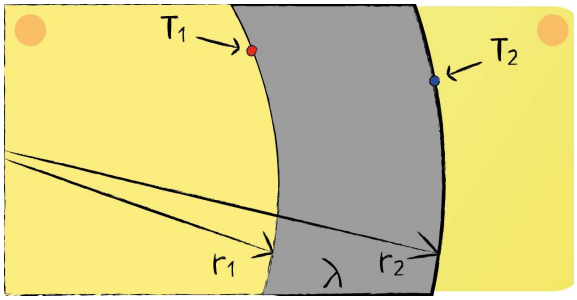
Lecture 5 - Question 5



Give the energy balance, describe the heat fluxes and give the boundary conditions. Assume one-dimensional steady state heat transfer.

Energy balance:

$$\dot{Q}_{in} - \dot{Q}_{out} = 0$$

Heat fluxes:

$$\dot{Q}_{in} = -\lambda 2\pi r L \frac{dT(r)}{dr}$$

$$\dot{Q}_{out} = -\lambda 2\pi r L \frac{dT(r)}{dr}$$

In order to obtain the steady-state energy balance, the energy entering and leaving the system should equal each other. Since conductive heat transfer is the only type of heat transfer for this system the in- and outgoing heat flux can be described by conductive heat transfer in cylindrical coordinates.

Boundary conditions:

$$T(r = r_1) = T_1$$

$$T(r = r_2) = T_2$$

The boundary conditions above describe that the temperature of the body equals T_1 when $r = r_1$ and T_2 when $r = r_2$, as can be seen in the sketched situation.