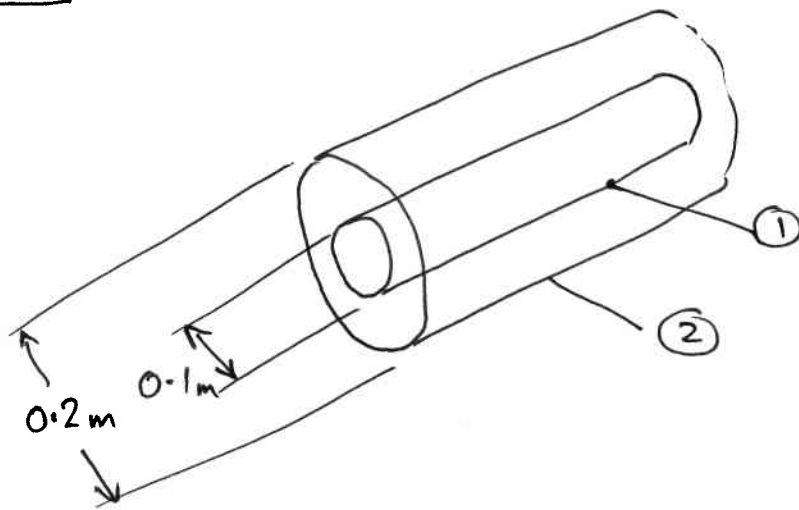


Q.4 (ii)



If the chamber surrounds the tube as shown it is no longer 'large' in comparison to the tube. Radiation from the nickel tube will be absorbed by, and reflected from, the chamber wall.

Also the walls relative to the tube will have a geometric factor. However, if the tube and chamber are long then  $F_{12} = 1$ .

The heat exchange rate for a long tube in a concentric chamber is given by :-

$$\begin{aligned}\dot{Q}_{12} &= \frac{\sigma A_1 (T_1^4 - T_2^4)}{\frac{1}{\epsilon_1} + \frac{d_1}{d_2} \left( \frac{1}{\epsilon_2} - 1 \right)} \\ &= \frac{5.67 \times 10^{-8} \times \pi \times 0.1 \left( 700^4 - 1255^4 \right)}{\frac{1}{0.5} + \frac{0.1}{0.2} \left( \frac{1}{0.8} - 1 \right)} \\ &= -18782 \text{ W/m}\end{aligned}$$

or 18.78 kW/m received

NB. less than for the walls as a block body.