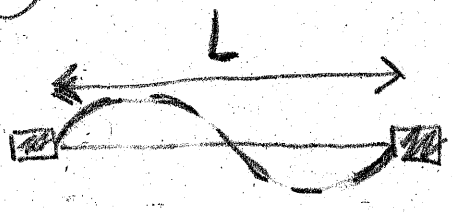
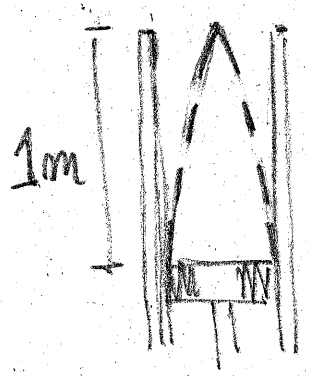
EJERCICIO 1



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

$m = 0{,}01\,kg$ $\Rightarrow \mu = \frac{m}{L}$

$\boxed{\mu = 0{,}025\,kg/m}$



$\lambda_C = L \therefore \boxed{\lambda_C = 0{,}4\,m}$

$V_{AIRE} = 343\,m/s$

a) $\frac{\lambda_T}{4} = 1m \Rightarrow \boxed{\lambda_T = 4m}$

$\lambda_T f_T = V_{AIRE}$

$\Rightarrow f_T = \frac{(343\,m/s)}{(4m)}$

$\boxed{f_T = 85{,}75\,Hz}$

b) $f_C = f_T \Rightarrow \boxed{f_C = 85{,}75\,Hz}$

$V_{CUERDA} = \lambda_C f_C \therefore V_{CUERDA} = (0{,}4m)(85{,}75\,Hz)$

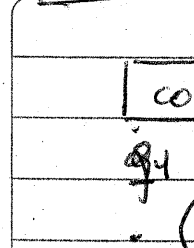
$\boxed{V_{CUERDA} = 34{,}3\,m/s}$

$V_{CUERDA} = \sqrt{\frac{T}{\mu}} \therefore T = \mu V_{CUERDA}^2$

$T = (0{,}025\,kg/m)(34{,}3\,m/s)^2$

$\boxed{T = 29{,}41\,N}$

EJERCICIO 2



DATOS:

- $G = 1000\ W/m^2$; $T_0 = 20^\circ C = 293\ K$
- $\rho = 20\ kg/m^2$; $c = 0{,}25\ kJ/kg\,K$

a, b, c) $T_c = C_{te} = 90^\circ C = 363\ K$

$\eta = (0{,}8)\,\eta_c$

d) $G = 0$; $T_c \neq C_{te}$; MT REVERSIBLE

(a) FUNCIONAMIENTO EN RÉGIMEN $\longrightarrow$ $\boxed{\dot{q}_H = G = 1000\ W/m^2}$

$$\Rightarrow \eta = (0{,}8)\,\eta_c = (0{,}8)\left(1 - \frac{T_L}{T_H}\right) \approx 0{,}154 \longrightarrow \boxed{\eta \approx 0{,}154}$$

$$\Rightarrow \eta = \frac{\dot{W}}{\dot{q}_H} \Rightarrow \dot{w} = \eta\,\dot{q}_H \Rightarrow \boxed{\dot{w} \approx 154{,}3\ W/m^2}$$

$$\Rightarrow \dot{q}_L = \dot{q}_H - \dot{w} \Rightarrow \boxed{\dot{q}_L \approx 845{,}7\ W/m^2}$$

(b) $\dot{W} = A_c\,\dot{w} \Rightarrow \boxed{A_c = \frac{\dot{W}}{\dot{w}} \approx 4{,}83\ m^2}$

(c) $\dot{S}^{IRH} = -\frac{A_c \cdot \dot{q}_H}{T_c} \approx -13{,}32\ W/K$

$$\Rightarrow \boxed{\Delta S^{IRH} = (3600)\,\dot{S}^{IRH} \approx -47{,}9\ kJ/K}$$

$$\dot{S}^{IRL} = \frac{+A_c \dot{q}_L}{T_0} \approx 13{,}94\ W/K$$

$$\Rightarrow \boxed{\Delta S^{IRL} = (3600)\,\dot{S}^{IRL} \approx 50{,}2\ kJ/K}$$

$$\Delta S^{UNIV} = \Delta S^{IRH} + \Delta S^{IRL}$$

$$\Rightarrow \boxed{\Delta S^{UNIV} \approx 2{,}3\ kJ/K}$$

Pregunta 1

$D_{int} = 56 \times 10^{-2}\ m$

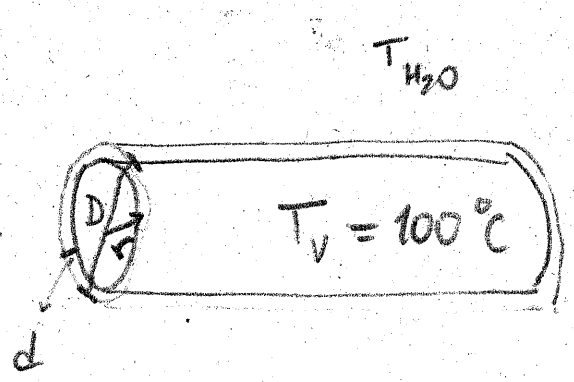
$D_{ext} = 60 \times 10^{-2}\ m$

$d = 2 \times 10^{-2}\ m$

$T_{H_2O} = 20\,^{\circ}C = 293\,K$

$T_V = 100\,^{\circ}C = 373\,K$

$k = 50\ W/m\,K$



$$\dot{Q} = -kA\frac{dT}{dr}$$

$$A(r) = 2\pi r \ell$$

$$\dot{q} = \frac{\dot{Q}}{\ell} = -k\,2\pi r \frac{dT}{dr}$$

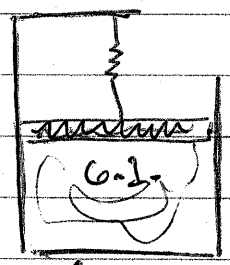
$$\dot{q}\int_{D_{int}/2}^{D_{ext}/2}\frac{dr}{r} = -k\,2\pi\int_{T_V}^{T_{H_2O}} dT$$

$$\dot{q}\,\ln\left(\frac{D_{ext}}{D_{int}}\right) = -k\,2\pi\,(T_{H_2O} - T_V)$$

$$\dot{q} = \frac{-k\,2\pi\,(T_{H_2O} - T_V)}{\ln\left(\frac{D_{ext}}{D_{int}}\right)} = \frac{25132{,}7\ kW/m}{0{,}069}$$

$$\boxed{\dot{q} = 364\ \frac{kW}{m}}$$

PREGUNTA 2



1) $T_1 = 20^\circ C = 293 K$
$P_1 = 150 KPa$
$V_1 = 0,1 m^3$
$M \approx 0,178 Kg$

2) $V_2'' = V_1 + 0,02 m^3 = 0,12 m^3$
$P_2 = 2P_1 = 300 KPa$
$T_2 \approx 704,7 K$

$\rightarrow Q = \Delta U - W = MC_v(T_2 - T_1) + \frac{(P_2 + P_1)(V_2 - V_1)}{2}$

$\approx 52,5 KJ + 4,5 KJ$

$\Rightarrow Q \approx 57 KJ$

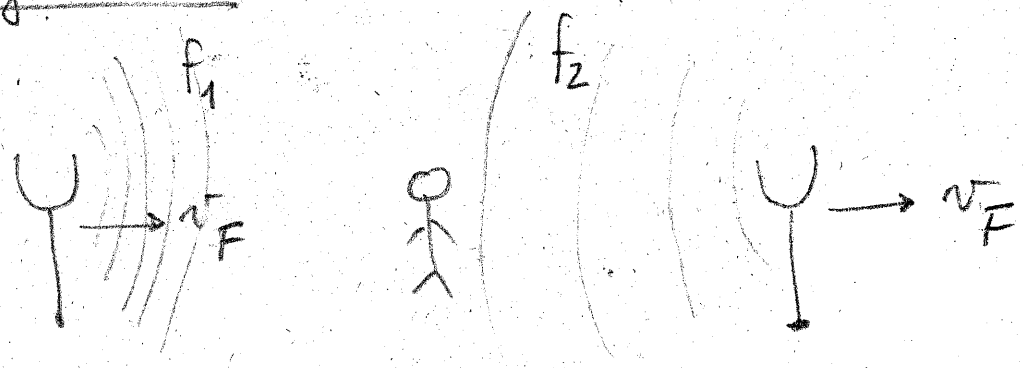
$\rightarrow \Delta S^{UNIV} = \Delta S^{AIRE} + \Delta S^{RS}$

$= MC_v L\left(\frac{T_2}{T_1}\right) + MRL\left(\frac{V_2}{V_1}\right) - \frac{Q}{T_R}$

$\approx 0,112 \frac{KJ}{K} + 0,023 \frac{KJ}{K} - 0,071$

$\Rightarrow \Delta S^{UNIV} \approx 0,064 KJ/K$

Pregunta 3:



$f = 440\,Hz$

$f_p = 2\,Hz$

$v_s = 343\,m/s$

$\boxed{v_F = ?}$

$$f_1 = \frac{v_F}{v_F - v_s} f$$

$$f_2 = \frac{v_F}{v_F + v_s} f$$

$$f_1 - f_2 = f_p = 2\,Hz$$

$$\frac{v_F}{v_F - v_s} - \frac{v_F}{v_F + v_s} = \frac{f_p}{f}$$

$$\frac{\cancel{v_F} + v_s - \cancel{v_F} + v_s}{(v_F - v_s)(v_F + v_s)} = \frac{1}{v_F}\,\frac{f_p}{f}$$

$$\frac{2 v_s v_f}{v_F^2 - v_s^2} = \frac{f_p}{f}$$

Prog 3 (cont)

$$2 v_s v_F = \frac{f_P}{f}\left(v_F^2 - v_s^2\right)$$

$$\frac{f_P}{f} v_F^2 - (2 v_s) v_F + \frac{f_P}{f} v_s^2 = 0$$

$$(4{,}5\times10^{-3}) v_F^2 - (686) v_F + 534{,}8 = 0$$

$$v_F = \frac{682 \pm \sqrt{(686)^2 - 4(4{,}5\times10^{-3})(534{,}8)}}{2\times 4{,}5\times10^{-3}}$$

$$\begin{cases} v_F = 152443{,}6 \text{ m/s} \quad \text{Absurdo} \\ \boxed{v_F = 0{,}78 \text{ m/s}} \end{cases}$$