1.7-5

I $\dot{Q}_{convección} = \alpha \cdot A \cdot (\vartheta_{a\,int} - \vartheta_{pint}) = 20 \frac{W}{m^2 K} \cdot 100 m^2 (20°C - \vartheta_{pint}) = 2000 \frac{W}{K} (20° - \vartheta_{pint})$

II $\dot{Q}_{cond} = \frac{\lambda \cdot A (\vartheta_{pint} - \vartheta_{pext})}{x} = \frac{0{,}19 \frac{W}{mK} \cdot 100 m^2 (\vartheta_{pint} - \vartheta_{pext})}{0{,}24 m} = 79{,}17 \frac{W}{K} (\vartheta_{pint} - \vartheta_{pext})$

III $\dot{Q}_{convección} = 2000 \frac{W}{K} (\vartheta_{pext} - 0°C)$

→ I' $\vartheta_{pint} = 20°C - \frac{\dot{Q}}{2000 \frac{W}{K}}$

→ III' $\vartheta_{pext} = \frac{\dot{Q}}{2000 \frac{W}{K}} + 0°C$

→ II' $\dot{Q} = 79{,}17 \frac{W}{K} \left(20°C - \frac{\dot{Q}}{2000 \frac{W}{K}} - \left(\frac{\dot{Q}}{2000 \frac{W}{K}} + 0°C\right)\right)$

$\dot{Q} = 79{,}17 \frac{W}{K} \cdot 20°C - \frac{79{,}17 \frac{W}{K} \cdot \dot{Q}}{2000 \frac{W}{K}} - \frac{79{,}17 \frac{W}{K} \cdot \dot{Q}}{2000 \frac{W}{K}} - 0$

$\dot{Q} + \frac{79{,}17 \frac{W}{K} \cdot \dot{Q}}{1000 \frac{W}{K}} = 1583{,}4 W$

$\dot{Q} = \frac{1583{,}4 W}{1{,}0792} = 1467 W$