higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

NASIENRIGLYN

NASIONALE SERTIFIKAAT

MEGANOTEGNIEK N4

7 April 2021

Hierdie nasienriglyn bestaan uit 9 bladsye.

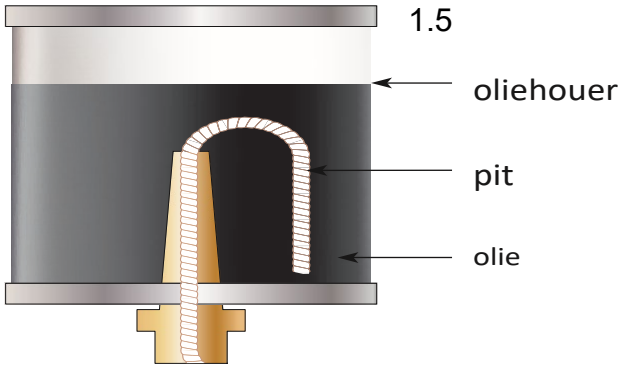
Kopiereg voorbehou

VRAAG 1

1.1
- Buigsame uitleg
- Gekoördineerde diens
- Duidelike vervoerroete
- Optimum gebruik van spasie
- Toeganklike diens- en onderhoudpunte
- Aangename werkstoestande
- Minimum hantering van materiaal
- Minimum reisafstand vir personeel en materiaal
- Eenrigtingvloei van materiaal en produkte
- Veiligheid van werkers en sekerheid van toerusting (Enige 5 × 1) (5)

1.2
- Anodisering
- Galvanisering
- Elektroplatering
- Fosfatering
- Katodiese beskerming (5)

1.5



(5)

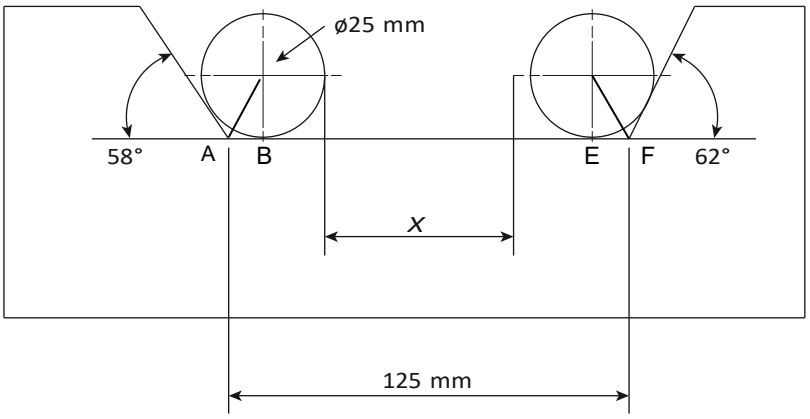
(2 punte vir die skets en 3 punte vir die etikettering)

[15]

Kopiereg voorbehou

VRAAG 2

2.1



$$\tan 61° = \frac{12,5}{AB} \checkmark$$

$$AB = \frac{12,5}{\tan 61°} \checkmark$$

$$AB = 6,929mm \checkmark$$

Ook

$$\tan 59° = \frac{12,5}{EF} \checkmark$$

$$EF = \frac{12,5}{\tan 59°} \checkmark$$

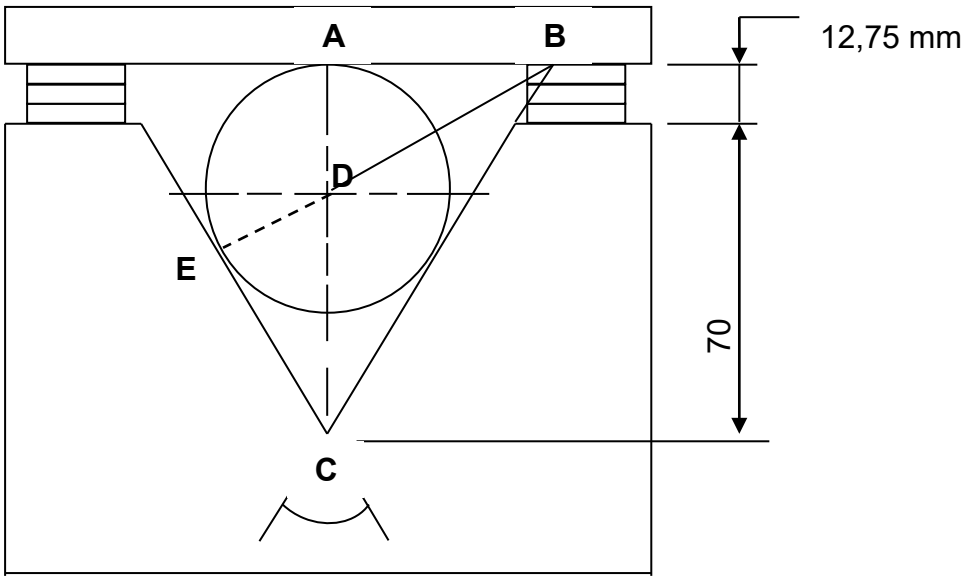
$$EF = 7,511mm \checkmark$$

$$EF = 125 - AB - EF - 2(r)$$

$$EF = 125 - 6,929 - 7,511 - 2(12,5) \checkmark$$

$$EF = 85,56mm \checkmark$$ (8)

2.2



$in\Delta ABC$

$$\tan\theta = \frac{AB}{AC}$$

$$AB = 82{,}75\tan 30° \checkmark$$

$$= 47{,}776mm \checkmark$$

$in\Delta ABD$

$$\tan 30° = \frac{AD}{47{,}776} \checkmark$$

$$AD = 47{,}776\tan 30° \checkmark$$

$$= 27{,}583mm \checkmark$$

$$Diameter = 2 \times AD$$

$$Diameter = 2 \times 27{,}583 \checkmark$$

$$= 55{,}166mm \checkmark$$

OF

$$AC = AD + CD$$

$AD = r \text{ and } AD = ED$

$in\Delta CDE$

$$\sin 30° = \frac{ED}{CD}$$

$$CD = \frac{r}{\sin 30} \checkmark$$

$$= 2r \checkmark$$

$$AC = AD + CD$$

$$82{,}75 = r + 2r \checkmark$$

$$r = \frac{82{,}75}{3} \checkmark$$

$$= 27{,}583mm \checkmark$$

$$Diameter = 2 \times 27{,}583 \checkmark$$

$$= 55{,}166mm \checkmark$$

(7)

[15]

VRAAG 3

3.1 $T_A = T_S + 2T_P$

$T_A = 60 + 2 \times 20$

$T_A = 100\,tande$✓

Nr	Toestand	Rat A	Rat P	Rat S	Arm D
1	*Bevestig arm D en roteer Rat A met +1rev*	$+1\surd$	$\frac{100}{20} = 5\surd$	$= \frac{100}{20} \times \frac{20}{-60}\surd$ $= -1{,}667$	$0\surd$
2	*Vermenigvuldig met x en y*	$x + y\surd$	$5x + y\surd$	$-1{,}667x + y\surd$	$+ y\surd$
3	$N_A = 0$ $N_S = 450r/\min$ $N_D = ?$	$N_A = 0\surd$		$N_S = 450\surd$	$N_D = ?\surd$
4	$N_A = ?$ $N_S = 450r/\min$ $N_D = -15$	$N_A = ?\surd$		$N_S = 450\surd$	$N_D = -15\surd$

$x + y = 0$

$x = -y$.....1

$-1{,}667x + y = 450$.....2

substitute ...1 *in* 2

$-1{,}667(-y) + y = 450$✓

$y = \frac{450}{2{,}667}$✓

$y = 168{,}729$

$N_D = 168{,}729r/\min$ *clockwise /positive direction*✓ (11)

3.2 $y = -15$.....1

$-1{,}667x + y = 450$.....2

substitute ...1 *in* 2

$-1{,}667x - 15 = 450$

$x = \frac{465}{-1{,}667}$✓

$x = -278{,}944$✓

$N_A = x + y$

$N_A = -278{,}944 - 15$✓

$N_A = -293{,}944$

$N_A = 293{,}944r/\min$ *anti – clockwise /opposite direction*✓ (4)

[15]

VRAAG 4

$D_e = D + t$
$D_e = 1,2 + 0,012$ ✓
$D_e = 1,212m$ ✓

$v = \frac{\pi D_e N}{60}$
$v = \frac{\pi 1,212 \times 240}{60}$ ✓✓
$v = 15,23m/s$ ✓

[5]

VRAAG 5

5.1 5.1.1

$h_f = \frac{f \times l \times Q^2}{3,026 \times d^5}$

$h_f = \frac{p}{Rhoxg}$

$h_f = \frac{60 \times 10^3}{1000x9,81}$ ✓
$= 6,116m$ ✓

$f = \frac{h_f \times 3,026 \times d^5}{l \times Q^2}$

$= \frac{6,116 \times 3,026 \times (0,09)^5}{20 \times (0,03)^2}$ ✓✓
$= 0,00607$ ✓ (5)

5.1.2

$m = \frac{d}{4}$
$= \frac{0,09}{4}$ ✓
$= 0,023$ ✓ (2)

5.1.3

$i = \frac{h_f}{l}$
$= \frac{6,116}{20}$ ✓
$= 0,306$ ✓ (2)

5.1.4

$$C = \frac{v}{\sqrt{mi}} \qquad A = \frac{\pi d^2}{4}$$

$$v = \frac{Q}{A} \qquad = \frac{\pi(0{,}09)^2}{4} \surd$$

$$= \frac{0{,}03}{6{,}361 \times 10^{-3}} \surd \qquad = 6{,}361x10^{-3}\, m^2 \checkmark$$

$$= 4{,}716 m/s \checkmark$$

$$C = \frac{v}{\sqrt{mi}}$$

$$= \frac{4{,}716}{\sqrt{0{,}023 \times 0{,}306}} \checkmark$$

$$= 56{,}215 \checkmark$$

(5)

5.2

$$A = \frac{\pi D^2}{4}$$

$$A = \frac{\pi 0{,}18^2}{4}$$

$$A = 0{,}025 m^2 \checkmark$$

$$m^2 = \frac{D^4}{d^4}$$

$$m^2 = \frac{0{,}18^4}{0{,}11^4}$$

$$m^2 = 7{,}170 \checkmark$$

$$h = 12{,}6 h_1$$

$$h = 12{,}6(0{,}86)$$

$$h = 10{,}836 m \checkmark$$

$$Q = C_d \times A \times \sqrt{\frac{2gh}{(m^2 - 1)}}$$

$$Q = 0{,}97 \times 0{,}025 \times \sqrt{\frac{2(9{,}81) \times 10{,}836}{(7{,}170\ -1)}} \checkmark\checkmark$$

$$Q = 0{,}142 m^3/s \checkmark$$

(6)

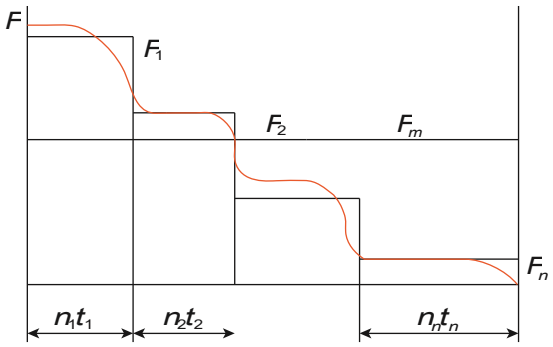
[20]

VRAAG 6

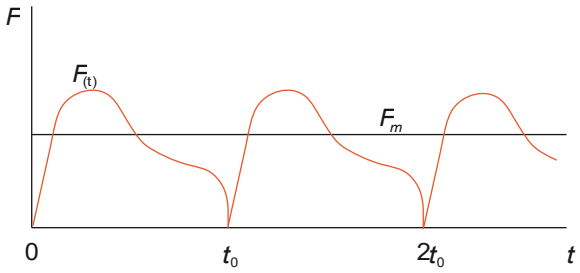
6.1
- Fluktuerende traplas
- Lineêre fluktuerende las
- Sinusvormige fluktuerende las
- Deurlopend fluktuerende las

(Enige 3 × 1) (3)

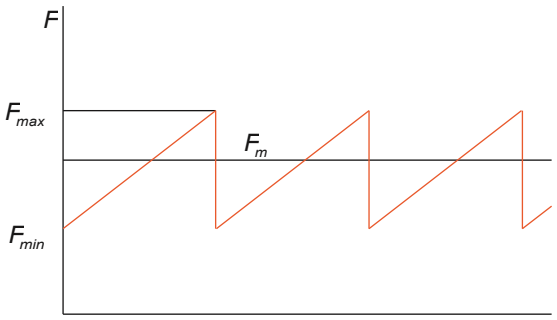
6.2 (12)



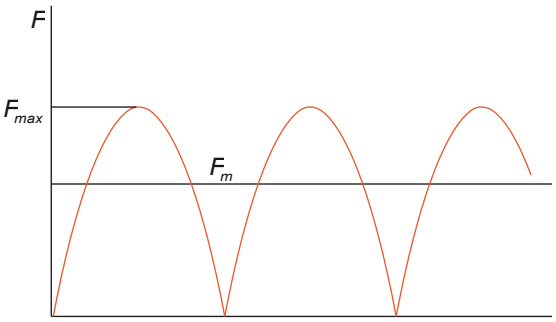
Fluktuerende traplas



Deurlopend fluktuerende las



Lineêre fluktuerende las



Sinusvormige fluktuerende las

[15]

VRAAG 7

7.1

$$\mu = \frac{F_f}{N_R}$$

$$F_f = \mu \times N_R$$
$$= 0{,}02 \times 80 \times 10^3 \checkmark$$
$$= 1600N \checkmark$$

$$v = \frac{\pi.D.N}{60}$$
$$= \frac{\pi \times 0{,}3 \times 350}{60} \checkmark$$
$$= 5{,}498m/s \checkmark$$

$$P_f = F_f \times v$$
$$= 1600 \times 5{,}498 \checkmark$$
$$= 8796{,}8W \checkmark$$

(6)

7.2 7.2.1

$$P = \frac{2\pi NT}{60}$$

$$T = \frac{P \times 60}{2 \times \pi \times N}$$

$$= \frac{3{,}5 \times 10^3 \times 60}{2\pi 1750} \checkmark\checkmark$$

$$= 19{,}098 N.m \checkmark$$

7.2.2

$$\eta = \frac{P_O}{P_1} \times 100$$

$$P_O = P_i \times \eta$$

$$= 3{,}5 \times 10^3 \times 0{,}8$$

$$= 2800 W \checkmark$$

$$T = \frac{P \times 60}{2 \times \pi \times N}$$

$$= \frac{2800 \times 60}{2\pi 3500} \checkmark$$

$$= 7{,}63 N.m \checkmark$$

7.2.3

$$T = \frac{P \times 60}{2 \times \pi \times N}$$

$$= \frac{2800 \times 60}{2\pi \times 25} \checkmark\checkmark$$

$$= 1069{,}521 N.m \checkmark$$

(3 × 3) (9)
[15]

TOTAAL: 100

Kopiereg voorbehou