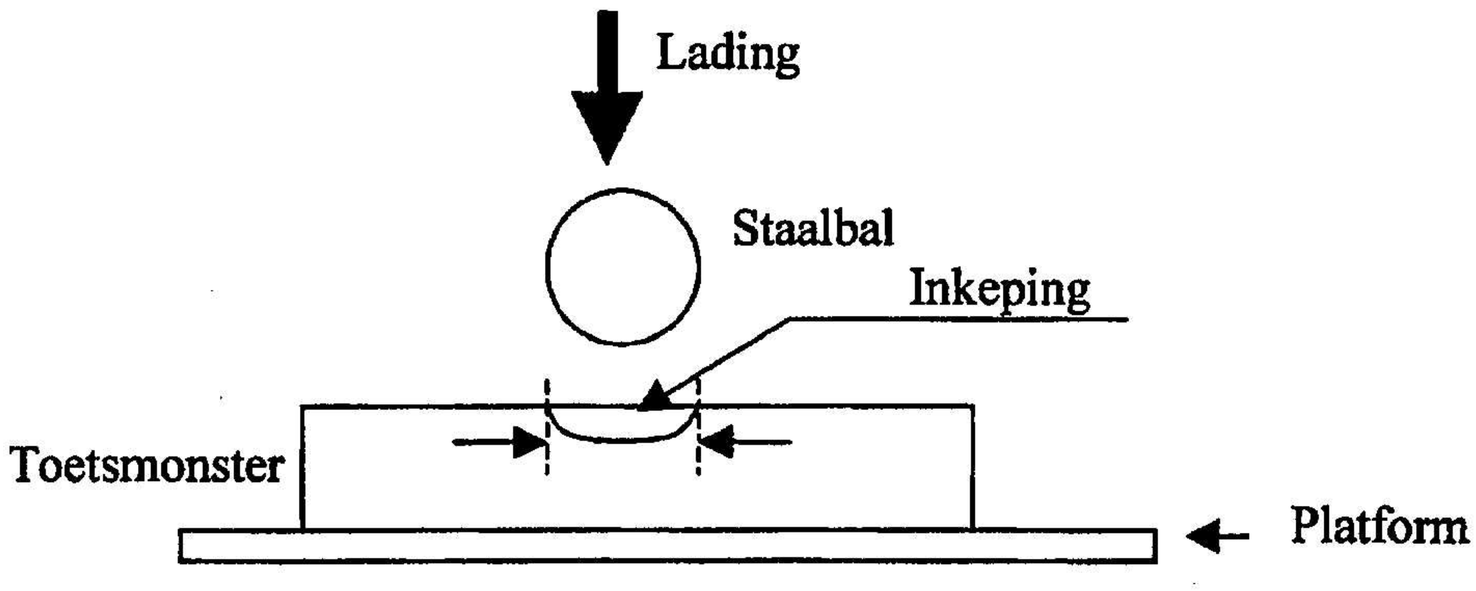
= 0,515

$\frac{\theta}{2} = 31°$ $\quad Ø = 62°$

Fout in hoek = 62° - 60 = 2° (8)

1.7 **Die Brinell – Hardheidstoets**

Plaas die werkstuk in posisie.
Kies die korrekte belasting vir die tipe materiaal.
Aktiveer die hefboom wat die staalbal in die materiaal forseer.
Bereken induiking (inkeping) m.b.v. 'n mikroskoop. (4)



(4)

1.8 Indeksmeeneemplaat

- Pas gegleufde dryfplaat op die spil.
- Maak beitel skerp en stel op.
- Sny die eerste draad tot op die verlangde diepte.
- Verwyder die werkstuk van die draaibank met die meenemer nog vas.
- Plaas die werkstuk terug met die meenemer in die teenoorgestelde gleuf as dit van die eerste draad.
- Sny en voltooi die tweede draad. (6)

1.9 **Eienskappe van 'n ideale gas:**

- Die molekules is identies aan mekaar.
- Afstand tussen molekules is baie groot.
- Gas beslaan slegs volume as gevolg van die beweging en botsings van die molekules.
- Geen kragte tussen molekules behalwe tussen botsings.
- Botsings is volkome elasties. (Enige 3) (3)

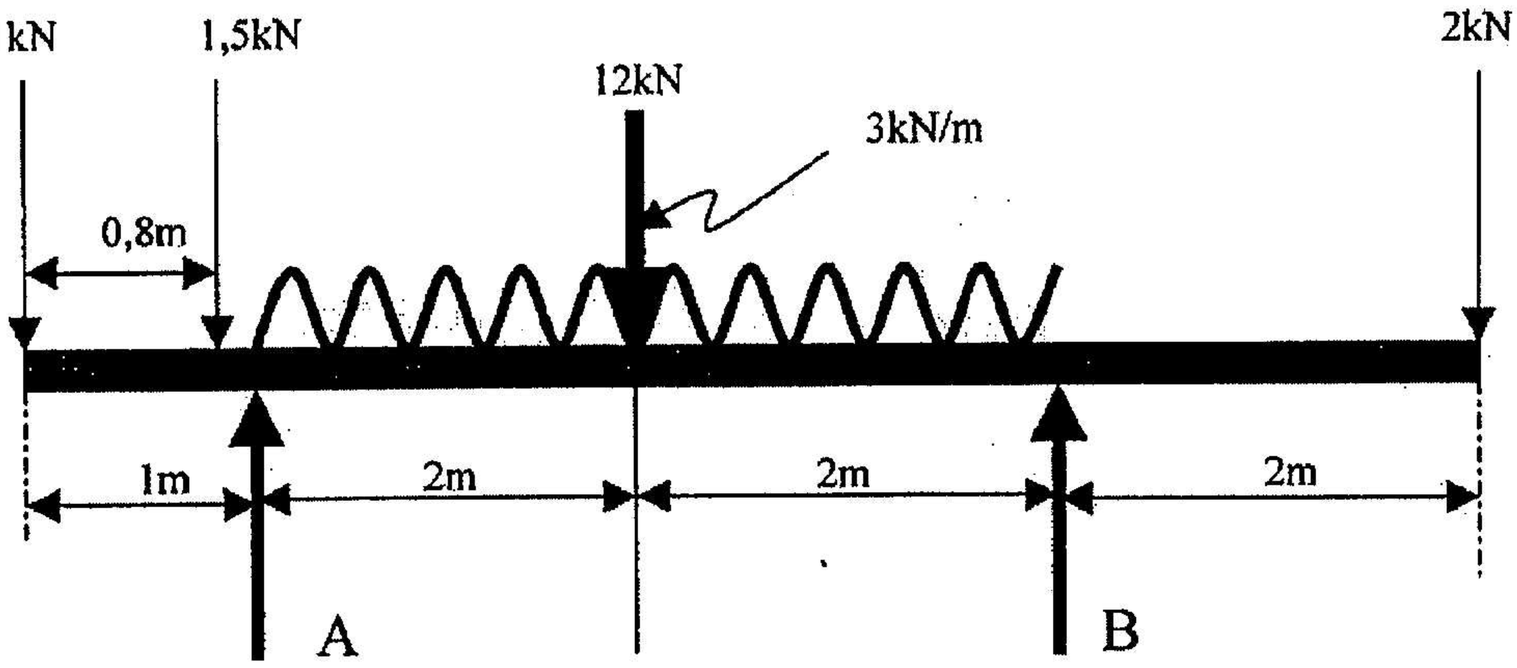
1.10 Daar moet 'n krag uitgeoefen word.
Daar moet beweging wees in die rigting van die toegepaste krag.
Daar moet weerstand wees. (3)

1.11 Druk in die stelsel te beheer. Laat vloeistof na opgaartenk vloei sodra die druk te veel word. (1)

1.12 Opgaartenk
Ratpomp
Elektriese motor
Drukontlasklep (3)
[50]

VRAAG 2

2.1



Neem momente om A

$\sum LOM = \sum ROM$

$(B \times 4) + (1 \times 1) + (1{,}5 \times 0{,}2) = (12 \times 2) + (2 \times 6)$

$B4 + 1 + 0{,}3 = 24 + 12$

$B4 = 36 - 1{,}3$

$B4 = 34{,}7\ kN$

$B = 8{,}675\ kN$

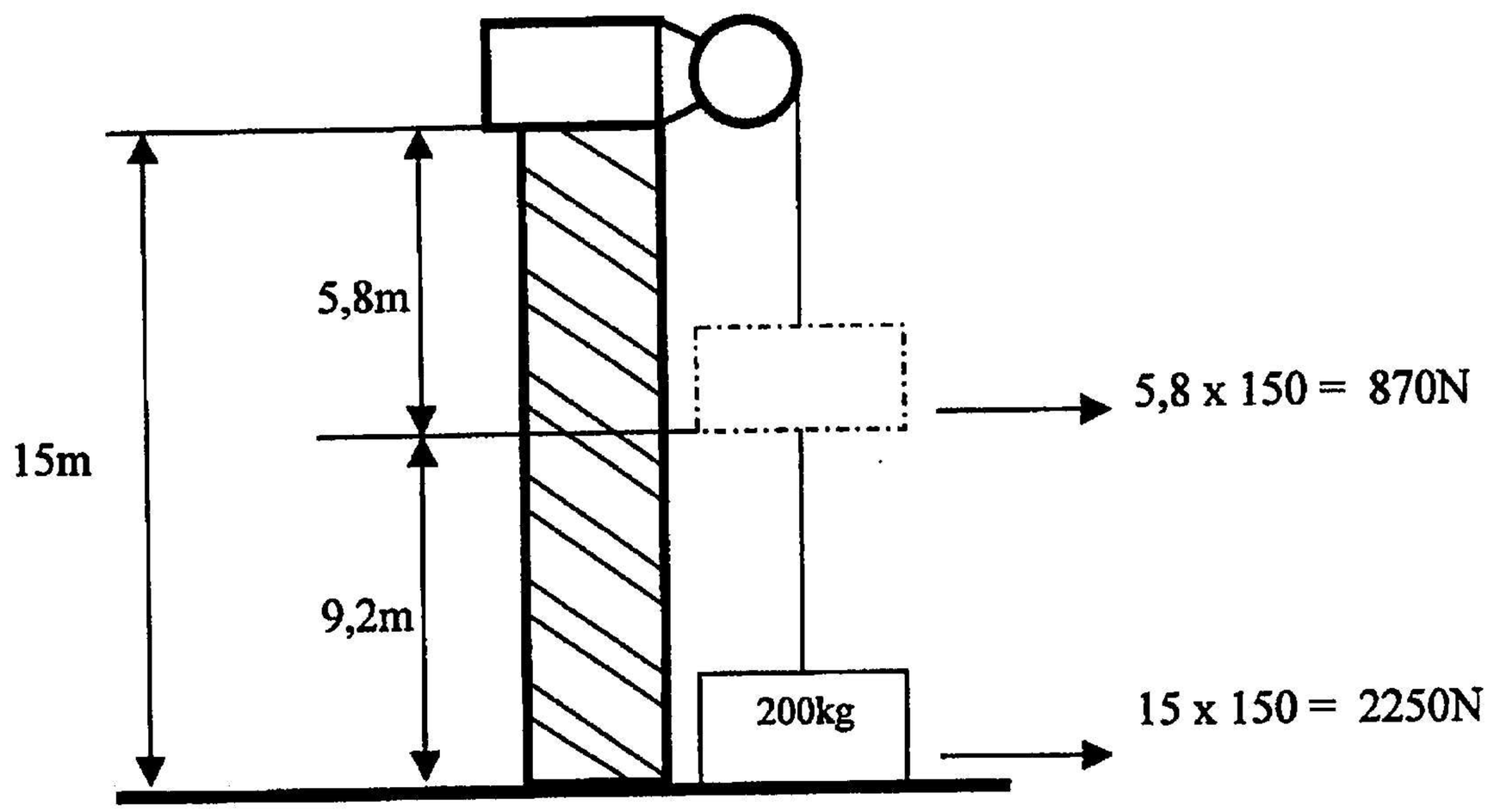
Neem momente om B

$$\sum LOM = \sum ROM$$
$$(2 \times 2) + (A \times 4) = (12 \times 2) + (1{,}5 \times 4{,}2) + (1 \times 5)$$
$$4 + A4 = 24 + 6{,}3 + 5$$
$$A4 = 35{,}3 - 4$$
$$A4 = 31{,}3$$
$$A = 7{,}825 \text{ kN}$$

Toets:

Opwaartse F = Afwaartse F
$8{,}675 + 7{,}825 = 1 + 1{,}5 + 12 + 2$
$16{,}5 \text{ kN} = 16{,}5 \text{ kN}$ (2)

2.2



Arbeid verrig (W) = F vir hysbak + gem F vir kabel x afstand

$$= 2\,000 \text{ N} + \frac{2250 + 870}{2} \times 9{,}2$$
$$= \underline{32\,752 \text{ J}}$$ (8)

2.3.2 $$E = \frac{52{,}81 \times 10^{6}}{4{,}87 \times 10^{-4}}$$

$$= 108{,}3 \text{ GPa}$$ (5)

2.3.3 $$\text{Span} = \frac{F}{A}$$

$$= \frac{14{,}01 \times 10^{3}}{1{,}6 \times 10^{-4}}$$

$$= 87{,}6 \text{ MPa}$$ (5)

[50]

VRAAG 3

3.1 **Radiaal** – dit is die hoek wat by die middelpunt van 'n sirkel gevorm word wanneer die radius op die omtrek afgemeet word. (4)

3.2.1 Hoekverplasing (θ) = $2\pi⅓$
= $⅔\pi$ rad
= 2,09 rad (4)

3.2.2 Verplasing (s) = $2\pi r \times ⅓$
= $2(\pi)(1,2)⅓$
= 2,51 m (4)

3.2.3 Hoeksnelheid (ω) = $\frac{\theta}{t}$

= $\frac{2,094395}{1200}$

= 0,001745 rad/s (4)

3.2.4 Lineêre snelheid (v) = ωr
= 0,001745 x 1,2
= 0,00209 m/s
= 2,09 mm/s (3)

3.3 Goed opgelei en intelligent
Regverdig wees
Goeie oordeelsvermoë
Konsekwent (4)

3.4 Beplanning
Organisering
Leiding
Beheer (4)

3.5 Faktore soos geraas, ventilasie, beligting en klimaat moet in gedagte gehou word. Higiëne speel ook 'n groot rol.
Onsuiwer lug moet weggevoer word.
Goeie beligting verminder stremming op oë en ongelukke. (5)

3.6 Wortel
Kruin
Steek
Versnelling
Flank
Worteldiameter
Kruindiameter (enige 5) (5)

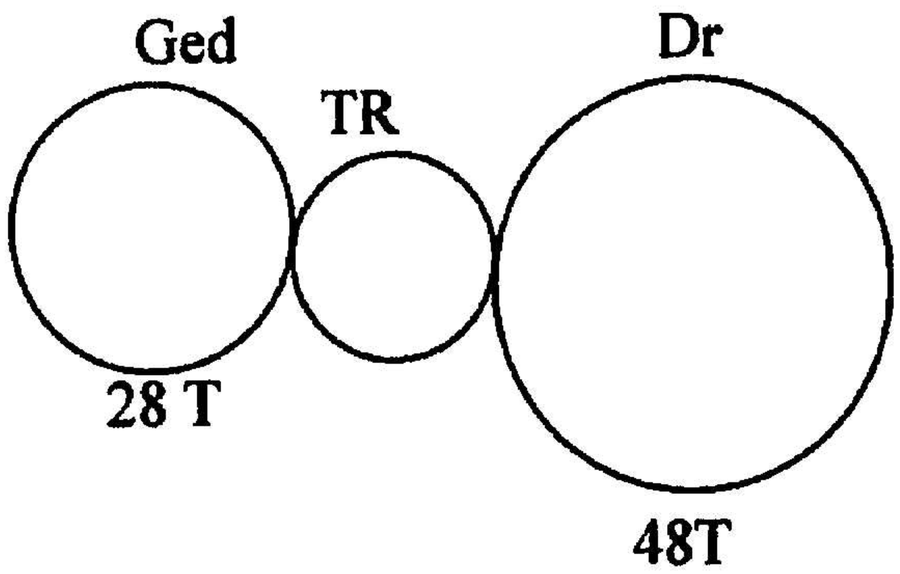
3.7 Indeksering = $\frac{40}{A} = \frac{40}{70} = \frac{4}{7}\frac{(x4)}{x4}$ = 16 gate op 'n 28 gatsirkel (2)

Wisselratte: $\frac{\text{drywer}}{\text{gedrewe}} = \frac{(A-N)\,x\,40}{A}$

$= \frac{3\,x\,4}{7} = \frac{12(x4)}{7}$

$= \frac{48}{28}$ (5)

Draairigting is positief (dieselfde rigting as die indeksslinger) (2)



(4)
[50]

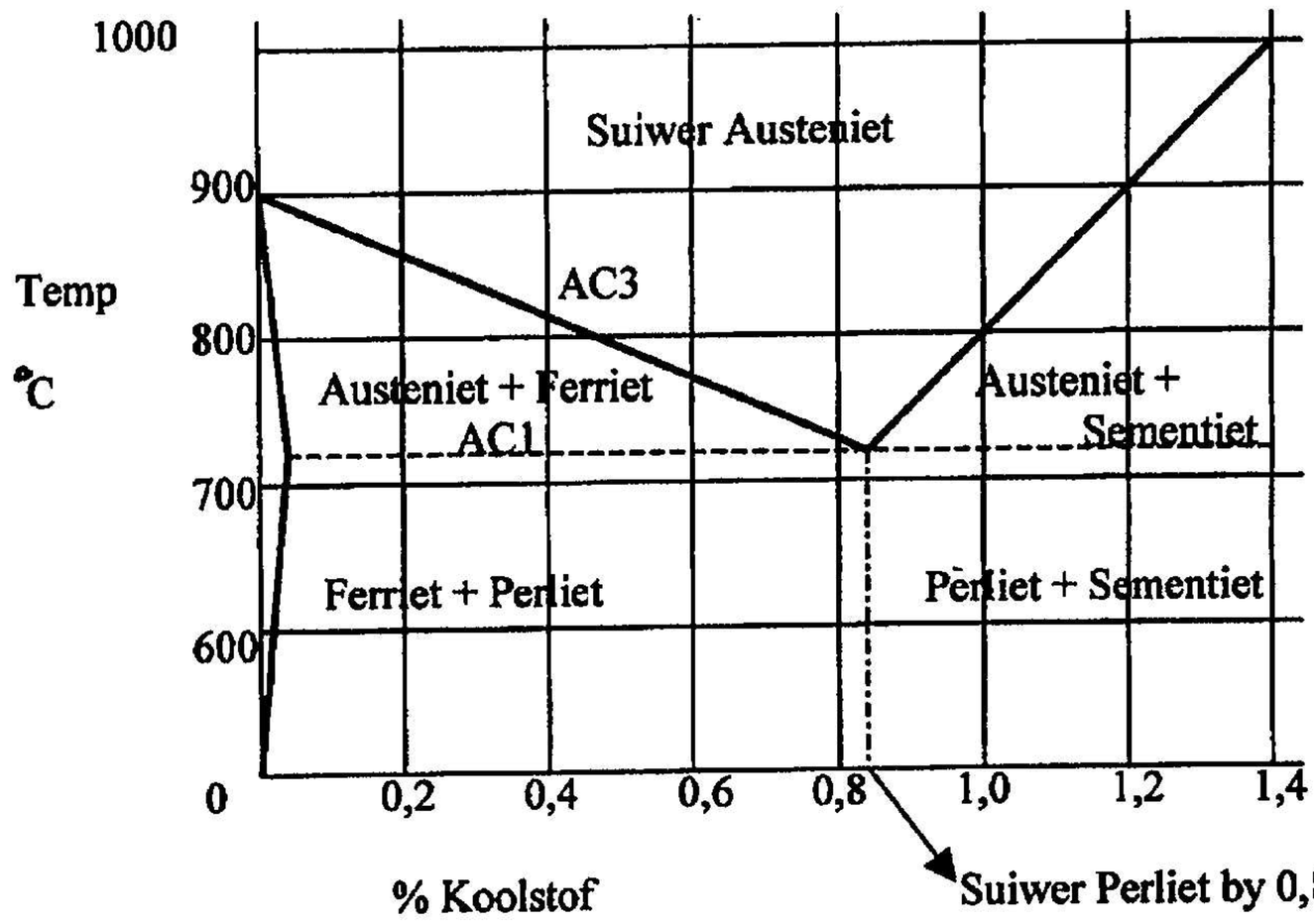
VRAAG 4

4.1 Normalisering

- Eenvormige struktuur te verkry.
- Meganiese eienskappe te verbeter.
- Interne spannings wat gedurende koudbewerking veroorsaak is, te verwyder.
- Sterkte te verbeter. (4)

4.2 Rekbaarheid (1)

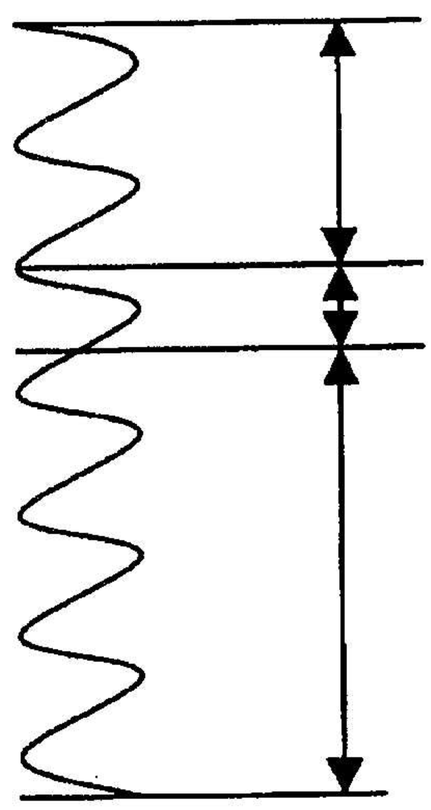
4.3



(12)

4.4 Kubies, piramidaal, kalsiet (3)

4.5



$W = F \times s$

$W = \frac{16+48}{2} \times 0,04$

$W = 32,5 \times 0,04$

$= 1,28 \text{ J}$ (5)

4.6 **Kubiese digpakkingsatoomrangskikking**
Atoomgetal = 9
Yster, Chroom, Molibdeen, Wolfram en Vanadium

Kubiese vlakgesentreerde atoomrangskikking
Atoomgetal = 14
Aluminium, Koper, Lood, Nikkel en Platinum

Heksagonale digpakkingsatoomrangskikking
Atoomgetal = 17
Kobalt, Kadmium, Magnesium, Litanium en Sink (6)

4.7 $$\frac{PV}{T} = \frac{PV}{T}$$

$$T_2 = \frac{T \times P \times V}{P \times V}$$

$$T_2 = \frac{293 \times 600\,000 \times 1{,}1}{125\,000 \times 2{,}4}$$

$$= 644{,}6 \text{ K}$$

Finale temperatuur **t** = K – 273

= 644,6 – 273

= 371,6°C (5)

4.8 **Isotermiese samepersing**
Indien die volume van 'n ideale gas teen konstante temperatuur verminder, sal die druk toeneem. Dit vind plaas by konstante temperatuur en is in ooreenstemming met die wet van Boyle. (4)

4.9 Trekskaal
Houtblokke
Verstelskroef
Balansmassa
Vliegwiel
Remarmlengte (6)

4.10 **Hooke se wet**

Vir 'n elastiese voorwerp is vormverandering direk eweredig aan die toegepaste spanning wat dit veroorsaak mits die eweredigheidsgrens nie oorskry word nie. (3)
[50]

VRAAG 5

5.1 Vir die 15H7-p6 passing

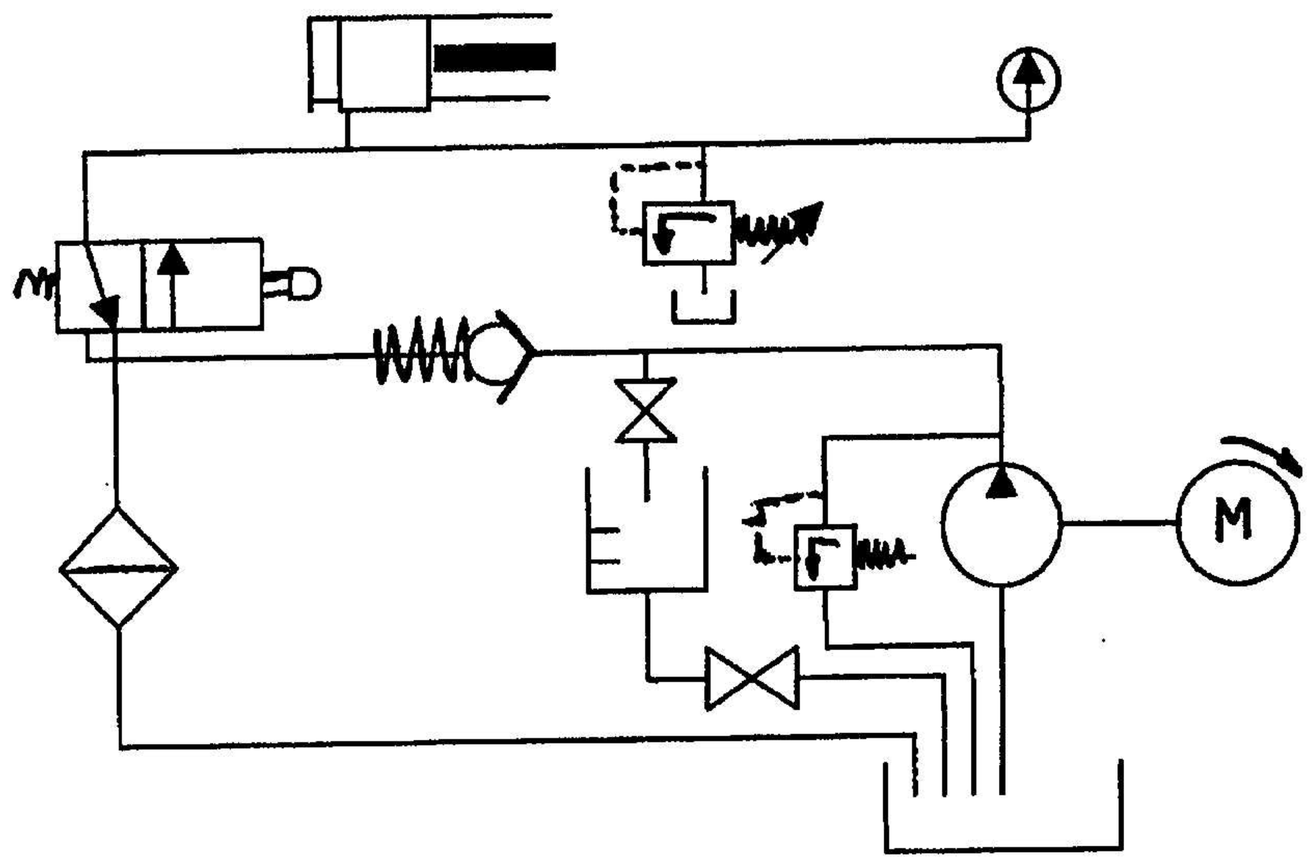
	Gat	As
Hoë	15 + 0,018 = 15,018 mm	15 + 0,029 = 15,029
Lae	15 + 0 = 15,00 mm	15 + 0,018 = 15,018 mm

(4)

Soort passing: Stuitpassing (11)

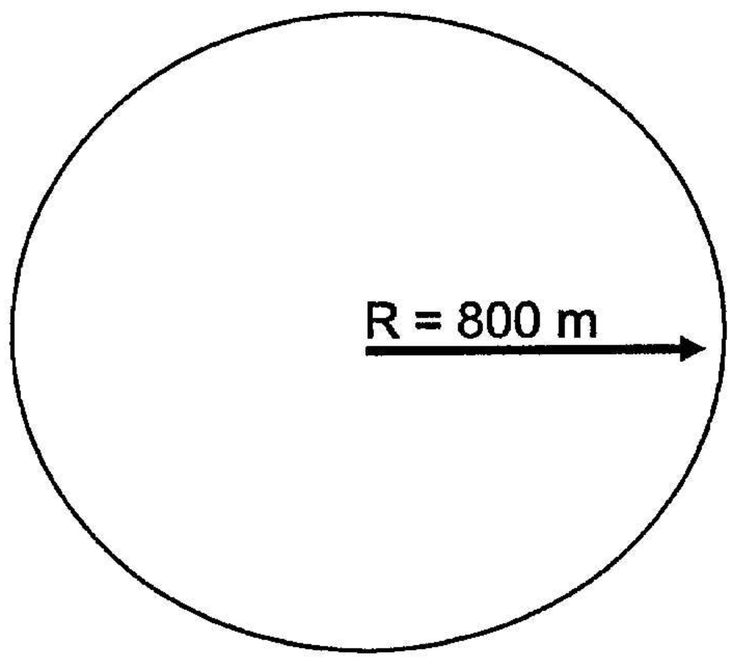
Toelating: Dit is die hoë toleransiegrens van die as minus die laegrens van die gat
d.w.s. Toelating = 15,029 – 15,00
= 0,029 mm (3)

5.2



(12)

5.3



56 km/h Omtrek van sirkel = $2\pi r$
= 2 x π x 800
= **5 026,5 m**

$$\frac{56\,000\text{ m}}{3\,600\text{ s}} = 15{,}55\text{ m/s}$$

Verplasing = 15,55 x 60 x 5 = 4 666,6 m (5)

5.4.1 **Ratreduksieverhouding**

Die planeetratraam word aan die uitsetas gekoppel. Een van die ander twee komponente is gesluit en die derde word aangedryf. Reduksie ontstaan by die planeetraam. (4)

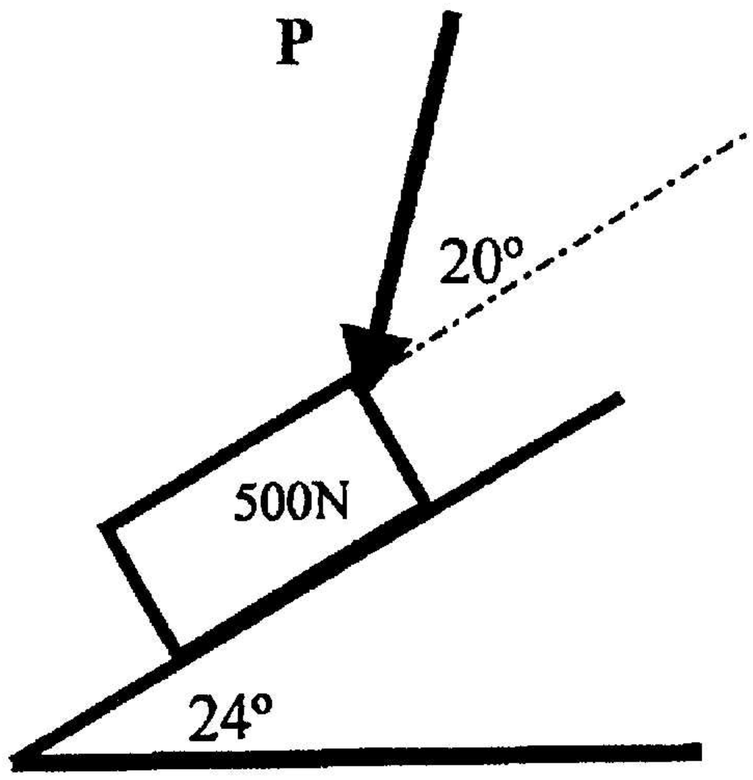
5.4.2 **Snelgang**

Wanneer die planeetraam aangedryf word terwyl die ander twee komponente gesluit word, sal 'n snelgang of spoedverhoging by die derde komponent ontstaan. (3)

5.5.1 Wanneer die temperatuur styg, verkry die gasmolekules meer kinetiese energie. Die molekules beweeg vinniger en hewiger botsings vind plaas sodat die druk toeneem. (5)

5.5.2 Die molekules van 'n gas is relatief ver uitmekaar. Wanneer die gas saamgepers word, kom die molekules nader aan mekaar omdat die volume verminder. Gasse is dus saampersbaar. (4)

5.6



PCos 20	=	$F\mu - 500Sin24$
PCos 20	=	0,4 (500Cos24 + PSin20) – 500Sin24
P0,9397	=	0,4 (456,77 + P0,342) – 203,368
P0,9397	=	182,7 + P0,1368 – 203,368
P0,9397 – P0,1368	=	-20,668 N
P0,8029	=	-20,668 N
P	=	$\frac{-20,668\ N}{0,8029}$
P	=	**-25,74 N**

(10)
[50]

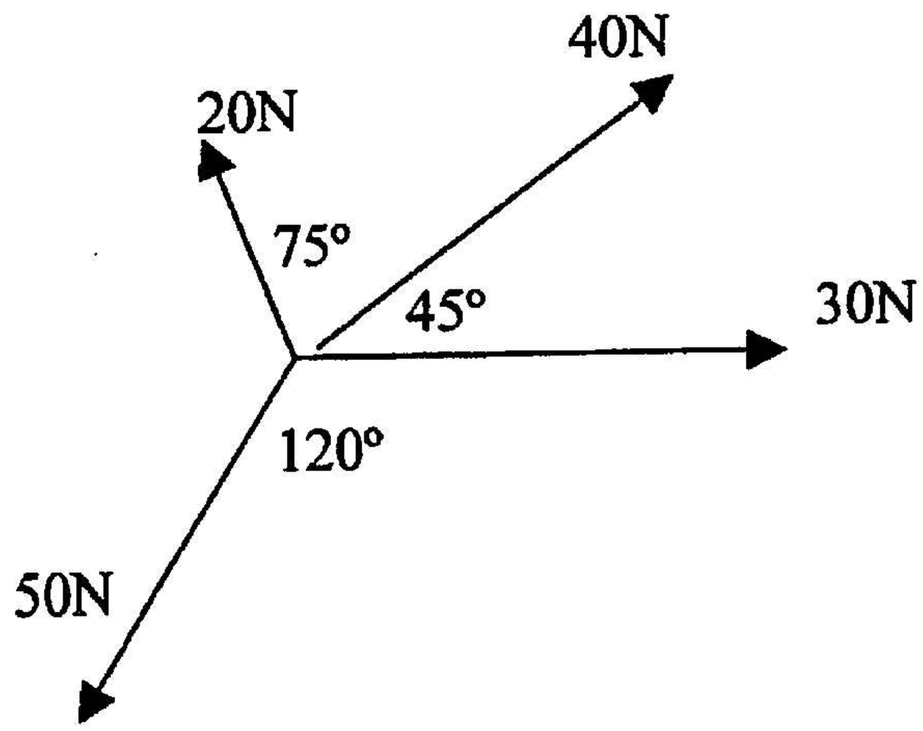
VRAAG 6

6.1 Koolstof en waterstof verbind gretig met suurstof vanuit die lug. Die eindprodukte is koolstofdioksied en water. Groot hoeveelhede energie in die vorm van hitte en lig word vrygestel.

Oktaanpetrol + Suurstof → Koolstofdioksied + Water + Energie

$C_8H_{18} + 0 \rightarrow CO_2 + H_20 + Energie$ (6)

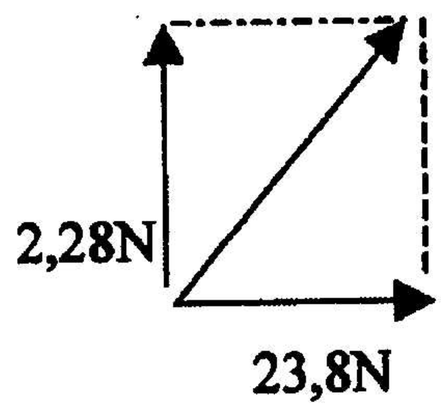
6.2



Som van die VK
VK = 20 Sin 60° + 40 Sin 45° - 50 Sin 60°
VK = 17,32 + 28,28 – 43,3

VK = 2,28 N ↑

Som van die HK
HK = 30 + 40 Cos 45° - 20 Cos 60° - 50 Cos 60°
HK = 30 + 28,28 – 10 -25
HK = 58,28 – 35
HK = 23,8 N ⟶
$R = \sqrt{(2,28)^2 + (23,8)^2}$
$R = \sqrt{5,19 + 541,958}$
R = 23,39 N Oos 5,47° Noord



$\text{Tan } Ø = \frac{2,28}{23,39}$

$= 0,0957$

$Ø = 5,47°$

(18)

6.3.1 $AD = PLAN_n$

$$AD = 1\,200 \times 10^3 \times 0,105 \times \frac{\pi \times 45 \times 45}{1000 \times 1000} \times \frac{3500}{60 \times 2} \times 6$$

AD = 1 200 x 10^3 x 0,105 x 0,006361725 x 29,16 x 6

AD= 1 kW

AD = 140,243 kW (7)

6.3.2 Arbeid verrig vir EEN slag

W = PLA

$$W = 1\,200 \times 10^2 \times 0,105 \times \frac{\pi \times 45 \times 45}{1000 \times 1000}$$

W = Joule

W = 801,57 J (3)

6.3.3 Remdrywing

$RD = 2\pi N\ T$

Waar $T = FR$

$T = 220 \times 1,2$

$= 264\ Nm$

$$RD = 2 \times \pi \times \frac{3\,500}{60} \times 264$$

$RD = 96,761\ kW$ (4)

6.3.4 Meganiese Rendement

$$\text{Rendement} = \frac{RD}{AD} \times 100$$

$$= \frac{96,761\,kW}{140,243\,kW} \times \frac{100}{1}$$

$= 68,99\ \%$

$= 69\ \%$ (3)

6.4 Ontkoppeling

- Die druklaer word deur die operateur in die rigting van die vliegwiel beweeg.
- Die ontkoppelingshefboom wat om die steunpunt beweeg trek die drukplaat teen die spanning van die vere weg van die vliegwiel.
- Die koppelaarplaat kom vry en is nie langer in aanraking met die vliegwiel of drukplaat nie.
- Die leilaer tree in werking en stel die vliegwiel in staat om rondom die stilstaande uitsetas (koppelaarplaat) te roteer. (9)

[50]

TOTAAL: 300

EXAMINATION NUMBER / *EKSAMENNOMMER* | | | | | | | | | | | | |

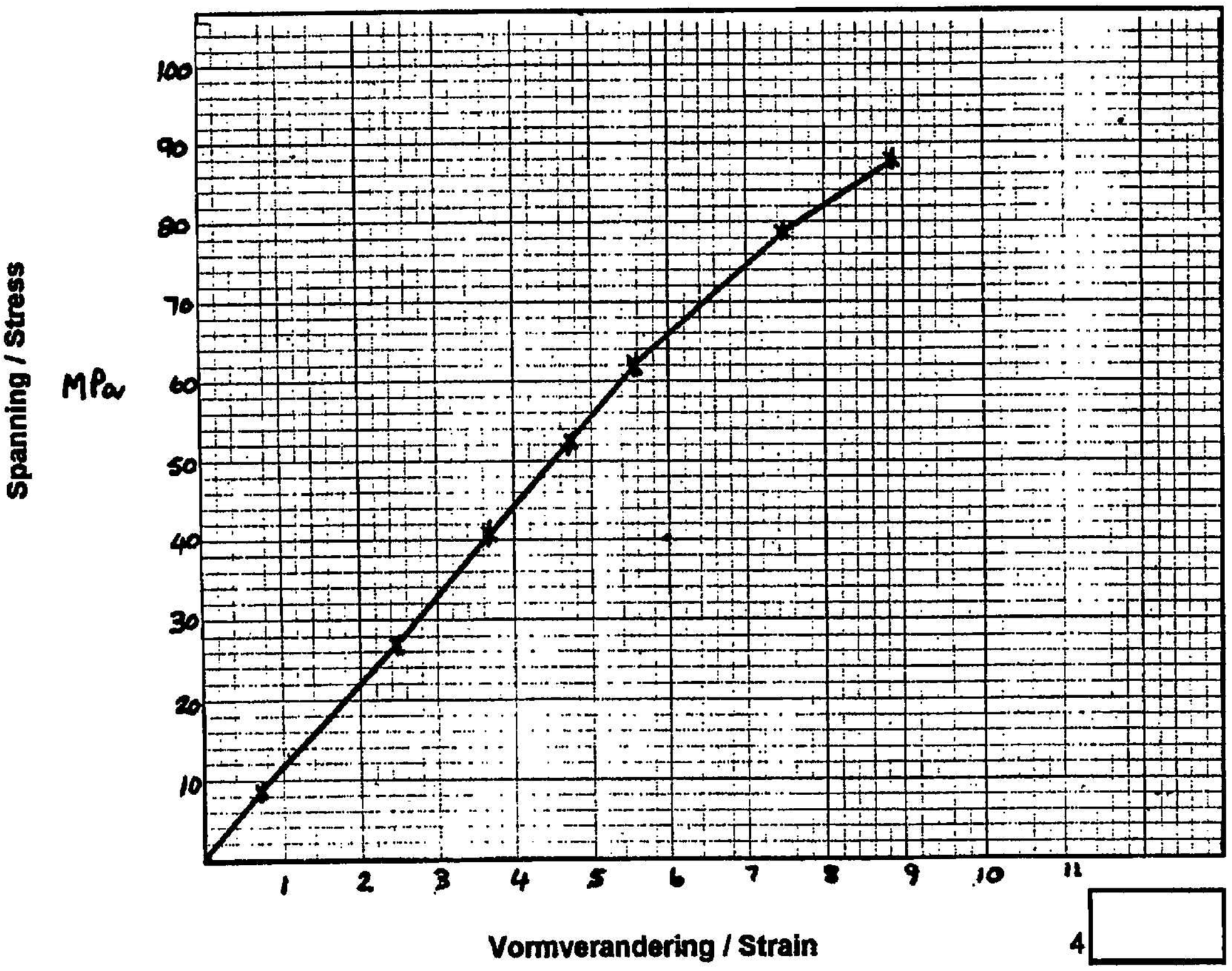
Annexure/ Bylaag A

Question / Vraag 2.3.1

TABLE FOR STRESS AND STRAIN ***TABEL VIR SPANNING - VORMVERANDERING***

Stress / Spanning MPa	Strain/ Vormverandering
8,313	$0,76 \times 10^{-4}$
26,44	$2,44 \times 10^{-4}$
41,69	$3,66 \times 10^{-4}$
52,81	$4,87 \times 10^{-4}$
62,58	$5,48 \times 10^{-4}$
69,5	$6,095 \times 10^{-4}$
79,25	$7,52 \times 10^{-4}$
87,56	$8,94 \times 10^{-4}$

(8 X 2) = 16



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