

2019

[15]

$$1) \quad D = 0.03 \text{ m}, \quad \rho = 1 \times 10^3 \text{ kg/m}^3, \quad \mu = 1.0 \times 10^{-3} \text{ Pa}\cdot\text{s}$$

$$Re = \frac{\rho u D}{\mu} = \frac{6.0 \times 10^4}{\text{''}} \quad f = \frac{0.006}{\text{''}}$$

$$L_{\text{入口}} = 4 \times 32 \times D = 3.84 \text{ m}, \quad L_{\text{管}} = 2 \times 300 \times D = 1.8 \text{ m}$$

$$\text{よ. 2 全長は } \underline{1.22 \text{ m}} \text{''}$$

$$F = \underbrace{4f \cdot \frac{u^2}{2} \cdot \frac{L}{D}}_{\text{''}} = 4 \times 0.006 \times \frac{2^2}{2} \times \frac{1.22}{0.03} = \underline{195 \text{ J/kg}} \text{''}$$

$$2) \quad \text{水の流量 [m}^3\text{]} = \frac{\pi}{4} D^2 u.$$

$$\text{よ. 2 水の質量流量} = \frac{\pi}{4} D^2 u \times \rho = \underline{1.41 \text{ kg/s}} \text{''}$$

Bernoulli: 式,

$$h_2 - h_1 = 10 \text{ m}, \quad u_2 = 2 \text{ m/s}, \quad F = 195 \text{ J/kg}, \quad p_2 = p_1 = \text{大気圧}$$

$$\text{よ. 2 } W = F + g(h_2 - h_1) + \frac{1}{2} u_2^2$$

$$= 195 + 98 + 2 = 295 \text{ J/kg}$$

$$W' = 295 \times 1.41 = 415.9 \text{ J/s}$$

$$\text{よ. 2 } W_{\text{ポンプ}} = \frac{415.9 \text{ J/s}}{0.6} = 693 \text{ J/s}$$

$$= \underline{0.693 \text{ kW}} \text{''}$$