higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

NASIENRIGLYN

NASIONALE SERTIFIKAAT

Meganotegniek N6

1 AUGUSTUS 2019

Hierdie nasienriglyn bestaan uit 10 bladsye.

VRAAG 1: REMME

1.1 $10x + 9(\frac{x}{1,5}) = 288$ ✔

$10x + 6x = 288$

$x = 18°$ ✔

$\therefore \theta = \frac{18°}{2} = 9°$ ✔

(3)

1.2 $P = \frac{2\pi NT}{60}$

$150 \times 10^3 = \frac{2\pi(250)T}{60}$ ✔

$\therefore T = 5,73 \text{ kNm}$ ✔

(2)

1.3 $\frac{T_1}{T_2} = [\frac{1 + \mu tan\theta}{1 - \mu tan\theta}]^n$

$\frac{T_1}{T_2} = [\frac{1 + 0,2tan9}{1 - 0,2tan9}]^{10}$ ✔✔

$T_1 = 1,885 \, T_2$ ✔

(3)

1.4 $T = (T_1 - T_2)R$

$5\,730 = (1,885 \, T_2 - T_2)0,4$ ✔

$T_2 = 16,186 \text{ kN}$ ✔

$T_1 = 30,51 \text{ kN}$ ✔

$T_1 \times 150 = T_2 \times 100 + F \times 600$ ✔

$30\,510 \times 150 = 16\,186 \times 100 + F \times 600$ ✔

$F = 4,93 \text{ kN}$ ✔

(6)

[14]

VRAAG 2: WRYWINGSKOPPELAAR

2.1 $h = wsin\theta$

        $= 80,9sin18°$✓

        $= 25 \text{ mm}$✓

   $D = d + 2h$

      $= 140 + 2(25)$

      $= 190 \text{ mm}$✓   (3)

2.2 $T = \dfrac{60P}{2\pi N}$

          $= \dfrac{60(15 \times 10^3)}{2\pi(1\ 440)}$ ✓

          $= 99,472 \text{ Nm}$✓

   $R_f = \dfrac{R + r}{2} = \dfrac{95 + 70}{2} = 82,5 \text{ mm}$✓

   $T = \dfrac{\mu F_A \times R_f}{sin\theta}$

   $99,472 = \dfrac{(0,3)F_A \times (82,5 \times 10^3)}{sin18°}$✓

   $F_A = 1\ 241,961 \text{ N}$✓

   $F_{engage} = F_A(1 + \dfrac{\mu}{tan\theta})$

          $= 1\ 241,961(1 + \dfrac{0,3}{tan18°})$✓

          $= 2\ 388,67 \text{ N}$✓   (7)

2.3 $P_{MAX} = \dfrac{F_A}{2\pi(R - r)r}$

          $= \dfrac{1\ 241,961}{2\pi(0,095 - 0,07)0,07}$ ✓

          $= 112,95 \text{ kPa}$✓   (2)
                                                                                        [12]

VRAAG 3: **LYNAS (HOOFDRYFAS)**

3.1 $$P = \frac{2\pi N_A T_A}{60}$$

$$40 \times 10^3 = \frac{2\pi(1\ 000)T_A}{60} \checkmark$$

$$T_A = 381,972\ \text{Nm} \checkmark \tag{2}$$

3.2 $$D_A N_A = D_B N_B$$

$$(140)(1\ 000) = (280)N_B \checkmark$$

$$N_B = 500\ \text{r/min} \checkmark$$

$$P = \frac{2\pi N_B T_B}{60}$$

$$40 \times 10^3 = \frac{2\pi(500)T_B}{60} \checkmark$$

$$T_B = 763,944\ \text{Nm} \checkmark \tag{4}$$

3.3 $$F_t = \frac{2 \times T}{PCD}$$

$$= \frac{2 \times 381,972}{0,14}$$

$$= 5,457\ \text{kN} \checkmark \tag{1}$$

3.4 $$\frac{T_1}{T_2} = e^{\mu\theta}$$
$$\frac{T_1}{T_2} = e^{(0,43)(\pi)} \checkmark$$

$$T_1 = 3,861\ T_2 \checkmark$$

$$T = (T_1 - T_2)$$

$$763,944 = (3,861\ T_2 - T_2)0,175 \checkmark$$

$$T_2 = 1\ 525,828\ \text{N} \checkmark$$

$$T_1 = 5\ 891,222\ \text{N} \checkmark \tag{5}$$

3.5 $\Sigma CWM = \Sigma ACWM$

$(882,9 \times 300) + (5\ 457sin30° \times 800) + (196,2 \times 1\ 250) = R_R \times 1\ 000$✓

$\quad R_R = 2\ 696,92\ \text{N}$✓

$\Sigma CWM = \Sigma ACWM$

$(R_L \times 1\ 000) + (196,2 \times 250) = (882,9 \times 700) + (5\ 457sin30° \times 200)$✓

$\quad R_L = 1\ 114,68\ \text{N}$✓ (4)

3.6 $\Sigma CWM = \Sigma ACWM$

$(5\ 457cos30°)(800) + (R_R \times 1\ 000) = (1\ 525,828 + 5\ 891,222)(1\ 250)$✓

$\quad R_R = 5\ 490,592\ \text{N}$✓

$\Sigma CWM = \Sigma ACWM$

$(1\ 525,828 + 5\ 891,222)(250) + (R_L \times 1\ 000) + (5\ 457cos30°)(200) = 0$✓

$\quad R_L = -2\ 799,443\ \text{N}$✓ (4)

[20]

VRAAG 4: VLIEGWIEL

4.1 $\quad \propto = \dfrac{w_2 - w_1}{t}$

$\quad = \dfrac{47{,}124 - 0}{8}$ ✓

$\quad = 5{,}89 \text{ rad/s}^2$ ✓

$\quad w_1 = \dfrac{2\pi N}{60}$

$\quad = \dfrac{2\pi(450)}{60}$

$\quad = 47{,}124 \text{ rad/s}$ ✓ (3)

4.2 $\quad T = I \propto$

$\quad = (45)(5{,}89)$ ✓

$\quad = 265{,}05 \text{ Nm}$ ✓

$\quad I = mk^2$

$\quad = (500)(0{,}3)^2$

$\quad = 4{,}5 \text{ kg.m}^2$ ✓ (3)

4.3 $\quad E_k = \dfrac{1}{2} I w^2$

$\quad = \dfrac{1}{2}(45)(47{,}124)^2$ ✓

$\quad = 49{,}965 \text{ kJ}$ ✓ (2)

4.4 $\quad V = wr$

$\quad = 47{,}124 \times 0{,}6$ ✓

$\quad = 28{,}274 \text{ m/s}$ ✓ (2)

[10]

VRAAG 5: BALANSERING

5.1

|	m(kg)	r(mm)	mr(kg.mm)	ℓ(m)	$mr\ell$(kg. mm. m)
A	10	70	700√	-0,25	-175√
B	8	90	720√	0,6	432√
C	12	60	720√	1,4	1 008√
x	-	-	R_x	0	0
y	-	-	R_y	1,2√	$1,2R_y$√
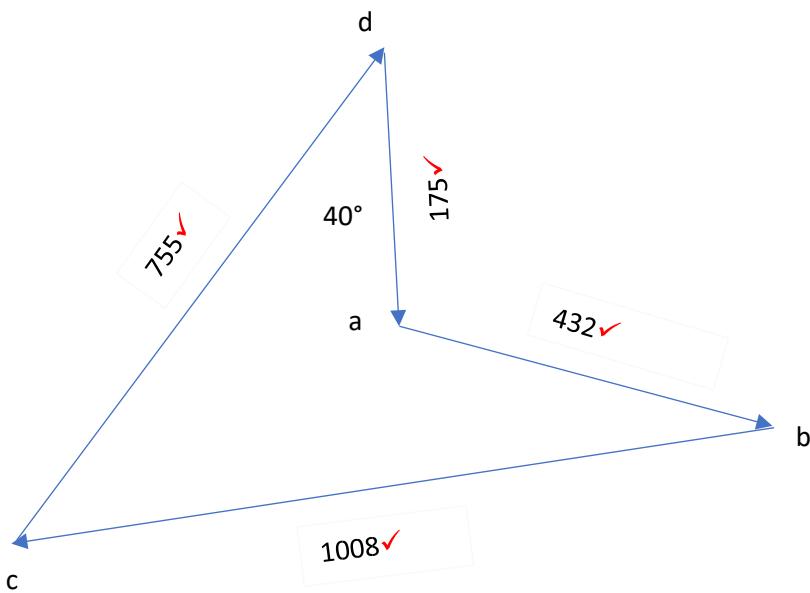
$$755 = 1,2R_y$$

$$R_y = 629,167 \text{ kg. mm}✓$$

$$\text{dinamiese reaksie op y} = \frac{629,167}{1\,000}\left(\frac{2\pi N}{60}\right)^2$$

$$= \frac{629,167}{1\,000}\left[\frac{2\pi(120)}{60}\right]^2✓$$

$$= 99,354 \text{ N}✓ \hspace{4cm} (11)$$

5.2
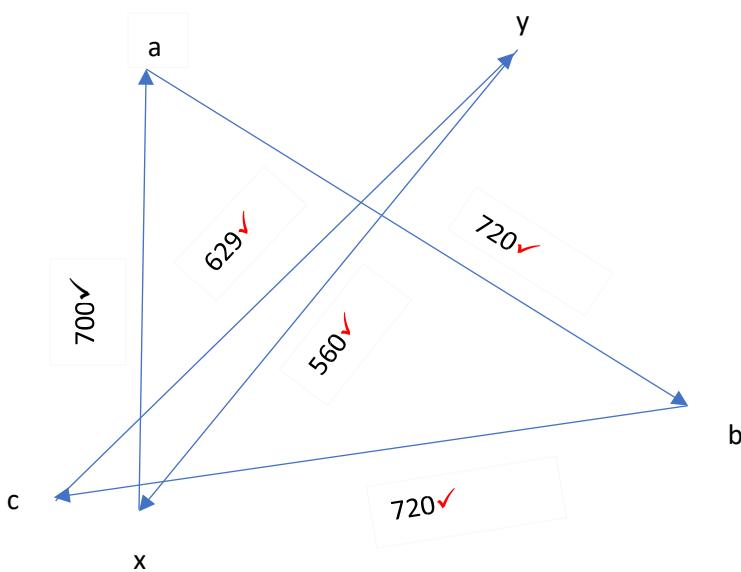
$R_x = 560 \text{ kg. mm}$✓

dinamiese reaksie op $x = \frac{560}{1\,000}\left(\frac{2\pi N}{60}\right)^2$✓

$$= \frac{560}{1\,000}\left(\frac{2\pi 120}{60}\right)^2$$✓

$$= 88{,}432 \text{ N}$$✓ (9)

[20]

VRAAG 6: DINAMIKA

6.1   6.1.1 $N_f = 1{,}8 \times 10^3$

$= 7\,063{,}2$✓

$N_R = 1{,}8 \times 10^3$

$= 10\,594{,}8 \text{ N}$✓

$F_a = \mu(mg)\dfrac{h}{d}$

$W_1 = 0{,}4(1\,800 \times 9{,}81)\dfrac{0{,}7}{3{,}2}$✓

$W_1 = 1\,545{,}075 \text{ N}$✓

$\therefore$ Normale reaksie van agterwiel $= N_R - W_1$

$= 10\,594{,}8 - 1\,545{,}075$✓

$= 9\,049{,}725 \text{ N}$✓ (6)

6.1.2 $$F_a = \mu(N_f + W_2)\frac{h}{d}$$

$$\therefore W_2 = \mu(N_f + W_2)\frac{h}{d}$$

$$W_2 = 0,4(7\ 063,2 + W_2)\frac{0,7}{3,2} \checkmark$$

$$W_2 = 2\ 825,28 + 87,5 \times 10^{-3}W_2$$

$$W_2 = 3\ 096,197 \text{ N}\checkmark$$

Normale reaksie op agterwiel $= N_R - W_1$

$$= 10\ 594,8 - 3\ 096,197\checkmark$$

$$= 7\ 498,603 \text{ N}\checkmark \tag{4}$$

6.2 $$W_3 = \mu(N_R - W_3)\frac{h}{d}$$

$$W_3 = 0,4(10\ 594,8 - W_3)\frac{0,7}{3,2} \checkmark$$

$$W_3 = 4\ 237,92 - 87,5 \times 10^{-3}W_3$$

$$W_3 = 3\ 896,938 \text{ N}\checkmark$$

Normale reaksie op voorwiel $= N_f + W_3$

$$= 7\ 063,2 + 3\ 896,938\checkmark$$

$$= 10\ 960,138 \text{ N}\checkmark \tag{4}$$

[14]

VRAAG 7: KINEMATIKA
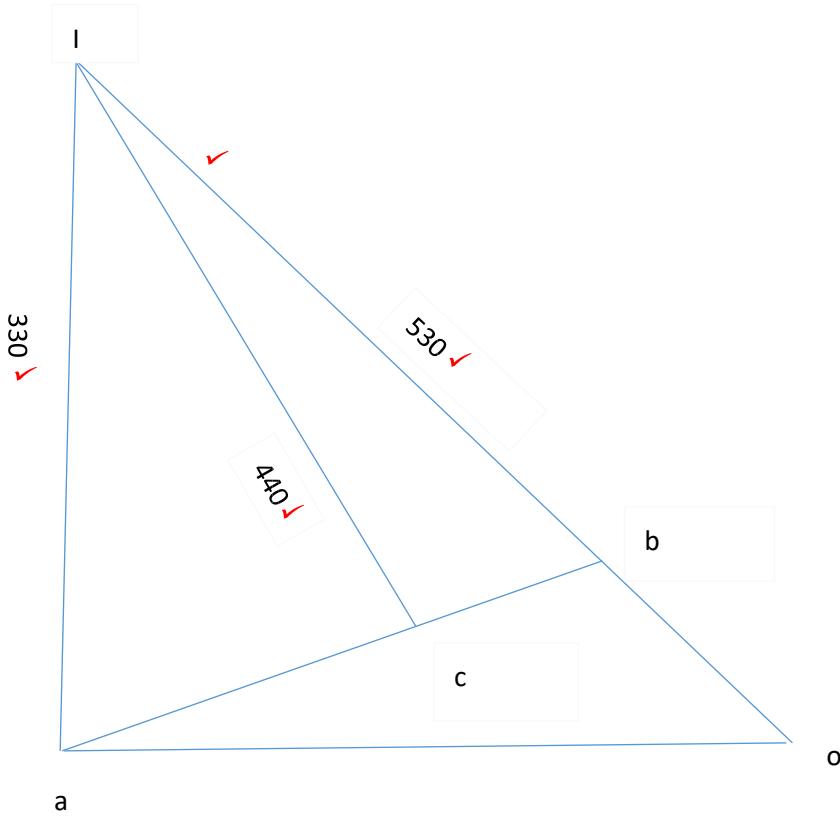
$V_B = wr$

$$= (\frac{2\pi(100)}{60})(0,12) ✓$$

$$= 1,257 \text{ m/s} ✓$$

$V_A = \frac{V_B}{I_B} \times I_A$

$$= \frac{1,257}{530} \times 330 ✓$$

$$= 0,783 \text{ m/s} ✓$$

$V_C = \frac{V_B}{I_B} \times I_C$ **OF** $V_C = \frac{V_A}{I_A} \times I_C$

$$= \frac{1,257}{530} \times 440 ✓ \qquad\qquad = \frac{0,783}{330} \times 440 ✓$$

$$= 1,044 \text{ m/s} ✓ \qquad\qquad = 1,044 \text{ m/s} ✓ \qquad\qquad \textbf{[10]}$$

TOTAAL: 100