

**【1】**

- (1)  $\eta_{\max} = 26.8\%$ ,  $L_{\max} = 80.4$  [kW]  
 (2)  $\eta_1 = 11.7\%$ ,  $\eta_2 = 43.5\%$ ,  $E_{\text{loss}} = 45.6$  [kW]  
 (3):  $\varepsilon_H = 3.73$ ,  $Q_{HB} = 130.55$  [kW],  $Q_{LB} = 95.6$  [kW]  
 (4) 不可能  
 (5)  $\eta_{1AB} = 0$

**【2】**

- (1) 省略  
 (2)  $l_t = \frac{\kappa}{\kappa-1} R(T_3 - T_4)$ ,  $l_c = \frac{\kappa}{\kappa-1} R(T_2 - T_1)$   
 (3) 省略  
 (4)  $q_H = \frac{\kappa}{\kappa-1} R(T_3 - T_4)$ ,  $q_L = \frac{\kappa}{\kappa-1} R(T_2 - T_1)$ ,  $q_r = \frac{\kappa}{\kappa-1} R(T_4 - T_2)$   
 (5)  

$$\eta_{th} = 1 - \frac{T_1}{T_3} \gamma^{(\kappa-1)/\kappa}$$

$$T_2 > T_1 \text{ より, } \eta_{\text{carnot}} = 1 - \frac{T_1}{T_3} > \eta_{th} = 1 - \frac{T_2}{T_3} \quad . \quad \text{あるいは, } \gamma^{(\kappa-1)/\kappa} > 1 \text{ より, } \eta_{\text{carnot}} > \eta_{th}$$

**【3】**

- (1)  $\rho = 1.177$  [kg/m<sup>3</sup>]  
 (2)  $x_c = 1.96$  [m]  
 (3)  $x=1$  m:  $Re_x = 2.5 \times 10^5$ ,  $\delta_x = 0.009$  [m],  $x=3$  m:  $Re_x = 7.6 \times 10^5$ ,  $\delta_x = 0.074$  [m]  
 (4)  $\Delta m = 0.278$  [kg/s]  
 (5)  $x=1$  m:  $Nu_x = 143.63$ ,  $\alpha_{x=1} = 3.907$  W/(m<sup>2</sup>·K),  $x=3$  m:  $Nu_x = 1337.71$ ,  $\alpha_{x=3} = 12.129$  W/(m<sup>2</sup>·K)  
 (6)  $\alpha = 7.814$  W/(m<sup>2</sup>·K),  $Q = 203$  W