GABARITO – PROVA OFICIA – T.A – 22014 (1)

1ª Q $Q_{m3} = \rho_3 \times Q_3 \Rightarrow 56 = 998 \times Q_3$

$\boxed{Q_3 \simeq 0{,}0561 \ \frac{m^3}{s}} \Rightarrow (0{,}25)$

$Q_3 = Q_1 + Q_2$ e $Q_1 = v_1 \times A_1 = 8 \times \frac{\pi \times 0{,}06^2}{4}$

(0,25)

$\boxed{Q_1 \simeq 0{,}0226 \ \frac{m^3}{s}}$ $\therefore Q_2 = Q_3 - Q_1$

$\Rightarrow (0{,}5)$

$Q_2 = 0{,}0561 - 0{,}0226 \Rightarrow \boxed{Q_2 = 0{,}0335 \ \frac{m^3}{s}}$

$v_2 = \frac{Q_2}{A_2} = \frac{4 \times 0{,}0335}{\pi \times 0{,}04^2} \Rightarrow \boxed{v_2 \simeq 26{,}7 \ m/s} \Rightarrow (0{,}5)$

$Re_2 = \frac{v_2 \times D_2}{\nu} = \frac{26{,}7 \times 40 \times 10^{-3}}{10^{-6}} \Rightarrow \boxed{Re_2 \simeq 1068000}$

$\therefore$ TURBULENTO (0,25)

$v_2 = \frac{49}{60} \cdot v_{máx2} \Rightarrow v_{máx2} = \frac{26{,}7 \times 60}{49}$

$\boxed{v_{máx2} \simeq 32{,}7 \ m/s} \Rightarrow (0{,}25)$

2ª Q a) $H_2 = 10m = 0 + 2{,}03 + \frac{v_2^2}{19{,}6} \Rightarrow v_2 = \sqrt{156{,}212}$

$\boxed{v_2 \simeq 12{,}5 \ m/s} \Rightarrow (0{,}25)$ $\frac{v_2 \times \pi D_2^2}{4} = \frac{v_1 \times \pi D_1^2}{4}$

$v_1 = 12{,}5 \times \left(\frac{5}{6}\right)^2 \Rightarrow \boxed{v_1 \simeq 8{,}7 \ m/s} \Rightarrow (0{,}25)$

(2) $H_1 + H_M = H_2$

$$z_1 + \frac{p_1}{\gamma} + \frac{v_1^2}{2g} + H_M = z_2 + \frac{p_2}{\gamma} + \frac{v_2^2}{2g}$$

$z_1 = z_2 \Rightarrow p_2 - p_1 = 0,3 \times (133280 - 9800)$

$\boxed{p_2 - p_1 = 37044\,Pa} \rightarrow (0,5)$

$$H_M = \frac{37044}{9800} + \frac{12,5^2 - 8,7^2}{19,6} \Rightarrow \boxed{H_M = 7,89\,m} \rightarrow (0,5)$$

$H_M > 0$ é BOMBA.

$$N_B = \frac{\gamma \times Q \times H_B}{\eta_B} = \frac{9800 \times (12,5 \times \pi \times 0,05^2) \times 7,89}{4 \times 0,8}$$

(0,5) $\boxed{N_B \simeq 2372,2\ W}$

b) $H_0 = H_1 + H_{p_{0-1}}$

$$50 = \frac{p_1}{9800} + \frac{8,7^2}{19,6} + H_{p_{0-1}}$$

$2,03 \times 9800 - p_1 = 37044 \Rightarrow \boxed{p_1 = -17150\,Pa} \rightarrow (0,25)$

$$50 + \frac{17150}{9800} - \frac{8,7^2}{19,6} = H_{p_{0-1}}$$

$\boxed{H_{p_{0-1}} \simeq 47,9\,m} \rightarrow (0,25)$

c) $H_2 = H_3 + H_{p_{2-3}}$. (3)

$10 = -9 + H_{p2-3} \Rightarrow \boxed{H_{p_{2-3}} = 19\,m}$ (0,5)

x x

3ª Q

$p_m + 0,12 \times 1000 \times 9,8 + 0,3 \times 13600 \times 9,8 - 0,3 \times 1000 \times 9,8$

$+ 0,2 \times 13600 \times 9,8 - 0,2 \times 1000 \times 9,8 = 75000$.

$p_m + 1176 + 39984 - 2940 + 26656 - 1960 = 75000$

$\boxed{p_m \simeq 12084 \frac{N}{m^2} \text{ (ou Pa)}} \Rightarrow (4,5)$

$H_1 = H_2 + H_{p1-2} \Rightarrow Z_1 = Z_2$ e $v_1 = v_2$

$\frac{p_1}{\gamma} = \frac{p_2}{\gamma} + H_{p1-2} \Rightarrow p_1 + 0,3 \times 1000 \times 9,8 - 0,3 \times 13600 \times 9,8 = p_2$

$p_1 - p_2 = 0,3 \times 9,8 \times (13600 - 1000) \Rightarrow \boxed{p_1 - p_2 = 37044\,Pa}$ (0,5)

$H_{p1-2} = \frac{p_1 - p_2}{\gamma} = \frac{37044}{9800} \Rightarrow \boxed{H_{p_{1-2}} = 3,78\,m} \Rightarrow (1,0)$

4

4ª Q

$$\rho_R = \frac{\rho_{GN}}{\rho_{padrão}} = 0,6$$

$$\rho_{padrão} = \rho_{ar} < \begin{matrix} 15°C \\ 10^5 Pa \ (abs) \end{matrix}$$

$$\rho_{ar} = \frac{p}{R \times T} = \frac{10^5}{287 \times (273+15)} \Rightarrow \boxed{\rho_{ar} \simeq 1,21 \frac{kg}{m^3}} \rightarrow (0,5)$$

$$\rho_{GN} = 0,6 \times 1,21 \Rightarrow \boxed{\rho_{GN} \simeq 0,726 \frac{kg}{m^3}} \Rightarrow (0,5)$$

$$\gamma_{GN} = \rho_{GN} \times g = 0,726 \times 9,8 \Rightarrow \boxed{\gamma_{GN} \simeq 7,12 \frac{N}{m^3}} \rightarrow (0,5)$$

$$0,726 = \frac{10^5}{R_{GN} \times 288} \Rightarrow R_{GN} = \frac{10^5}{0,726 \times 288}$$

$$\boxed{R_{GN} \simeq 478,3 \frac{m^2}{s^2 K}} \Rightarrow (0,5)$$