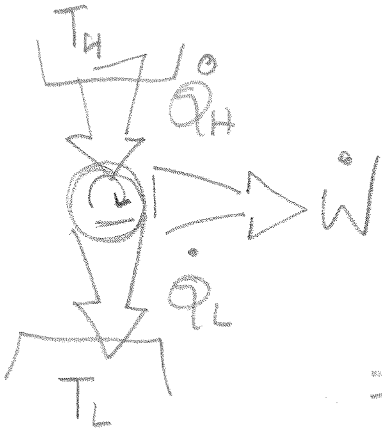
PREGUNTA 1

a)



$$\boxed{\dot{W} = 150\,MW}$$

$$\eta = 0{,}15 = \frac{\dot{W}}{\dot{Q}_H}$$

$$\Rightarrow \dot{Q}_H = \frac{\dot{W}}{0{,}15} \therefore \dot{Q}_H = \frac{150\,MW}{0{,}15}$$

$$\boxed{\dot{Q}_H = 1000\,MW}$$

$$\dot{Q}_H \cdot \{24[60(60\,s)]\} = Q_H^{DIA}$$

$$\boxed{Q_H^{DIA} = 86{,}4 \times 10^6\,MJ} = 86{,}4 \times 10^3\,GJ$$

$$m_c q_c = Q_H^{DIA}$$

$$m_c = \frac{Q_H^{DIA}}{q_c}$$

$$m_c = \frac{(86{,}4 \times 10^9\,kJ)}{(33{,}0\,kJ/g)}$$

$$m_c = 2{,}618 \times 10^9\,g$$

$$\boxed{m_c = 2618 \text{ Toneladas}}$$

b)

$$\dot{Q}_L = \dot{Q}_H - \dot{W} \therefore \boxed{850\,MW = \dot{Q}_L}$$

Se desechan $\dot{Q}_L$ a través del agua estraída del río

$$Q = m c_v \Delta T \qquad \Delta T \leq 5K$$

$\Downarrow$ en régimen

$$\dot{Q} = \dot{m} c_v \Delta T \Rightarrow \Delta T = \frac{\dot{Q}}{\dot{m} c_v}$$

$$\Rightarrow \dot{m} \geq \frac{\dot{Q}}{(5K)c_v}$$

$$\dot{m} \geq \frac{(850\,MW)}{(5K)(4186\,J/kg\,K)}$$

$$\boxed{\dot{m} \geq 40{,}6 \text{ TONELADAS/s}}$$

Pregunta 2.

Inicialmente, en ambos recipientes,

$m = 0{,}1\ kg$, $T_1 = T_0 = 293{,}15\ K$

$P_1 = P_0 = 100\ kPa$ y $V_1 = \dfrac{mRT_0}{P_0} = 0{,}084\ m^3$

En el recinto A, la temperatura y la presión permanecen constantes. El estado final es el mismo que el inicial.

$$\Delta U_A = 0 \qquad \Delta S_A = 0$$

Por la primera ley,

$$\Delta U_A = Q_A + W_A = 0 \Rightarrow Q_A = -10\ kJ$$

En el recinto B, la presión permanece constante y $Q_B = 0$

Por la primera ley

$$\Delta U_B = W_B - m P_0 (V_{B2} - V_1)$$

$$m c_v (T_{B_2} - T_1) = W_B - mR(T_{B_2} - T_1)$$

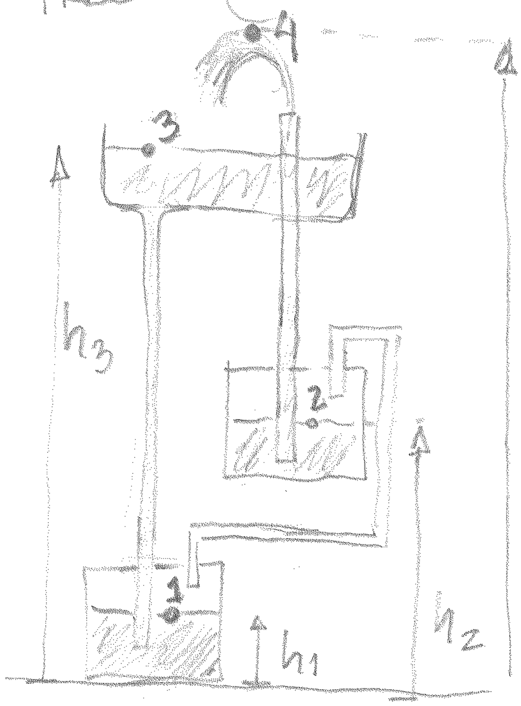
$$T_{B2} = T_1 + \frac{W_B}{m(c_v + R)} = 343\ K.$$

Como la presión es constante,

$$\Delta S_B = m(c_v + R) \ln \frac{T_{B2}}{T_1} = 16\ J/K$$

$$\Delta S_{univ} = \Delta S_A + \Delta S_B - \frac{Q_A}{T_0} = 50\ J/K$$

PREGUNTA 3



$$\boxed{P_3 = P_0 = P_4}$$

$$P_3 + \rho g h_3 = P_1 + \rho g h_1$$

$$\Longrightarrow \boxed{P_1 = P_0 + \rho g (h_3 - h_1)}$$

$\boxed{P_2 = P_1}$! pues solo es aire

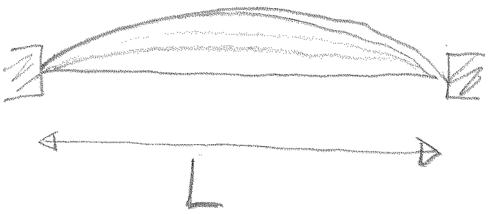
$$\boxed{P_4 + \rho g h = P_2 + \rho g h_2}$$

$$\Longrightarrow \boxed{h_4 = h_3 - h_1 + h_2}$$

$$h_4 = h_3 + h$$

$$\boxed{h = h_2 - h_1}$$

EJERCICIO 1



$L = 0{,}4\,m$

$m = 0{,}002\,kg$ $\Longrightarrow \boxed{\mu = 0{,}005\,kg/m}$

$T = 600\,N$

a)

$$v = \sqrt{\frac{T}{\mu}} \therefore v = \sqrt{\frac{600N}{0{,}005\,kg/m}} \Longrightarrow \boxed{v \simeq 346{,}4\,m/s}$$

La cuerda oscila si

$$\left.\begin{array}{l} L = \dfrac{\lambda m}{2} \\ \lambda f = v \end{array}\right\} \Longrightarrow L = \frac{v m}{2 f_m} \therefore f_m = \frac{v m}{2L}$$

$$\Longrightarrow f_1 = \frac{(346{,}4\,m/s)}{2 \times (0{,}4\,m)}$$

$$\boxed{f_1 \simeq 433{,}0\,Hz}$$

b) $f_1^{CUERDA} = f_{AIRE}$

$$\lambda_{AIRE} = \frac{v_{AIRE}}{f_{AIRE}} \therefore \lambda_{AIRE} = \frac{(343\,m/s)}{(433{,}0\,Hz)}$$

$$\boxed{\lambda_{AIRE} \simeq 0{,}792\,m}$$

EJERCICIO 1

c) $f_n = \frac{v\, n}{2L} \Longrightarrow \tilde{n} = \frac{2Lf}{v} \therefore \tilde{n} = \frac{2\times(0,4m)\times(14\,kHz)}{(346,4\,m/s)}$

$\tilde{n} \simeq 32,3$
$n \in \mathbb{N}$
$\Big\} \Longrightarrow \boxed{n = 32}$

nº de armónico

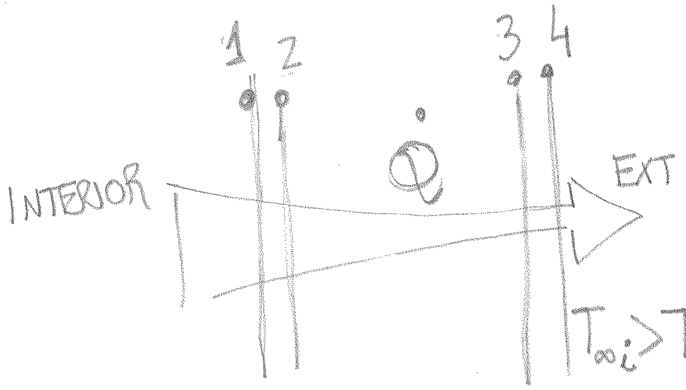
d) Suponiendo la cuerda lo suficientemente lejos, la potencia $\overline{P}$ generada por la cuerda de piano se distribuye en una esfera $\Longrightarrow I_r = \frac{\overline{P}}{4\pi r^2}$

$2I_1 = I_2$

$\frac{2\overline{P}}{4\pi r_1^2} = \frac{\overline{P}}{4\pi r_2^2} \Longrightarrow r_2 = \frac{r_1}{\sqrt{2}} \Longrightarrow r_2 = \frac{(30m)}{\sqrt{2}}$

$\boxed{r_2 = 21,2\,m}$

EJERCICIO 2



$h_{EXT} = 60\,W/m^2K$ | $T_{\infty i} = 293K$

$h_{INT} = 30\,W/m^2K$ | $T_{\infty o} = 258K$

$S = 350\,m^2$

$T_{\infty i} > T_1 > T_2 > T_3 > T_4 > T_{\infty o}$

CONVECCION interior $\rightarrow$ yeso : $\dot{Q} = h_{INT} S (T_{\infty i} - T_1)$

a) CONDUCCION yeso : $\dot{Q} = \frac{k_p S}{L_p}(T_1 - T_2)$

CONDUCCION fibra : $\rightarrow \dot{Q} = \frac{k_b S}{L_b}(T_2 - T_3)$

CONDUCCION madera : $\dot{Q} = \frac{k_s S}{L_s}(T_3 - T_4)$

CONVECCION madera $\rightarrow$ exterior : $\dot{Q} = h_{EXT} S (T_4 - T_{\infty o})$

$$\boxed{R_{EQ} = \frac{1}{h_{INT} S} + \frac{L_p}{k_p S} + \frac{L_b}{k_b S} + \frac{L_s}{k_s S} + \frac{1}{h_{EXT} S}}$$

$$R_{EQ} = \frac{1}{(350\,m^2)}\left[\frac{1}{(30\,W/m^2K)} + \frac{(0{,}01\,m)}{(0{,}17\,W/mK)} + \frac{(0{,}1\,m)}{(0{,}038\,W/mK)} + \frac{(0{,}02\,m)}{(0{,}12\,W/mK)} + \frac{1}{(60\,W/m^2K)}\right]$$

$$\boxed{R_{EQ} = 0{,}0083\ K/W}$$

b) $\dot{Q} = \frac{T_{\infty i} - T_{\infty o}}{R_{EQ}} \therefore \dot{Q} = \frac{(35\,K)}{(0{,}0083\,K/W)} \Longrightarrow \boxed{\dot{Q} \simeq 4{,}2\,kW}$

c) $\dot{S}^{UNIV} = \dot{S}^{PARED} + \dot{S}^{INT} + \dot{S}^{EXT}$

$\dot{S}^{PARED} = \emptyset$ pues supongo régimen

$\dot{S}^{INT} = \frac{-\dot{Q}}{T_{\infty i}}$; $\dot{S}^{EXT} = \dot{Q}/T_{\infty o}$

$\Longrightarrow \dot{S}^{UNIV} = \dot{Q}\left[\frac{1}{T_{\infty o}} - \frac{1}{T_{\infty i}}\right]$

$\dot{S}^{UNIV} = (4{,}2\,kW)\left[\frac{1}{258K} - \frac{1}{293K}\right]$

$$\boxed{\dot{S}^{UNIV} \simeq 0{,}00195\,kW/K}$$