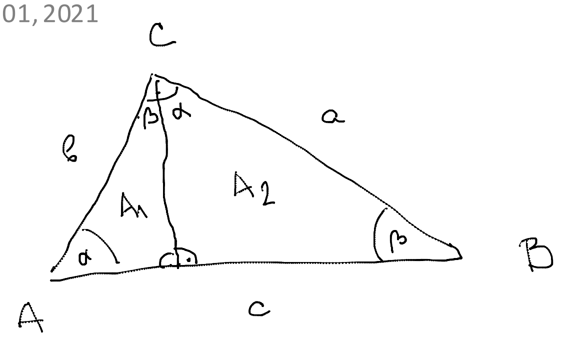
Thursday, April 01, 2021
4:54 PM




$$P = f(c, \alpha, \beta)$$

$$\delta(P) = L^2$$

$$\delta(c) = L$$

$$\delta(\alpha) = \delta(\beta) = 1$$

$$\delta\left(\frac{P}{c^2}\right) = \frac{L^2}{L^2} = 1$$

$$\underbrace{\frac{P}{c^2}} = \underbrace{f_1(\alpha, \beta)} \Rightarrow P = c^2 \cdot f_1(\alpha, \beta)$$

Iz $A_1$: $P_1 = b^2 \cdot f_1(\alpha, \beta)$

Iz $A_2$: $P_2 = a^2 f_1(\alpha, \beta)$

$$P = P_1 + P_2$$

$$c^2 \cancel{f_1(\alpha, \beta)} = b^2 f_1(\alpha, \beta) + a^2 \cancel{f_1(\alpha, \beta)}$$

$$c^2 = a^2 + b^2$$

Thursday, April 01, 2021
4:54 PM

$m$ - masa lopte $\qquad \delta(m) = M$

$v$ - brzina $\qquad \delta(v) = L/T$

$h$ - max visina $\qquad \delta(h) = L$

$m^0 \quad v^0 \quad h^0 \quad \times$

$g$ - ubrzanje sile z. teže $\qquad \delta(g) = L/T^2$

$$\delta\left(\frac{v^2}{g}\right) = \frac{L^2/T^2}{L/T} = L$$

$$\delta\left(\frac{v^2}{g \cdot h}\right) = \frac{L}{L} = 1$$

$$\frac{v^2}{g \cdot h} = c \quad \Rightarrow \quad \boxed{h = c \cdot \frac{v^2}{g}}$$

II način

$$\begin{array}{c} M \\ L \\ T \end{array} \begin{pmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 1 & 1 \\ 0 & -1 & 0 & -2 \end{pmatrix} = \mathcal{M} \qquad p = \text{rang}(\mathcal{M}) = 3$$

$$\underbrace{m \quad v \quad h}_{} \quad g \qquad n - p = 4 - 3 = 1$$

$$\begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 1 \\ 0 & -1 & 0 \end{pmatrix} \begin{pmatrix} m \\ v \\ h \end{pmatrix} = -g \cdot \begin{pmatrix} 0 \\ 1 \\ -2 \end{pmatrix}$$

$g = 1$ : $\quad m = 0$

$v + h = -1 \qquad h = 1$

$-v = 2 \quad , \quad v = -2$

$(0, -2, 1, 1)$

$$\Pi_1 = \frac{m^0 \cdot h^1 \cdot g^1}{v^2} = \frac{hg}{v^2}$$

$$f(\Pi_1) = 0$$

$$f\left(\frac{hg}{v^2}\right) = 0 \quad \Rightarrow \quad \frac{hg}{v^2} = c \quad \Rightarrow \quad \boxed{h = c \cdot \frac{v^2}{g}}$$

$d$ - precnik cevi

$w$ - tezina kapljice

$\sigma$ - povrsinski napon tecnosti

$\delta(d) = L$

$\delta(w) = \frac{M \cdot L}{T^2}$

$\delta(\sigma) = \frac{M}{T^2}$

$$\delta\left(\frac{w}{\sigma}\right) = \frac{\cancel{M}L/\cancel{T^2}}{\cancel{M}/\cancel{T^2}} = L$$

$$\delta\left(\frac{w}{d \cdot \sigma}\right) = \frac{L}{L} = 1$$

$$\frac{w}{d \cdot \sigma} = \text{const} \Rightarrow \boxed{w = C \cdot d \cdot \sigma}$$

II)

$$\begin{array}{c} M \\ T \\ L \end{array} \begin{pmatrix} 0 & 1 & 1 \\ 0 & -2 & -2 \\ 1 & 1 & 0 \end{pmatrix} = \mathcal{M}$$
$$\begin{array}{ccc} \underset{\sim}{d} & w & \underset{\sim}{\sigma} \end{array}$$

$\text{rang}(\mathcal{M}) = 2$

$n - p = 3 - 2 = 1$

$$\begin{pmatrix} 0 & 1 \\ 0 & -2 \\ 1 & 0 \end{pmatrix} \begin{pmatrix} d \\ \sigma \end{pmatrix} = -w \begin{pmatrix} 1 \\ -2 \\ 1 \end{pmatrix}$$

$w = 1$: $\quad \sigma = -1$

$-2\sigma = 2$

$d = -1$

$(-1, 1, -1)$

$$\pi_1 = \frac{w}{d\sigma}$$

$$f(\pi_1) = 0 \Rightarrow f\left(\frac{w}{d\sigma}\right) = 0 \Rightarrow \frac{w}{d\sigma} = \text{const}$$

$$\Rightarrow w = C \cdot d \cdot \sigma$$

$P_{in} > P_{out}$

$\Delta P = P_{in} - P_{out}$ $\qquad \delta(\Delta P) = \frac{M}{LT^2}$

$R$ - prečnik balona $\qquad \delta(R) = L$

$\sigma$ - površinski napon $\qquad \delta(\sigma) = \frac{M}{T^2}$

$$f(\Delta P, R, \sigma) = 0$$

$$\begin{array}{c c} \begin{array}{c} T \\ L \\ M \end{array} & \begin{pmatrix} -2 & 0 & -2 \\ -1 & 1 & 0 \\ 1 & 0 & 1 \end{pmatrix} = \mathcal{M} \\ & \begin{array}{ccc} \Delta P & \underbrace{R \quad \sigma} \end{array} \end{array}$$

$\text{rang}(\mathcal{M}) = 2$

$n - p = 1$

$$\begin{pmatrix} 0 & -2 \\ 1 & 0 \\ 0 & 1 \end{pmatrix} \begin{pmatrix} R \\ \sigma \end{pmatrix} = -\Delta P \begin{pmatrix} -2 \\ -1 \\ 1 \end{pmatrix}$$

$\Delta P = 1:$ $\quad -2\sigma = 2$

$R = 1$

$\sigma = -1$

$(1, 1, -1)$

$$\pi_1 = \frac{\Delta P \cdot R}{\sigma}$$

$$f(\pi_1) = 0 \Rightarrow f\left(\frac{\Delta P R}{\sigma}\right) = 0$$

$$\frac{\Delta P R}{\sigma} = const$$

$$\boxed{\Delta P = \frac{C \cdot \sigma}{R}}$$

20m original ⟺ 1m model

Thursday, April 01, 2021
4:54 PM

$F$ - sila otpora $\qquad \delta(F) = \frac{ML}{T^2}$

$v$ - brzina broda $\qquad \delta(v) = \frac{L}{T}$

$l$ - dužina broda $\qquad \delta(l) = L$

$\mu$ - viskoznost vode $\qquad \delta(\mu) = \frac{M}{LT}$

$\rho$ - gustina vode $\qquad \delta(\rho) = \frac{M}{L^3}$

$$\begin{array}{c} M \\ L \\ T \end{array}\begin{pmatrix} 1 & 0 & 0 & 1 & 1 \\ 1 & 1 & 1 & -1 & -3 \\ -2 & -1 & 0 & -1 & 0 \end{pmatrix}$$
$$\quad F \quad \underbrace{v \quad l} \quad \mu \quad \underbrace{\rho}$$

$\operatorname{rang}(M) = 3$

$n - p = 5 - 3 = 2$

$$\begin{pmatrix} 0 & 0 & 1 \\ 1 & 1 & -3 \\ -1 & 0 & 0 \end{pmatrix}\begin{pmatrix} v \\ l \\ \rho \end{pmatrix} = -F\begin{pmatrix} 1 \\ 1 \\ -2 \end{pmatrix} - \mu\cdot\begin{pmatrix} 1 \\ -1 \\ -1 \end{pmatrix}$$

$\cancel{F=1, \mu=0 \quad a_1 = (-1, +2, +2, 0, +1, 0)}$ $\qquad \Pi_1 = \rule{2cm}{0.4pt}$

$\cancel{F=0, \mu=1: \quad a_2 = (0, -1, -1, 1, -1, 0)}$

$F=1, \mu=0:$

$$\rho = -1$$
$$v + l - 3\rho = -1$$
$$-v = 2$$

$a_1 = (1, -2, -2, 0, -1)$

$$\Pi_1 = \frac{F}{v^2 l^2 \rho}$$

$F=0, \mu=1:$

$$\rho = -1$$
$$v + l - 3\rho = 1$$
$$-v = 1$$

$a_2 = (0, -1, -1, 1, -1)$

$$\Pi_2 = \frac{\mu}{v l \rho}$$

$$f(\Pi_1, \Pi_2) = 0$$

$$f\left(\frac{F}{v^2 l^2 \rho}, \frac{v l \rho}{\mu}\right) = 0 \Rightarrow \frac{F}{v^2 l^2 \rho} = \phi\left(\frac{v l \rho}{\mu}\right)$$

Thursday, April 01, 2021
6:33 PM

$$F_m = S_F \cdot F_v \qquad \mu_m = S_\mu \cdot \mu_v$$

$$\sigma_m = S_\sigma \cdot \sigma_v \qquad \rho_m = S_\rho \cdot \rho_v \quad \Big\} \quad S_\mu = S_\rho = 1$$

$$l_m = S_l \cdot l_v \Rightarrow S_l = \frac{1}{20}$$

$$\Pi_1^m = \underbrace{\frac{S_F}{S_\sigma^2 \cdot S_l^2 \cdot S_\rho}}_{=1} \cdot \Pi_1^v = \Pi_1^v$$

$$\Pi_2^m = \underbrace{\frac{S_\sigma \cdot S_l \cdot S_\rho}{S_\mu}}_{=1} \cdot \Pi_2^v = \Pi_2^v$$

$$\frac{S_F}{S_\sigma^2 \cdot S_l^2 \cdot \cancel{S_\rho}_{1}} = 1 \quad ; \quad \frac{S_\sigma \cdot S_l \cdot \cancel{S_\rho}^{1}}{\cancel{S_\mu}_{1}} = 1$$

$$S_F = (S_\sigma \cdot S_l)^2 \qquad S_\sigma \cdot \underbrace{S_l}_{=\frac{1}{20}} = 1$$

$$S_F = 1 \qquad \Rightarrow S_\sigma = 20$$

$$\sigma_m = S_\sigma \cdot \sigma_v = 20 \cdot \sigma_v$$

$2kg$ pileta $\to$ $2h$

$10kg$ curke $\to$ $?h$

Thursday, April 01, 2021
6:33 PM

$t$ - vreme pečenja $\qquad \delta(t) = T$

$m$ - masa mesa $\qquad \delta(m) = M$

$\rho$ - gustina mesa $\qquad \delta(\rho) = M/L^3$

$\lambda$ - toplotna provodljivost $\qquad \delta(\lambda) = \frac{ML}{T^3\theta}$

$c$ - specifični toplotni kapacitet (po jedinici mase) $\qquad \delta(c) = \frac{L^2}{\theta T^2}$

$$\begin{array}{c} T \\ M \\ L \\ \theta \\ \\ \end{array} \begin{pmatrix} 1 & 0 & 0 & -3 & -2 \\ 0 & 1 & 1 & 1 & 0 \\ 0 & -3 & 0 & 1 & 2 \\ 0 & 0 & 0 & -1 & -1 \\ t & \rho & m & \lambda & c \end{pmatrix}$$

rang$(M) = 3$

$n - p = 4 - 3 = 1$

$c = 1: \quad a_1 = \left(1, -\frac{1}{3}, -\frac{2}{3}, 1, -1\right)$

$$\Pi_1 = \frac{t \cdot \lambda}{c\sqrt[3]{\rho \cdot m^2}}$$

$f(\Pi_1) = 0$

$\frac{t \cdot \lambda}{c\sqrt[3]{\rho m^2}} = const$

$t_{\acute{c}} = S_t \cdot t_p$

$\rho_{\acute{c}} = S_\rho \cdot \rho_p \Rightarrow S_\rho = 1$

$m_{\acute{c}} = S_m \cdot m_p$

$\lambda_{\acute{c}} = S_\lambda \cdot \lambda_p \Rightarrow S_\lambda = 1$

$C_{\acute{c}} = S_{\acute{c}} \cdot C_p \Rightarrow S_c = 1$

$$\Pi_1^{\acute{c}} = \underbrace{\frac{S_t \cdot S_\lambda}{S_c \cdot \sqrt[3]{S_\rho (S_m)^2}}}_{=1} \quad \Pi_1^p = \Pi_1^p$$

$$\frac{S_t \cdot \cancel{S_\lambda}^{1}}{\cancel{S_c}_{1} \cdot \sqrt[3]{\cancel{S_\rho}_{1} \cdot (S_m)^2}} = 1 \Rightarrow \frac{S_t}{\sqrt[3]{S_m^2}} = 1$$

$S_t = \sqrt[3]{S_m^2}$

$t_p = 2h$

$m_p = 2kg$

$m_{\acute{c}} = 10kg$

$S_m = \frac{m_{\acute{c}}}{m_p} = \frac{10}{2} = 5$

$S_t = \sqrt[3]{5^2} = \sqrt[3]{25}$

$t_{\acute{c}} = S_t \cdot t_p = \sqrt[3]{25} \cdot 2 = 5{,}85h \approx 351 min$

$$\frac{t_1}{t_2} = \left(\frac{m_1}{m_2}\right)^{2/3}$$