Formularium Fysica voor industrieel ingenieurs schakelprogramma*

CONSTANTES

1 atm = $1{,}013 \times 10^5$ Pa = 1,013 bar

ρ_{water} = 1000 kg/m³

ρ_{lucht} = 1,29 kg/m³

$v_g = (331 + 0{,}60\ T)$ m/s

$I_0 = 1{,}00 \times 10^{-12}$ W/m²

$c = 3{,}00 \times 10^8$ m/s

WISKUNDIGE FORMULES

$\sin^2 a + \cos^2 a = 1$

$\sin(a+b) = \sin a \cos b + \cos a \sin b$

$\sin(a-b) = \sin a \cos b - \cos a \sin b$

$\cos(a+b) = \cos a \cos b - \sin a \sin b$

$\cos(a-b) = \sin a \sin b + \cos a \cos b$

$$\sin(a) + \sin(b) = 2\cos\left(\frac{a-b}{2}\right)\sin\left(\frac{a+b}{2}\right)$$

ELASTICITEIT

$$\frac{F}{A} = E\frac{\Delta L}{L_0}$$

$$\Delta P = -K\frac{\Delta V}{V_0}$$

TRILLINGEN

$$\frac{d^2x}{dt^2} + \omega_0{}^2 x = 0$$

$$x(t) = A\cos(\omega_0 t + \phi_0)$$

$$f_0 = 1/T_0 = \omega_0 / 2\pi$$

$$\omega_0 = \sqrt{\frac{k}{m}}$$

$$\omega_0 = \sqrt{\frac{g}{l}}$$

$$\omega_0 = \sqrt{\frac{mgh}{I}}$$

$$\omega_0 = \sqrt{\frac{K}{I}}$$

$$E = \frac{1}{2}mv^2 + \frac{1}{2}kx^2$$

$$m\frac{d^2x}{dt^2} + b\frac{dx}{dt} + kx = 0$$

$$x(t) = A_0 e^{-\gamma t}\cos(\omega' t + \phi')$$

$$\gamma = \frac{b}{2m} = \frac{1}{\tau}$$

$$\omega' = \sqrt{\omega_0^2 - \gamma^2}$$

$$Q = \frac{\omega_0 m}{b}$$

$$m\frac{d^2x}{dt^2} + b\frac{dx}{dt} + kx = F_0\cos(\omega t)$$

$$x(t) = A\sin(\omega t + \phi)$$

$$A = \frac{F_0}{m\sqrt{(2\gamma\omega)^2 + \left(\omega_0^2 - \omega^2\right)^2}}$$

$$\tan(\phi) = \frac{\left(\omega_0^2 - \omega^2\right)}{2\gamma\omega}$$

GOLFBEWEGING

$$\frac{\partial^2 D}{\partial t^2} = v^2\frac{\partial^2 D}{\partial x^2}$$

$$D(x,t) = A\sin(kx \mp \omega t + \phi)$$

$$v = \lambda f$$

$$k\lambda = 2\pi$$

$$v = \sqrt{\frac{F_T}{\mu}}$$

$$v = \sqrt{\frac{K}{\rho}}$$

$$v = \sqrt{\frac{E}{\rho}}$$

$$\bar{I} = \frac{1}{2}\rho v \omega^2 A^2$$

$f_n = n\dfrac{v}{2L}$ met n = 1, 2, 3, …

$f_{2n-1} = (2n-1)\dfrac{v}{4L}$

met n = 1, 2, 3…

$$f_{zw} = \Delta f$$

GELUIDSGOLVEN

$$P(x,t) = -K\frac{\partial D}{\partial x}$$

$$\Delta P_M = 2\pi\rho v A f$$

$$\beta = 10\log_{10}\left(\frac{I}{I_0}\right)$$

$$f' = f\left(\frac{v \pm v_w}{v \mp v_b}\right)$$

GELIEVE NIET TE SCHRIJVEN OP DIT FORMULARIUM

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$\varepsilon_0 = 8{,}8541878 \times 10^{-12}\ C^2/Nm^2$

$\mu_0 = 1{,}2566371 \times 10^{-6}$ Tm/A

$c = 3{,}00 \times 10^8$ m/s

$e = 1{,}602 \times 10^{-19}$ C

ELEKTROMAGNETISME

$$E = E_0 \sin(kx - \omega t + \phi)$$

$$v = \frac{1}{\sqrt{\mu\varepsilon}} = \frac{\omega}{k} = \lambda f = \frac{c}{n}$$

$$v = \frac{E}{B}$$

$$\lambda_n = \lambda/n$$

$$\vec{S} = \frac{1}{\mu}\left(\vec{E} \times \vec{B}\right)$$

$$\bar{I} = \frac{1}{2} c\varepsilon_0 E_0^2$$

$$\Phi_S = \iint \vec{S} \cdot \overrightarrow{dA}$$

Fresnelvergelijkingen:

$$r_\sigma = \frac{n_1 \cos\theta_i - n_2 \cos\theta_t}{n_1 \cos\theta_i + n_2 \cos\theta_t}$$

$$t_\sigma = \frac{2n_1 \cos\theta_i}{n_1 \cos\theta_i + n_2 \cos\theta_t}$$

$$r_\pi = \frac{n_1 \cos\theta_t - n_2 \cos\theta_i}{n_1 \cos\theta_t + n_2 \cos\theta_i}$$

$$t_\pi = \frac{2n_1 \cos\theta_i}{n_1 \cos\theta_t + n_2 \cos\theta_i}$$

$$n_1 \sin\theta_1 = n_2 \sin\theta_2$$

INTERFERENTIE

$\Lambda = n\Delta x$

$\delta = k\Lambda$

Intensiteit (proef Young):

$$I_\theta = I_0 \cos^2\left(\frac{\delta}{2}\right)$$

met I_0 maximale intensiteit in het midden van het scherm en

$$\delta = \frac{2\pi d \sin\theta}{\lambda}$$

Maxima (proef Young, roosters):

$d \sin\theta = m\lambda$

met $m = 0, \pm1, \pm2, \ldots$

Minima (proef Young):

$$d \sin\theta = (2m+1)\frac{\lambda}{2}$$

met m = 0, ±1, ±2,…

BUIGING

Intensiteit:

$$I_\theta = I_0 \left(\frac{\sin(\beta/2)}{\beta/2} \right)^2$$

met I_0 maximale intensiteit in het midden van het scherm en

$$\beta = \frac{2\pi D \sin\theta}{\lambda}$$

Maxima:

$$D \sin\theta \approx (m + \frac{1}{2})\lambda$$

met $m = +1, \pm2, \pm3, \ldots$

Minima:

$D \sin\theta = m\lambda$

met $m = \pm1, \pm2, \pm3, \ldots$

$$\Delta\theta = \frac{\lambda}{Nd\cos\theta}$$

$$R = \frac{\lambda}{\Delta\lambda} = mN$$

POLARISATIE

$$I = I_0 \cos^2\theta$$

$$\tan\theta_p = \frac{n_2}{n_1}$$

GELIEVE NIET TE SCHRIJVEN OP DIT FORMULARIUM