Enakomerno gibanje

$$s = vt$$

Enakomerno pospešeno gibanje

$$v = at,,, s = v_0 \pm \frac{at^2}{2}$$

$$v = v_0 \pm at,,, v^2 = v_0 \pm 2as$$

Poševni met

$$v_{0x} = v_0 \cdot \cos\varphi$$

$$v_{0y} = v_0 \cdot \sin\varphi$$

$$v_x = konst.$$

$$v_y = v_0 \sin\varphi - gt$$

$$x = v_0 \cos\varphi \cdot t$$

$$y = v_0 \sin\varphi \cdot t - \frac{gt^2}{2}$$

$$X_D = \frac{v_0^2}{g}\sin(2\varphi)$$

Kroženje

α – kotni pospešek
ω – kotna hitrost
v – hitrost
a – pospešek
a_r – radialni pospešek
a_t – tangentni pospešek

$$\omega = 2\pi \cdot f$$

$$\omega = \omega_0 + \alpha \cdot t$$

$$\omega^2 = \omega_0^2 + 2 \cdot \alpha \cdot \varphi$$

$$v = \omega \cdot r$$

$$a_r = \omega^2 r = \alpha^2 t^2 r$$

$$a_t = \alpha \cdot r$$

$$a = \sqrt{a_r^2 + a_t^2}$$

$$\varphi = \omega_0 t + \frac{\alpha \cdot t^2}{2} = \int \omega dt$$

Trenje in lepenje

$$F_{tr} = k_{tr} \cdot F_n,,, F_l = k_l \cdot F_n$$

Sile na klancu

$$F_d = F_g \sin\alpha$$

$$F_s = F_g \cos\alpha$$

$$F_l = k_l \cdot F_s,,, k_l = \tan\alpha$$

Sile pri kroženju

$$F_{cf} = m\omega^2 r_0$$

$$F_{Cor} = -2m(\omega \times v_r)$$

$$F_{sist} = m\omega^2 r_0 - 2m(\omega \times v_r)$$

Navor

$$M = J\alpha,,, M = F \cdot r$$

Vztrajnostni moment

Obroč: $J=mr^2$
Valj: $J=mr^2/2$
Palica: $mr^2/3$
Točka: md^2
Steinerjev izrek:
$J = J^* + md^2$

Gravitacijski zakon

$$F = G\frac{Mm}{r^2}$$

Izrek o gibalni količini

$$\Delta G = F \cdot \Delta t = G_2 - G_1 = m_2 v_2 - m_1 v_1$$

popolnoma neelastični trk:

$$m_1 v_1 + 0 = (m_1 + m_2)v$$

popolnoma elastični trk:

$$m_1 v'_1 + m_2 v'_2 = m_1 v_1 + m_2 v_2$$

Sila curka

$$\Phi_m = \rho\frac{dV}{dt} = \rho \cdot \Phi_v = \rho \cdot S \cdot v$$

$$\Phi_v = \frac{dV}{dt} = S \cdot v$$

$$F_c = \Phi_m \cdot v = \rho \cdot S \cdot v^2$$

Izrek o vrtilni količini

$$\Delta\Gamma = \Gamma_2 - \Gamma_1 = M\Delta t = \int M dt$$

$$\Delta\Gamma = J\omega_2 - J\omega_1$$

$$\Gamma = J\omega$$

$$\Gamma = r \cdot G$$

Energija

$$A = W_{k2} - W_{k1} + W_{p2} - W_{p1}$$

$$A = F \cdot s$$

Kinetična energija

$$W_k = \frac{mv^2}{2} = \frac{J\omega^2}{2}$$

Popolnoma elastični trk
$G_2 = G_1 \qquad W_{k2} = W_{k1}$

Potencialna energija

$W_p = mgh$

Prožnostna energija

$W_{pr} = ks^2/2$

Moč

$$P = \frac{A}{t} = F \cdot v = M \cdot \omega$$

$$A = \int P dt$$

Elastomehanika

$$\frac{F}{S} = E\frac{\Delta l}{l} = \sigma,,, k = \frac{SE}{l}$$

Strižna deformacija

$$\frac{F}{S} = G\frac{\Delta l}{l}$$

Strižni modul
μ – Poissonovo število

$$G = \frac{E}{2(1+\mu)}$$

Vsestranska deformacija
κ - kappa

$$\frac{\Delta V}{V} = -\chi^{-1}\frac{F}{S} = -\kappa\frac{F}{S}$$

Mehanika tekočin

Zakon o viskoznosti

$$\frac{F}{S} = \eta\frac{v_x}{z},,, \Phi_v = \frac{V}{t} = S \cdot v$$

$$\Phi_m = \frac{m}{t} = \rho\frac{V}{t} = \rho \cdot S \cdot v$$

Hidrostatika

$$p = \frac{F}{S}$$

U-cev

$$\rho \cdot g \cdot h = \rho_1 \cdot g \cdot h_1$$

$$p = p_0 + \rho \cdot g \cdot h$$

Stisljivost tekočin

$$\chi = -\frac{1}{V}\frac{dV}{dP}$$

Vzgon
ρ - tekočine

$$F_v = m \cdot g = \rho \cdot V \cdot g$$

Delo tlaka

$$A = F \cdot s = p \cdot S \cdot s = p \cdot V$$

Hidrodinamika

Kontinuitetna enačba

$$v_1 \cdot s_1 = v_2 \cdot s_2$$

Bernulijeva enačba

$$p_1 + \frac{\rho \cdot v_1^2}{2} + \rho \cdot g \cdot z_1 = p + \frac{\rho \cdot v^2}{2} + \rho \cdot g \cdot z$$

$\mathrm{Re} > 10^3$ **kvadratni zakon upora**

Cu – koeficient upora
ρ - tekočine

$$F_u = C_u \cdot \Delta p \cdot S = C_u \rho \cdot S \cdot v^2$$

$\mathrm{Re} < 1$ **linearni zakon upora**

$$F_u = 6 \cdot \pi \cdot R \cdot \eta \cdot v$$

d-diagonala telesa

$$\mathrm{Re} = \frac{d\rho_0 v}{\eta}$$

Tok v ceveh (Poiseuille-ov zakon)

$$\Phi_v = \frac{(p_1 - p)\pi \cdot r^4}{8 \cdot \eta \cdot l}$$

Nihanje

ω_0 - Lastna krožna frekvenca

t_0 - nihajni čas

$$\omega_0 = \sqrt{\frac{k}{m}},,, t_0 = \frac{1}{f_0} = 2\pi\sqrt{\frac{m}{k}}$$

$$t_0 = 2\pi\sqrt{\frac{J}{m \cdot g \cdot r_t}}$$

Če začnemo šteti čas, ko je nihalo v ravnovesni legi:

$$x(t) = X_0 \cdot \sin(\omega_0 \cdot t + \varphi)$$

Če začnemo šteti čas, ko je nihalo odmaknjeno za amplitudo od rav. lege

$$x(t) = X_0 \cdot \cos(\omega_0 \cdot t + \varphi)$$

Hitrost nihala

$$\dot{x} = -X_0 \sin(\omega_0 t + \varphi)$$

Pospešek nihala

$$\ddot{x} = -X_0\omega_0^2 \cos(\omega_0 t + \varphi)$$

Energija nihala

$$W_0 = \frac{mv^2}{2} + \frac{ks^2}{2}$$

Nihalo na polžasto vzmet

$$dA = M \cdot d\varphi = D\varphi \cdot d\varphi$$

$$A = \frac{D\varphi_0^2}{2} = W_{pr}$$

$$\omega = \frac{M\Delta t}{J}$$

Koeficient dušenja

$$\beta = \frac{\gamma}{2m}$$

$$x = x_0 e^{-\beta \cdot t} \cos(\sqrt{\omega_0{}^2 - \beta^2} \cdot t)$$

Znižana frekvenca zaradi dušenja

$$\omega = \sqrt{\omega_0{}^2 - \beta^2}$$

Vsiljeno nihanje

δ - fazni kot

A - amplituda

$$tg\delta = \frac{-2\beta\omega}{\omega_0{}^2 - \omega^2}$$

$$A_2 = A_1 \sqrt{\frac{(\omega_0{}^2 - \omega_1{}^2) + 4\beta^2\omega_1{}^2}{(\omega_0{}^2 - \omega_2{}^2) + 4\beta^2\omega_2{}^2}}$$

Valovanje

k – valovno št.

λ - valovna dolžina

c – hitrost valovanja

f – frekvenca

$$c = \lambda \cdot f = \frac{\omega}{k},,, k = \frac{2\pi}{\lambda}$$

$$y = A\sin(\omega t - kx)$$

$$y = A\sin(2\pi \cdot f(t - \frac{x}{c})$$

Napeta struna

$$c = \sqrt{\frac{F}{\rho S}} = \sqrt{\frac{F}{\mu}}$$

Kovina Kapljevina

$$c = \sqrt{\frac{E}{\rho}} \qquad c = \sqrt{\frac{1}{\chi\rho}}$$

Plin

$$c = \sqrt{\frac{\kappa \cdot R \cdot T}{M}} = \sqrt{\frac{\kappa \cdot p}{\rho}}$$

Amplituda

$$S_0 = 2s_0 \cos\frac{\delta}{2}$$

Lomni zakon

$$\frac{\sin\alpha}{\sin\beta} = \frac{c}{c_1}$$

Energija valovanja

$$W = \rho \cdot s_0{}^2 \omega^2 \sin^2(\omega t - kx)$$

Gostota moči

$$j = \frac{s^2\omega^2\rho \cdot c}{2}$$

Gostota energije

$$j = w \cdot c,,, w = \frac{\rho(s_0\omega)^2 c}{2}$$

Gostota toka

$$P = \int j \cdot dS$$

Glasnost

$$g = 10\log\frac{j}{j_0}$$

Dopplerjev pojav

Gibanje zvočnika

- približevanje, + oddaljevanje

$$f = \frac{f_0}{1 \mp \frac{v_0}{c}}$$

Gibanje opazovalca

+ približevanje, - oddaljevanje

$$f = f_0(1 \pm \frac{v_0}{c})$$

Toplota

Temp. raztez. Snovi

1D: $\Delta l = \alpha \cdot l \cdot \Delta T$

3D: $\Delta V = \beta \cdot V \cdot \Delta T$

$\beta = 3\alpha$

Splošna plinska enačba

n-množina snovi (št. molov)

M – molska masa

$$R = 8314\frac{J}{kmolK}$$

$$p \cdot V = nRT$$

Enačba stanja

T = konst.

$$\frac{pV}{T} = \frac{p_1V_1}{T_1}$$

p = konst.

$$\frac{V}{T} = \frac{V_1}{T_1}$$

Energijski zakon

$$W_{n2} - W_{n1} = Q + A$$

$$\Delta W_n = dQ - pdV$$

Izračun toplote

V = konst.

$$A = -pdV = 0$$

$$\Delta W_n = Q$$

$$Q = m \cdot c_v \Delta T$$

p = konst.

$$A = -p\int_{V'}^{V} dV = -p(V - V')$$

$$W_n - W_n' = Q - p(V - V')$$

$$Q = m \cdot c_p \cdot \Delta T$$

Idealni plin

$$p \cdot V = nRT$$

$$\Delta W_n = mc_v \Delta T$$

$$c_p - c_v = \frac{R}{M},,, \kappa = \frac{c_p}{c_v}$$

Enoatomni plin

$$c_p = \frac{5R}{2M},,, c_v = \frac{3R}{2M}$$

$$\kappa = \frac{5}{3}$$

Dvoatomni plin

$$c_p = \frac{7R}{2M},,, c_v = \frac{5R}{2M}$$

$$\kappa = \frac{7}{5}$$

Izohorna sprememba V=konst.

$$\frac{p'}{T'} = \frac{p}{T},,, A = -\int_{V'}^{V} \rho dV$$

$$W_n - W_n' = (Q)_v = mc_v(T - T')$$

Izobarna sprememba p=konst.

$$\frac{V'}{T'} = \frac{V}{T}$$

$$W_n - W_n' = (Q)_p + (A)_p = mc_p(T - T')$$

Izotermna sprememba T=konst.

$$p'V' = pV,,, \Delta W_n = 0$$

$$(A)_T = -p'V'\ln\frac{V}{V'}$$

Adiabatna sprememba S=konst.

$$Q = 0$$

$$T \propto pV,,, T'V'^{\kappa-1} = TV^{\kappa-1}$$

$$p \propto \frac{T}{V},,, p'V'^{\kappa} = pV^{\kappa}$$

$$V \propto \frac{T}{p},,, \frac{T'^{\kappa}}{p'^{\kappa-1}} = \frac{T^{\kappa}}{p^{\kappa-1}},,, \chi_s = \frac{1}{\kappa \cdot p}$$

Prevajanje toplote

$$P = \frac{Q}{t},,, j = \frac{P}{S},,, j = -\lambda\frac{T - T'}{l}$$

Toplotni stroj

η -izkoristek

$$\eta = \frac{A}{Q_2} = 1 - \frac{Q_1}{Q_2}$$

Idealni toplotni stroj

$$\eta = 1 - \frac{T_1}{T_2}$$

Hladilnik

$$\eta = \frac{A}{Q_1} = \frac{T_2}{T_1} - 1,,, P = P_0 \cdot \eta$$