



higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

NASIENRIGLYN

NASIONALE SERTIFIKAAT

MEGANOTEGNIEK N6

1 Augustus 2024

Hierdie nasienriglyn bestaan uit 10 bladsye.

VRAAG 1: KOPPELAARS

$$F_c = m \times \omega^2 \times r$$

$$= m \times (94,25)^2 \times 0,135 \checkmark$$

$$= 1199,157 \text{ m} \checkmark$$

$$F_s = m \times (\% \text{ bedryfspoed} \times \omega)^2 \times r$$

$$= m \times (0,7 \times 94,25)^2 \times 0,135 \checkmark$$

$$= 587,587 \text{ m} \checkmark$$

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

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

$$= \frac{35 \times 1\,000 \times 60}{2\pi \times 900} \checkmark$$

$$= 371,361 \text{ Nm} \checkmark$$

$$T = m \times (F_c - F_s) \times R \times N$$

$$\frac{T}{m \times R \times N} = (F_c - F_s) \times R \times N \checkmark$$

$$\frac{371,361}{0,35 \times 0,165 \times 4} = m \times (1199,157 - 587,587)$$

$$m = 2,629 \text{ kg} \checkmark$$

$$\omega = \frac{2\pi \times N}{60}$$

$$= \frac{2\pi \times 900}{60}$$

$$= 94,25 \checkmark$$

[9]

VRAAG 2: REMME

$$2.1 \quad \frac{T_1}{T_2} = \left[\frac{1 + \mu \tan \theta}{1 - \mu \tan \theta} \right]^n \checkmark$$

$$= \left[\frac{1 + 0,25 \tan 7,5}{1 - 0,25 \tan 7,5} \right]^{14} \checkmark$$

$$\frac{T_1}{T_2} = 2,512 \checkmark$$

$$\Sigma \rightarrow M = \Sigma \leftarrow M$$

$$200 \times 750 + T_1 \times 30 = T_2 \times 120$$

$$12 T_2 - 3 T_1 = 15\,000 \checkmark$$

$$12 T_2 - 3 (2,512 T_2) = 15\,000 \checkmark$$

$$T_1 = 8440 \text{ N} \checkmark \quad T_2 = 3360 \text{ N} \checkmark$$

$$T_B = (T_1 - T_2) r$$

$$= (8440 - 3360) 0,5 \checkmark$$

$$= 2540 \text{ Nm} \checkmark$$

(9)

$$2.2 \quad T = I\alpha$$

$$2540 = I\alpha$$

$$2540 = (2000) (0,5) 2 \alpha \checkmark$$

$$\alpha = 5,08 \text{ rad/s}^2 \checkmark$$

(2)
[11]

VRAAG 3: DRYFASTE

$$3.1 \quad P = \frac{2\pi NT}{60}$$

$$30\,000 = \frac{2\pi \times 1600 \times T}{60} \checkmark$$

$$T = 179 \text{ Nm} \checkmark$$

(2)

$$3.2 \quad Ts = GR \times T_m$$

$$= 4 \times 179$$

$$= 716 \text{ Nm} \checkmark$$

$$716 = (T_1 - T_2) \times r$$

$$= 3T_2 - T_2 = 2386,7 \checkmark$$

$$T_2 = 1193 \text{ N}$$

✓

$$T_1 = 3580 \text{ N}$$

$$\begin{aligned}
 3.3 \quad F_t &= \frac{T \times 2}{PCD} \\
 &= \frac{179 \times 2}{0,12} \\
 &= 2\,983 \text{ N} \checkmark
 \end{aligned} \tag{1}$$

$$\begin{aligned}
 3.4 \quad F_r &= F_t \tan \phi \\
 &= 2\,983 \tan 20^\circ \\
 &= 1\,086 \text{ N} \checkmark
 \end{aligned} \tag{1}$$

$$\begin{aligned}
 3.5 \quad \sum \rightarrow M &= \sum \leftarrow M && \text{(Vertikale reaksies)} \\
 R \times 1,1 + F_r \times 0,7 &= (T_1 + T_2) \times 11,35 + mg \times 0,3 \checkmark \\
 R \times 1,1 + 1,056 \times 0,7 &= (3550 + 1193) \times 1,35 + 240 \times 9,81 \times 0,3 \\
 R &= 5\,809 \text{ N} \checkmark \\
 L + R + F_r &= T_1 + T_2 + mg \checkmark \\
 L + 5\,809 + 1\,086 &= 35\,80 + 1193 + 240 \times 981 \\
 L &= 323,4 \text{ N} \checkmark
 \end{aligned} \tag{4}$$

$$\begin{aligned}
 3.6 \quad \sum \rightarrow M &= \sum \leftarrow M && \text{(Horizontale reaksies)} \\
 R \times 1,1 &= F_t \times 0,7 \checkmark \\
 R \times 1,1 &= 2983 \times 0,7 \\
 R &= 1898 \text{ N} \checkmark \\
 L + R &= F_t \\
 L + 1898 &= 2983 \checkmark \\
 L &= 1085 \text{ N} \checkmark
 \end{aligned} \tag{4}$$

[15]

VRAAG 4: REDUKSIERATKASTE EN VLEGWIELE

$$\begin{aligned}
 4.1 \quad 4.1.1 \quad w_2 &= \frac{2\pi \times 300}{60} \\
 &= 31,42 \text{ rad/s} \checkmark \\
 \alpha &= \frac{w_2 - w_1}{t} \\
 &= \frac{31,4 - 0}{30} \checkmark \\
 &= 1,047 \text{ rad/s}^2 \checkmark \\
 T &= I \times \alpha \\
 &= 400 \times 1,047 \\
 &= 418,8 \text{ Nm} \checkmark \quad (\text{Wringkrag by B}) \quad (4)
 \end{aligned}$$

$$\begin{aligned}
 4.1.2 \quad \frac{N_A}{N_B} &= \frac{\partial A}{\partial B} \\
 \partial A &= \frac{1050 \times 1,047}{300} \checkmark \\
 &= 3,665 \text{ rad/s}^2 \checkmark \\
 T_A &= I_A \times \partial_A \\
 &= 185 \times 3,665 \checkmark \\
 &= 678,03 \text{ Nm} \checkmark \quad (4)
 \end{aligned}$$

$$\begin{aligned}
 4.1.3 \quad V_R &= \frac{N_{inset}}{N_{uitset}} \\
 &= \frac{300}{1050} \checkmark \\
 &= 0,2857 \checkmark \\
 I_T &= I_A + [I_B + (mk^2)] \times V_R^2 \\
 &= 185 + [400 + (280 \times 0,252)] \times 0,2857^2 \checkmark \\
 &= 219,078 \text{ kg.m}^2 \checkmark \quad (4)
 \end{aligned}$$

$$\begin{aligned}
 4.1.4 \quad \omega_B &= \frac{2\pi \times 1\,050}{60} \\
 &= 109,956 \text{ rad/s} \checkmark \\
 E_k &= \frac{1}{2} I \omega^2 \\
 &= \frac{1}{2} (219,078 \times 109,956)^2 \checkmark \\
 &= 1324,36 \text{ KJ} \checkmark \quad (3)
 \end{aligned}$$

$$\begin{aligned}
 4.1.5 \quad T &= I \times \alpha \\
 &= 219,078 \times 1,047 \checkmark \\
 &= 229,4 \text{ Nm} \checkmark \quad (2)
 \end{aligned}$$

$$\begin{aligned}
 4.2 \quad 4.2.1 \quad E_k &= \frac{\text{arbeid verrig}}{\text{doeltreffendheid}} = \frac{\text{krag} \times \text{afstand}}{\text{doeltreffendheid}} \\
 &= \frac{22 \times 1000 \times 9,81 \times 0,02}{0,75} \checkmark \\
 &= 5,755 \text{ KJ} \checkmark \\
 E_k &= \frac{1}{2} I \times \omega^2 \\
 5755 &= 0,5 \times I (\omega_1^2 - \omega_2^2) \checkmark \\
 5755 &= 0,5 \times I \left[\left(\frac{2\pi \times 280}{60} \right)^2 - \left(\frac{2\pi \times 230}{60} \right)^2 \right] \checkmark \\
 I &= 41,2 \text{ kg.m}^2 \checkmark \quad (5)
 \end{aligned}$$

$$\begin{aligned}
 4.2.2 \quad P &= E_k \times \text{slae/s} \\
 &= 5755 \times \frac{15}{60} \checkmark \\
 &= 1,44 \text{ kW} \checkmark \quad (2) \\
 &\quad [24]
 \end{aligned}$$

VRAAG 5: SPOORTRAKSIE EN VOERTUIGDINAMIKA

5.1

5.1.1

$$\begin{aligned}
 V &= \sqrt{gr \left[\frac{\mu + \tan \theta}{1 - \mu \tan \theta} \right]} \\
 &= \sqrt{9,81 \times 90 \left[\frac{0,67 + \tan 25^\circ}{1 - 0,67 \tan 25^\circ} \right]} \checkmark \\
 &= 38,20 \text{ m/s} \checkmark \\
 &= 137,5 \text{ km/h} \checkmark
 \end{aligned}
 \tag{3}$$

5.1.2

$$\begin{aligned}
 V &= \sqrt{gr \left[\frac{h \tan \theta + 0,5b}{h - 0,5b \tan \theta} \right]} \\
 &= \sqrt{9,81 \times 90 \left[\frac{0,93 \tan 25^\circ + 0,5 \times 1,7}{0,93 - 0,5 \times 1,7 \tan 25^\circ} \right]} \checkmark \\
 &= 46,08 \text{ m/s} \checkmark \\
 &= 166 \text{ km/h} \checkmark
 \end{aligned}
 \tag{3}$$

5.2

$$V = \sqrt{\mu gr}$$

$$V = 72 \text{ km/h}$$

$$= 20 \text{ m/s}$$

$$\mu = \frac{V^2}{gr} = \frac{400}{(9,81)(100)} \checkmark$$

$$= 0,407 \checkmark$$

(2)
[8]

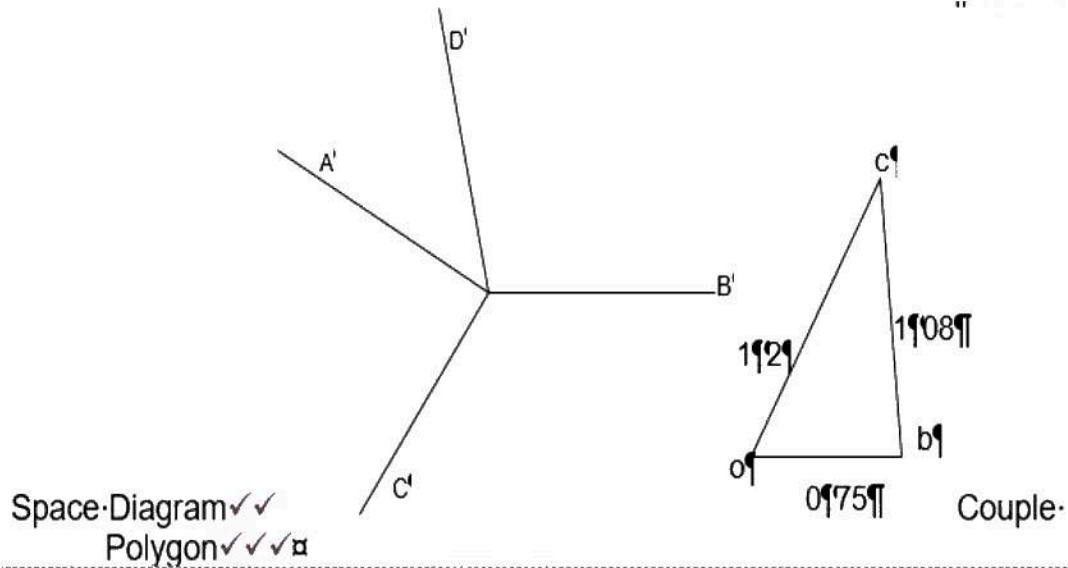
VRAAG 6: DINAMIESE BALANSERING

6.1

Vlak	M(kg)	r(m)	mr	l(m)	mr ² (kgm ²)
A	M _A	0,1	0,1 M _A	0	0
B	10	0,125	1,25	0,6	0,75
C	5	0,2	1	1,3	1,2
D	4	1,5	0,6	1,8	1,0

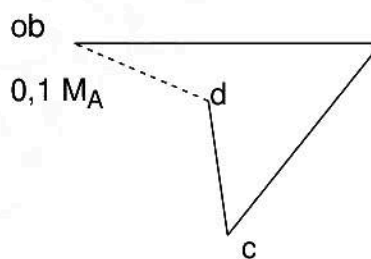
✓✓

"



(7)

6.2



Kragdiagram ✓✓✓✓

(4)

6.3

$$5 \text{ mm} = 0,1 \text{ kg} \cdot \text{m}$$

$$M_A = 6,9 \text{ kg} \checkmark \checkmark$$

(2)

6.4

$$\hat{C} = 240^\circ \text{ antiklosgewys van massa B} \checkmark \checkmark$$

$$\hat{D} = 100^\circ \text{ antiklosgewys van massa B} \checkmark \checkmark$$

(4)

[16]

VRAAG 7: KINEMATIKA

7.1 $V_{OA} = w \cdot r$

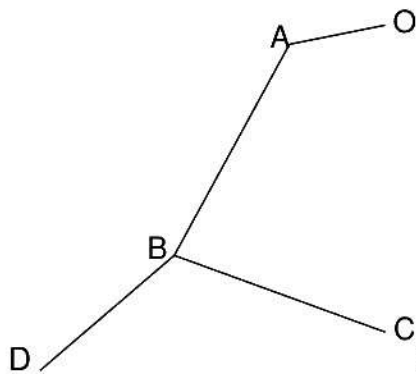
$$= \left(\frac{2\pi N}{60} \right) (r)$$

$$= \frac{2\pi(600)}{60} (0,28)$$

$$= 1,75 \text{ m/s} \checkmark$$

(1)

7.2



Ruimtediagram $\checkmark \checkmark \checkmark$

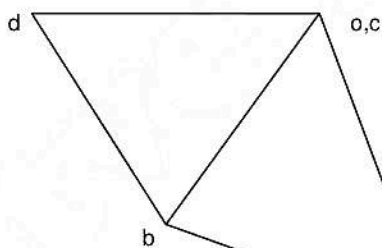
(3)

7.3 $V_{ba} = 1,15 \text{ m/s} \checkmark$

$$V_{bc} = 1,15 \text{ m/s} \checkmark$$

$$V_{db} = 1,65 \text{ m/s} \checkmark$$

$$V_{dc} = 1,55 \text{ m/s} \checkmark$$



'n Snelheidsdiagram $\checkmark \checkmark \checkmark$

(7)

7.4 $V_{dc} = 1,55 \text{ m/s} \checkmark \checkmark$

(2)

7.5 Middelpuntsoekende versnelling

$$\begin{aligned}\alpha_{AB} &= \frac{(v_{AB})^2}{AB} \\ &= \frac{(1,05)^2}{0,22} \\ &= 5,01 \text{ m/s}^2 \checkmark\end{aligned}$$

$$\begin{aligned}\alpha_{AB} &= \frac{(v_{AB})^2}{BC} \\ &= \frac{(1,15)^2}{0,245} \\ &= 5,397 \text{ m/s}^2 \checkmark\end{aligned}$$

$$\begin{aligned}\alpha_{AB} &= \frac{(v_{AB})^2}{BD} \\ &= \frac{(1,65)^2}{0,23} \\ &= 11,84 \text{ m/s}^2 \checkmark\end{aligned}$$

(3)
[16]

TOTAAL: 100