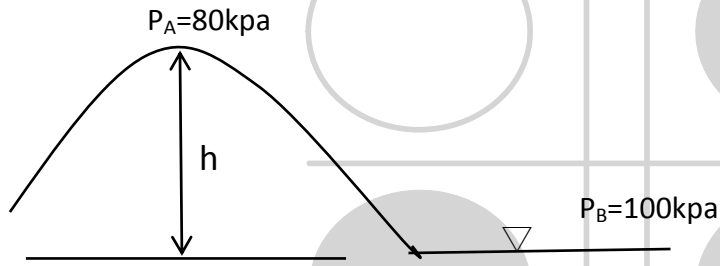


一、【參考題解】



設空氣密度為 ρ ，則

$$P_B = \rho R T_B \Rightarrow 10(10^3) = \rho(287)(20+273)$$

得空氣密度為 $\rho = 1.2 \text{ kg/m}^3$

$$\text{又 } \frac{P_A}{P_B} = \left(\frac{T_A}{T_B}\right)^{\frac{g}{R\beta}} \quad \text{其中 } \beta = 6.5^\circ\text{C/km} = 279.5\text{K/km} = 279.5\text{K}/1000\text{m} = 0.2795 \text{ K/m}$$

$$\text{得 } \frac{80}{100} = \left(\frac{T_A}{20+273}\right)^{\frac{9.8}{287(0.2795)}}$$

$$\Rightarrow T_A = 47\text{K}$$

$$\text{而 } T_A = T_B - \beta h$$

$$\Rightarrow 47 = 293 - (273 - 6.5)h$$

$$\Rightarrow h = 0.923 \text{ km}$$

二、【參考題解】

$$\text{頭損爲 } h_L = HGL_A - HGL_B = 24\text{m} \quad (1)$$

$$\text{由公式知 } R_e = \frac{64}{f} \quad \text{代入公式得}$$

$$f^{-\frac{1}{2}} = 1.93 \log 64 f^{-\frac{1}{2}} - 0.537$$

$$\text{令 } f^{-\frac{1}{2}} = y \quad \text{代入上式得 } y = 1.93 \log 64 y - 0.537$$

以試誤法得 $y = 4.1$ 代入得 $f = 0.06$

由有摩擦損失的達西偉士伯方程式(Darcy-Weisbach Equation)之頭損知:

$$h_L = f \frac{L}{D} (\sum K \frac{V^2}{2g})$$

由式(1)知 $24 = 0.06 \frac{100}{0.05} (0.2 + 0.3) \frac{V^2}{2g}$

$\Rightarrow V = 2.8 \text{ m/sec}$

故流量為 $Q = AV = \frac{\pi D^2 V}{4} = \frac{\pi}{4} (0.05)^2 (2.8) = 0.0055 \text{ m}^3 / \text{sec} = 330 \text{ l} / \text{min}$

三、【參考題解】

梯形面積 $(1 + 0.3 \times 2 + 1) / 2 = 0.39 \text{ m}^2$

將梯形渠道深度轉換成矩形渠道之水利深度 $y_c = 0.39 / (1 + 0.3 \times 2) = 0.2438 \text{ m}$

$$Fr = \frac{V}{\sqrt{gy_c}} = 1 = \frac{V}{\sqrt{9.8(0.2438)}}$$

得 $V = 1.55 \text{ m/s}$

所以流量為 $Q = AV = 0.39(1.55) = 0.6 \text{ m}^3/\text{s}$

四、【參考題解】

設電梯向上加速度為 a

由 $P = \gamma y (1 + \frac{a}{g})$ 知

$$5.5 = \gamma y (1 + \frac{a}{g}) \quad (1)$$

$$4.9 = \gamma y \quad (2)$$

$$\frac{(1)}{(2)} \quad \frac{5.5}{4.9} = 1 + \frac{a}{9.8}$$

得 $a = 1.197 \text{ m/sec}^2 (\uparrow)$