

宿題（3）（提出日: 1 2月6日）

[4-13]

$$\nu = 1.004 \times 10^{-6} m^2/s \text{ at } 20^\circ C$$

$$\tau_{wl} = \frac{0.73(10^3 \times 3^2)}{2} \sqrt{10^{-6}/(3 \times 0.8)} = 21.2 Pa$$

$$\tau_{w(l/2)} = 2.998 Pa$$

$$C_{fl} = \frac{1.462}{\sqrt{2.4 \times 10^{-6}}} = 0.943 \times 10^3$$

$$C_{f(l/2)} = \frac{1.462}{\sqrt{2.4 \times 10^{-6}}} = 1.335 \times 10^3$$

[4-14]

$$\delta_w = 5.48 \sqrt{\frac{10^{-6}x}{10}} = 5.48 \times 10^{-3.5} \sqrt{x} = 1.73 \times 10^{-3} \sqrt{x}$$

$$\delta_a = 1.73 \times 10^{-3} \times 3.87 \sqrt{x}$$

$$\frac{\delta_a}{\delta_w} = 3.87, \quad Re_t = 3.2 \times 10^5 = \frac{10x_t}{\nu}$$

$$x_{tw} = 3.2 \times 10^{-2} = 0.032m, \quad x_{ta} = 0.48m$$

[4-15]

$$Re = \frac{2.78 \times 1.5}{10^{-6}} = 4.17 \times 10^6 > 5 \times 10^5$$

$$C_f = 0.455(\log Re_l)^{-2.58} = 3.469 \times 10^{-3}$$

$$D = C_f \frac{1}{2} \rho V^2 (2bl) = 60.32N, L = Dv = 167.7w$$

$$D = 0.036 \rho V^2 (2bl) \left(\frac{Vl}{\nu}\right)^{-1/5}$$

$$= 0.036 \times 10^3 \times 2.78^2 (2 \times 1.5^2) (4.17 \times 10^6)^{-1/5} = 59.28N$$

$$L = DV = 164.8w$$