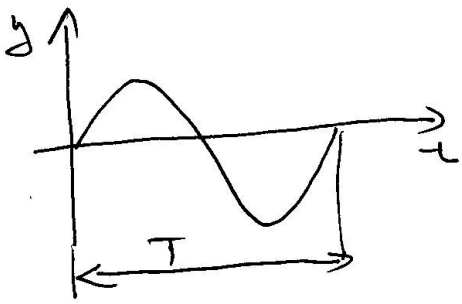
KMITY A VLNĚNÍ

② 

$f = \frac{1}{T} \Rightarrow T = \frac{1}{f}$

$T = \frac{1}{1000} = 1 \cdot 10^{-3}\ s$

5 ZNAČEK → 100 ms

1 ZNAČKA → 500 ms

POČET KMITŮ V ČASE t

$n = \frac{t}{T} \Rightarrow$

$n_1 = \frac{100 \cdot 10^{-3}}{1 \cdot 10^{-3}} = 100$

$n_2 = \frac{500 \cdot 10^{-3}}{1 \cdot 10^{-3}} = 500$

③ $f = \frac{1}{T} \Rightarrow T = \frac{1}{f} = \frac{1}{400} = 0{,}0025\ s$

⑤ $n_1 = 12$ $\quad t_1 = 24\ s$ $\quad n_2 = 16$ $\quad t_2 = 24\ s$

$T = \frac{t}{n} \Rightarrow T_1 = \frac{t_1}{n_1} = \frac{24}{12} = 2\ s$ $\quad T_2 = \frac{t_2}{n_2}$

$T_2 = \frac{24}{16} = 1{,}5\ s$ $\quad f_1 = \frac{1}{T_1}$ $\quad f_2 = \frac{1}{T_2}$

$f_2 = \frac{1}{1{,}5} = 0{,}67\ Hz$ $\quad f_1 = \frac{1}{2} = 0{,}5\ Hz$

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(8) $y = y_m \sin(\omega t)$ $\quad y_m = 5\,cm$, $T = 0{,}5\,s$

$y = 5 \sin\left(\frac{2\pi}{0{,}5} t\right) cm$; $y = 5 \sin(4\pi t)\,cm$

$y = 0{,}05 \sin(4\pi t)\,m$

(10) $y = 7 \sin(0{,}5\pi t)\,mm$

$y = y_m \equiv 7\,mm$ $\quad \cancel{x} = \cancel{7} \sin(0{,}5\pi t)$

$1 = \sin(0{,}5\pi t) \Rightarrow$ VYPOČÍTÁME POMOCÍ ARCUS SIN ($\sin^{-1}$)

$\arcsin(1) = 0{,}5 \cdot \pi t \Rightarrow t = \frac{\arcsin 1}{0{,}5 \cdot \pi}$

$t = \underline{1\,s}$

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(12) $y = 0{,}06 \sin(100\pi t)\ m$

$y_m = 0{,}06\ m$ $\qquad \omega = 100\pi = \frac{2\pi}{T}$

$T = \frac{1}{50} = 0{,}02\ s$

$f = \frac{1}{T} = \frac{1}{0{,}02} = 50\ Hz$

(41) $\frac{T_1}{T_2} = \frac{3}{2}$ $\qquad T = 2\pi\sqrt{\frac{l}{g}}$

$T_1 = 2\pi\sqrt{\frac{l_1}{g}}$ $\qquad T_2 = 2\pi\sqrt{\frac{l_2}{g}}$

$$\frac{2\pi\sqrt{\frac{l_1}{g}}}{2\pi\sqrt{\frac{l_2}{g}}} = \sqrt{\frac{l_1 g}{l_2 g}} = \sqrt{\frac{l_1}{l_2}} = \frac{3}{2}$$

$$l_1 = \left(\frac{3}{2}\right)^2 \cdot l_2 = \frac{9}{4} l_2$$

(42) $f_1 = 2 f_0$ $\quad f = \frac{1}{T}$ $\quad T = 2\pi\sqrt{\frac{l}{g}}$

$f = \frac{1}{2\pi}\sqrt{\frac{g}{l}}$

$f_0 = \frac{1}{2\pi}\sqrt{\frac{g}{l_0}}$

l_0 – PŮVODNÍ DÉLKA

$f_1 = \frac{1}{2\pi}\sqrt{\frac{g}{l_1}}$

f_0 – PŮVODNÍ FREKVENCE

$2f_0 = \frac{1}{2\pi}\sqrt{\frac{g}{l_1}}$; a $\frac{1}{2\pi}\sqrt{\frac{g}{l_0}} = \frac{1}{2\pi}\sqrt{\frac{g}{l_1}}$

$\sqrt{\frac{g}{l_0}} = \frac{1}{2}\sqrt{\frac{g}{l_1}}$; $\frac{g}{l_0} = \frac{1}{4}\frac{g}{l_1}$

$\underline{l_1 = \frac{1}{4} l_0}$

(43) $T = 2\pi\sqrt{\frac{l}{g}}$; $f = \frac{1}{2\pi}\sqrt{\frac{g}{l}}$

$T = \frac{300}{125}$ $\quad \Rightarrow \quad g = \frac{125^2 (2\pi)^2 l}{300^2}$

$g = \frac{125^2 (2\pi)^2 \cdot 115}{300^2} = \underline{10{,}28\ m \cdot s^{-2}}$

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(44) $T = 10\,s$

$$T = 2\pi\sqrt{\frac{l}{g}} \Rightarrow l = \frac{T^2 g}{(2\pi)^2}$$

$$l = \frac{10^2 \cdot 10}{(2\pi)^2} = \underline{25{,}33\ m}$$

(45)

$n_1 = 10$
$n_2 = 30$
} ČAS JE STEJNÝ (t)

$$T = 2\pi\sqrt{\frac{l}{g}} \qquad T_1 = \frac{t}{n_1} \qquad T_2 = \frac{t}{n_2}$$

$$\frac{T_1}{T_2} = \frac{\frac{t}{n_1}}{\frac{t}{n_2}} = \frac{n_2}{n_1} = \frac{30}{10} = \frac{3}{1}$$

$$\frac{2\pi\sqrt{\frac{l_1}{g}}}{2\pi\sqrt{\frac{l_2}{g}}} = \sqrt{\frac{l_1}{l_2}} \Rightarrow \sqrt{\frac{l_1}{l_2}} = \frac{3}{1}$$

$$\frac{l_1}{l_2} = \frac{9}{1} \Rightarrow \underline{l_1 = 9\,l_2}$$

(46)

$n_1 = 30$

$n_2 = 50$

$l_1 - l_2 = 32\ cm$

$\frac{T_1}{T_2} = \frac{5}{3}$ $\quad \frac{l_1}{l_2} = \frac{25}{9}$ (VIZ PŘÍKLAD (45))

$l_1 = 32 + l_2$ $\quad \frac{32 + l_2}{l_2} = \frac{25}{9}$

$9.(32 + l_2) = 25 l_2$

$288 = 25 l_2 - 9 l_2$

$288 = l_2 (25 - 9)$

$\frac{288}{16} = l_2 = \underline{18\ cm} \Rightarrow l_1 = 32 + 18 = \underline{50\ cm}$

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(57) $v = \lambda f = 0{,}8 \cdot 2 = \underline{1{,}6\ m.s^{-1}}$

(58) $v = 0425 \cdot \underbrace{2{,}5\ kHz}_{2{,}5.10^3\ Hz} = \underline{1062{,}5\ m.s^{-1}}$

(59) $440\ Hz = f_1$

$f_2 = ?$

$\omega_1 = 2\pi f_3$ — 330 ot./min

$\omega_2 = 2\pi f_4$ — 45 ot./min

f_3, f_4 — FREKVENCE OTÁČENÍ DESKY

$$\frac{440}{f_2} = \frac{\omega_1}{\omega_2}$$

$$\frac{440}{f_2} = \frac{2\pi f_3}{2\pi f_4}$$

$$f_3 = \frac{33}{60} = \frac{11}{20}$$

$$f_4 = \frac{45}{60} = \frac{9}{12}$$

$$\frac{440}{f_2} = \frac{\frac{11}{20}}{\frac{9}{12}} \Rightarrow f_2 = \frac{440.20.9}{11.12}$$

$$f_2 = \underline{600\ Hz}$$

(61)

$$y = 5.10^{-4} \sin\left(2\pi\left(450t - 1{,}4x\right)\right) m$$

$$y_m = 5.10^{-4} m$$

PRO VÝPOČET VLNĚNÍ LZE POUŽÍT I

VÝPOČET $y = y_m \sin\left(2\pi\left(\frac{t}{T} - \frac{x}{\lambda}\right)\right)$

VIZ PŘÍKLAD (60)

$$450t = \frac{t}{T} \qquad 1{,}4x = \frac{x}{\lambda}$$

$$450 = \frac{1}{T} = f \qquad 1{,}4 = \frac{1}{\lambda}$$

$$\lambda = \frac{1}{1{,}4} = 0{,}71$$

$f = 450 Hz$

$\lambda = 0{,}71 m$

$v = \lambda . f = 450 \cdot 0{,}71 = \underline{321{,}43 \; m.s^{-1}}$

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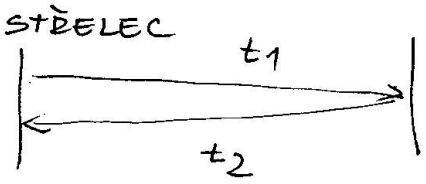
(75) $v = \frac{s}{t} \Rightarrow s = v \cdot t = 340 \cdot 6 = \underline{2040\,m}$

(86)

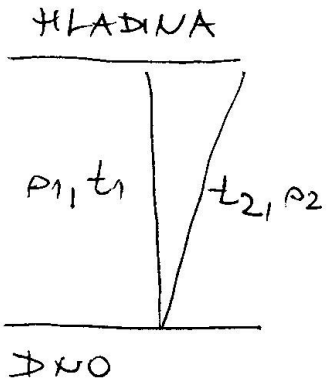


LES $\quad v = \frac{s}{t} \Rightarrow t = \frac{s}{v}$

$t_1 = \frac{s}{v} \qquad t_2 = \frac{s}{v}$

$t = t_1 + t_2 = 2t_1 = 2 \cdot \frac{s}{v} = 2 \cdot \frac{140}{340} = 1\,s$

(87)



$t_1 + t_2 = 0{,}6\,s$

$v = \frac{s}{t} \Rightarrow s = v \cdot t$

$s = 1400 \cdot 0{,}6 = 840$

$s_1 + s_2 = s \;\wedge\; s_1 = s_2$

$s_1 = \frac{1}{2}\,840 = \underline{420\,m}$

(88)

VIZ ÚLOHA (87) $\qquad s = \frac{1}{2}(5 \cdot 22)$

$s = \underline{55\,km}$