

THEMA 6-Harmonische tillingen - Oplossingen van OEFENINGEN

Oefening-1: Basic, maar 'op zijn kop'

$$A = 0,10 \text{ m}$$

$$f = 5 \text{ Hz} \Rightarrow T = \frac{1}{f} = 0,2 \text{ s}$$

$$y(t) = A \cdot \sin(\omega t + \varphi_0)$$

$$\text{met } \omega = 2\pi f = \frac{10\pi}{\text{s}}$$

$$\text{en voor } t = 0 \text{ s is } \varphi = \frac{\pi}{2}$$

$$\text{Dus : } y(t) = 0,10 \text{ m} \cdot \sin\left(\frac{10\pi}{\text{s}} t + \frac{\pi}{2}\right)$$

Oefening-2: springplank

$$\text{a) } -1,0 \text{ cm} \quad \text{en } -3,0 \text{ cm}$$

$$\text{b) } T = 1,5 \text{ s} \quad \varphi_0 = \frac{3\pi}{2} \quad A = 3,0 \text{ cm}$$

c) plank gaat door evenwichtspositie

$$\text{d) } y(t) = A \cdot \sin(\omega t + \varphi_0) = 0,030 \text{ m} \cdot \sin\left(\frac{4\pi}{3 \text{ s}} t + \frac{3\pi}{2}\right)$$

Oefening-3: verschillende systemen

$$\text{a) verticaal : } y \leftrightarrow 4 \text{ cm}$$

(want $A = 6 \text{ cm} \leftrightarrow 1,5$ schaalverdelingen)

$$\text{b) } y_2(t) = 0,12 \text{ m} \cdot \sin\left(\frac{4\pi}{\text{s}} t + \pi\right)$$

$$y_3(t) = 0,06 \text{ m} \cdot \sin\left(\frac{2\pi}{\text{s}} t + \frac{\pi}{2}\right)$$

Oefening-4: slinger

$$A = \ell \cdot \sin(20^\circ) = 2,0 \text{ m} \cdot \sin(20^\circ) = 0,68 \text{ m}$$

$$\varphi_0 = \frac{\pi}{2}$$

$$\omega = \frac{2\pi}{T} = \frac{2\pi}{4,0,70 \text{ s}} = 0,71 \frac{\pi}{\text{s}}$$

$$y(t) = 0,68 \text{ m} \cdot \sin\left(0,71 \frac{\pi}{\text{s}} t + \frac{\pi}{2}\right)$$