



**higher education
& training**

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

NASIENRIGLYN

NASIONALE SERTIFIKAAT

MEGANOTEGNIEK N6

30 JULIE 2018

Hiedie nasienriglyn bestaan uit 7 bladsye.

VRAAG 1

$$\begin{aligned}
 1.1 \quad P &= \frac{2\pi NT}{60} \\
 &= \frac{2 \times \pi \times 1\,500 \times 142}{60} \checkmark \\
 &= 22,3 \text{ kW} \checkmark
 \end{aligned} \tag{2}$$

$$\begin{aligned}
 1.2 \quad T &= \mu \times F_A \times R_m \times n \\
 F_A &= \frac{T}{\pi \times R_m \times n} \checkmark \\
 &= \frac{142 \times 2}{0,3 \times 0,095 \times 2} \checkmark \\
 &= 4\,982 \text{ N} \checkmark
 \end{aligned} \tag{3}$$

$$\begin{aligned}
 1.3 \quad I &= mk^2 \\
 I_m &= 63,5 \times 0,14^2 = 1,245 \text{ kgm}^2 \checkmark \\
 I_r &= 22,8 \times 0,075^2 = 0,128 \text{ kgm}^2 \checkmark \\
 (I_m + I_r)N_3 &= I_m N_m + I_r N_r \checkmark \\
 \therefore 1,373 N_3 &= 0 + 0,128 \times 1\,500 \checkmark \\
 N_3 &= 139,8 \text{ r/min} \checkmark
 \end{aligned} \tag{5}$$

$$\begin{aligned}
 1.4 \quad \omega_1 &= \frac{2\pi \times 1\,500}{60} = 157 \text{ rad/s} \checkmark \\
 \omega_2 &= \frac{2\pi \times 139,8}{60} = 14,6 \text{ rad/s} \checkmark \\
 T &= I\alpha \qquad \qquad \qquad \text{OF} \\
 \alpha_m &= \frac{142}{1,245} = 114 \text{ rad/s}^2 \checkmark & \alpha_r &= \frac{142}{0,128} = 1\,109 \text{ rad/s}^2 \checkmark \\
 t &= \frac{\omega_1 - \omega_2}{\alpha} & t &= \frac{\omega_2 - \omega_1}{\alpha} \\
 &= \frac{14,6 - 0}{114} = 0,128 \text{ sec} \checkmark & &= \frac{157 - 14,6}{1\,109} = 0,128 \text{ sec} \checkmark
 \end{aligned} \tag{4}$$

$$\begin{aligned}
 1.5 \quad E_{\text{kloss}} &= E_{\text{kin}} - E_{\text{kf}} \\
 &= \frac{1}{2} I_1 \omega_1^2 + \frac{1}{2} I_2 \omega_2^2 - \frac{1}{2} (I_1 + I_2) \omega_3^2 \checkmark \\
 &= \frac{1}{2} (0,128)(157)^2 + 0 - \frac{1}{2} (0,128 + 1,245)(14,6)^2 \checkmark \\
 &= 1\,431 \text{ J} \checkmark
 \end{aligned} \tag{3}$$

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VRAAG 2

$$\begin{aligned}
 2.1 \quad v &= \frac{\pi \times 0,85 \times 510}{60} = 22,698 \text{ m/s} \checkmark \\
 P &= (T_1 - T_2) \times v \quad \frac{T_1}{T_2} = e^{\mu\theta} \\
 25\,000 &= (T_1 - T_2) \times 22,698 \quad = e^{0,27\pi} \\
 (T_1 - T_2) &= 1\,101,4 \text{ N} \checkmark \quad = 2,335 \checkmark \\
 1,335 T_2 &= 2\,220 \text{ N} \checkmark \\
 T_2 &= 825 \text{ N} \quad \text{en} \quad T_1 = 1\,926 \text{ N} \checkmark
 \end{aligned} \tag{5}$$

$$\begin{aligned}
 2.2 \quad T_s &= (T_1 - T_2) \times r \\
 &= (1\,962 - 825) \times 0,425 \checkmark \\
 &= 467,9 \text{ Nm} \checkmark
 \end{aligned} \tag{2}$$

$$\begin{aligned}
 2.3 \quad T_p &= \frac{T_s \times N_s}{N_p} \\
 &= \frac{467,9 \times 510}{10\,200} \\
 &= 198,86 \text{ N} \checkmark
 \end{aligned} \tag{1}$$

$$\begin{aligned}
 2.4 \quad F_t &= \frac{T \times 2}{PCD} \\
 &= \frac{198,86 \times 2}{0,1} \checkmark \\
 &= 3\,977,2 \checkmark
 \end{aligned} \tag{2}$$

$$\begin{aligned}
 2.5 \quad F_n &= F_t \sec\theta \\
 &= 3\,977,2 \sec 20^\circ \checkmark \\
 &= 4\,232,4 \text{ N} \checkmark
 \end{aligned} \tag{2}$$

$$\begin{aligned}
 2.6 \quad \sum \curvearrowright M &= \sum \curvearrowleft M \text{ About/Om } L \\
 R \times 1,75 &= (T_1 + T_2 + m \times g) \times 0,5 \checkmark \\
 R \times 1,75 &= (1\,926 + 825 + 90 \times 9,81) \times 0,5 \checkmark \\
 R &= 1\,038 \text{ N} \checkmark \\
 L + R &= T_1 + T_2 + m \times g \checkmark \\
 L + 1\,038 &= 1\,926 + 825 + 90 \times 9,81 \checkmark \\
 L &= 2\,595 \text{ N} \checkmark
 \end{aligned} \tag{6}$$

(6)
[18]

VRAAG 3

$$\begin{aligned}
 3.1 \quad 3.1.1 \quad WD &= F \times s \\
 &= 23\,000 \times 9,81 \times 0,03 \times 100/75 \checkmark \\
 &= 9\,025 \text{ J} = \Delta E_k \checkmark \\
 \omega &= \frac{2\pi N}{60} \\
 \omega_1 &= \frac{2\pi \times 296}{60} & \omega_2 &= \frac{2\pi \times 248}{60} \\
 &= 31 \text{ rad/s} & &= 26 \text{ rad/s} \checkmark \\
 \Delta E_k &= E_{k1} - E_{k2} \\
 &= \frac{1}{2} I (\omega_1^2 - \omega_2^2) \\
 9\,025 &= \frac{1}{2} \times 9\,025 (31^2 - 26^2) \checkmark \\
 \therefore I &= 63,33 \text{ kgm}^2 \checkmark
 \end{aligned} \tag{5}$$

$$\begin{aligned}
 3.1.2 \quad P &= \frac{WD}{t} \\
 &= \frac{9\,025 \times 10}{60} \checkmark \\
 &= 1\,504 \text{ W} \checkmark
 \end{aligned} \tag{2}$$

$$\begin{aligned}
 3.2 \quad \frac{T_1}{T_2} &= e^{\mu\theta} & T_2 &= 250 \text{ N} \\
 &= e^{0,3 \times 225 \div 57,3} \checkmark \\
 &= 3,248 \checkmark \\
 \therefore T_1 &= 3,248 \times 250 \checkmark \\
 &= 812 \text{ N} \checkmark \\
 T_b &= (T_1 - T_2) \times R \\
 T_b &= (812 - 250) \times 0,2 \checkmark \\
 &= 112,4 \text{ Nm} \checkmark
 \end{aligned}$$

(6)
[13]

VRAAG 4

$$\begin{aligned}
 4.1 \quad I &= mk^2 \\
 I &= 80 \times 0,2^2 \checkmark \\
 &= 3,2 \text{ kgm}^2 \checkmark
 \end{aligned} \tag{2}$$

$$\begin{aligned}
 4.2 \quad T_D &= T_A \times VR \\
 &= \frac{3,5 \times 52 \times 55}{25 \times 30} \checkmark \\
 &= 13,35 \text{ Nm} \checkmark
 \end{aligned}$$

$$\begin{aligned}
 I_{D \text{ total}} &= I_A \times VR^2 + (I_B + I_C) \times VR^2 + I_D + I_{\text{drum}} \checkmark \checkmark \\
 &= 0,23 \times \left(\frac{52 \times 55}{25 \times 30} \right)^2 + (0,75 + 0,3) \times \left(\frac{55}{30} \right)^2 + 1,2 + 3,2 \\
 &\quad \checkmark \quad \checkmark \quad \checkmark \quad \checkmark \quad \checkmark \quad \checkmark \\
 &= 11,27 \text{ kgm}^2 \checkmark \checkmark
 \end{aligned}$$

$$T = I\alpha$$

$$\begin{aligned}
 \alpha &= 13,35 \div 11,27 \checkmark \\
 &= 1,185 \text{ rad/s}^2 \checkmark
 \end{aligned}$$

(14)
[16]**VRAAG 5**

5.1 Maksimum glyspoed:

$$\begin{aligned}
 v &= \sqrt{gr \left(\frac{\mu + \tan \theta}{1 - \mu \tan \theta} \right)} \\
 &= \sqrt{9,81 \times 130 \left(\frac{0,6 + \tan 20^\circ}{1 - 0,6 \tan 20^\circ} \right)} \checkmark
 \end{aligned}$$

$$\begin{aligned}
 v &= 39,65 \text{ m/s} \\
 &= 142,77 \text{ km/h} \checkmark
 \end{aligned}$$

Maksimum omslaanspoed:

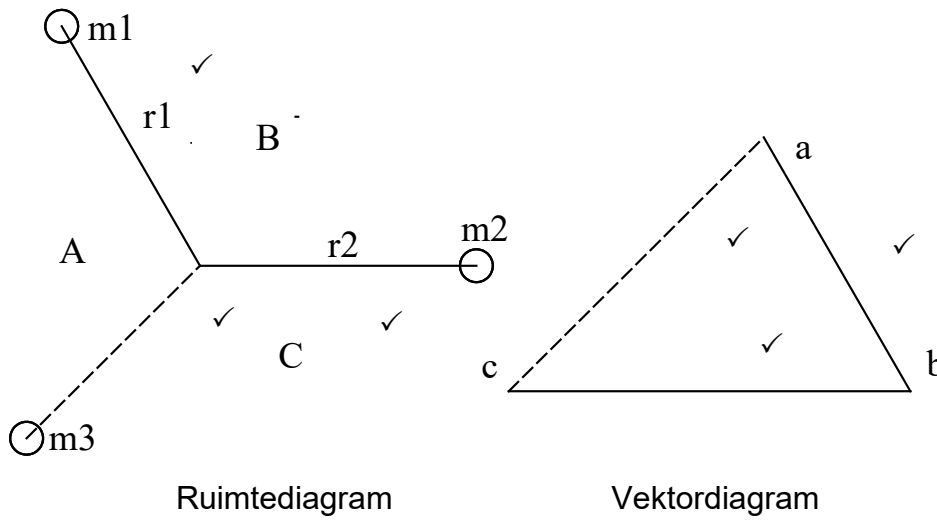
$$\begin{aligned}
 v &= \sqrt{gr \left(\frac{h \tan \theta + \frac{b}{2}}{h - \frac{b}{2} \tan \theta} \right)} \\
 &= \sqrt{9,81 \times 130 \left(\frac{0,65 \tan 20^\circ + \frac{1,5}{2}}{0,65 - \frac{1,5}{2} \tan 20^\circ} \right)} \checkmark
 \end{aligned}$$

$$\begin{aligned}
 v &= 57,77 \text{ m/s} \\
 &= 207,9 \text{ km/h} \checkmark
 \end{aligned}$$

Die maksimum veilige spoed is 142,77 km/h om gly te voorkom. $\checkmark \checkmark$

(6)

5.2 $m_1 r_1 = 114,5 \times 91 = 1\,312 \text{ kg}\cdot\text{mm}\checkmark$
 $m_2 r_2 = 17,91 \times 101 = 1\,809 \text{ kg}\cdot\text{mm}\checkmark$



$$m_3 r_3 = 54 \times 30\checkmark$$

$$= 1\,620\checkmark$$

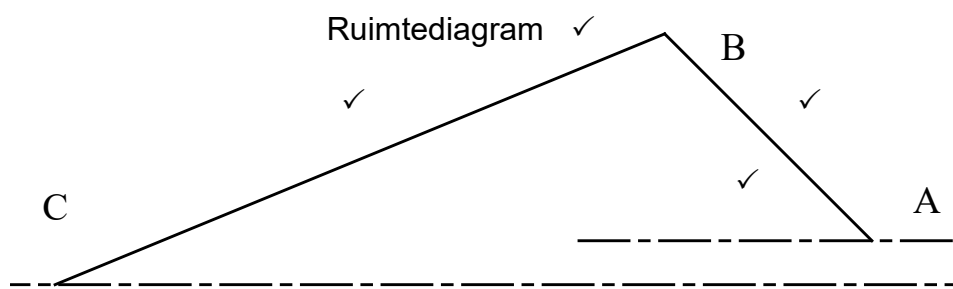
$$r = \frac{1\,620}{15}\checkmark$$

$$= 108 \text{ mm}\checkmark$$

(12)
[18]

VRAAG 6

6.1



(3)

6.2

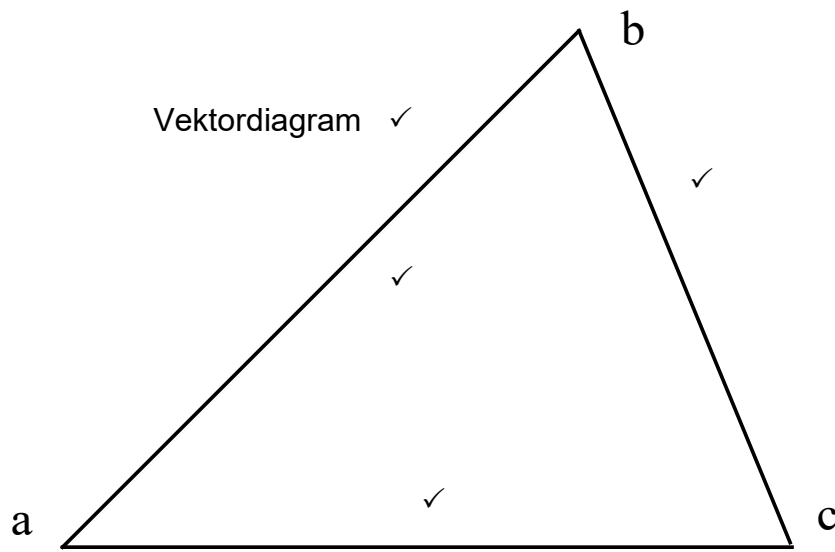
$$v_b = \frac{2\pi r N}{60}$$

$$= \frac{2\pi \times 0,2 \times 150}{60}\checkmark$$

$$= 3,14 \text{ m/s}\checkmark$$

(2)

6.3



(3)

6.4 6.4.1 $v_c = ac \times 0,04$
 $= 78,4 \times 0,04$
 $= 3,136 \text{ m/s}$ (3)

6.4.2 $\omega_{BC} = \frac{v_{BC}}{BC}$
 $= \frac{60 \times 0,04}{0,45} \checkmark$
 $= 5,33 \text{ rad/s} \checkmark$

*In 'n anti –
 kloksgewyse rigting teen $67,6^\circ$ teenoor die horisontaal* ✓ (3)

6.4.3 $a_{B \text{ rel tot } c} = \frac{v_{BC}^2}{BC}$
 $= \frac{(60 \times 0,04)^2}{0,45} \checkmark$
 $= 12,8 \text{ m/s}^2 \checkmark$ (2)

6.4.4 $a_{B \text{ rel tot } A} = \frac{v_{BA}^2}{AB}$
 $= \frac{(3,14)^2}{0,2} \checkmark$
 $= 49,298 \text{ m/s}^2 \checkmark$ (2)

[18]

TOTAAL: 100