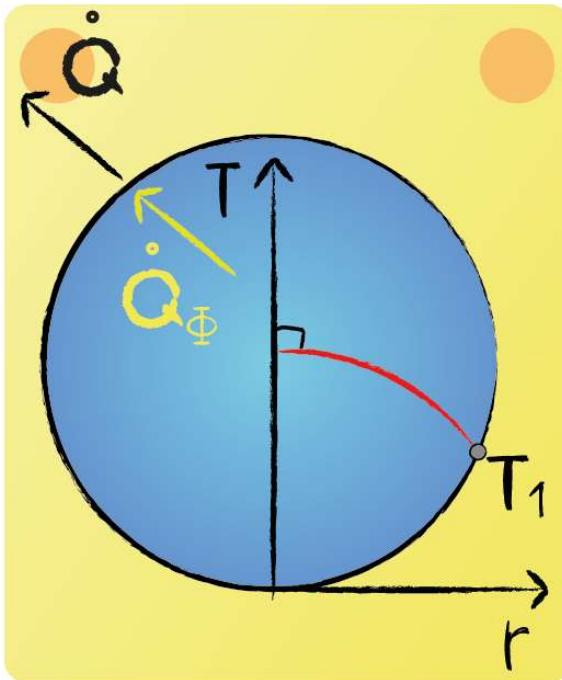


Lecture 13 - Question 5



Consider a sphere in a medium in which the heat conduction equation is given in its simplest form as:

$$\frac{1}{r} \frac{d}{dr} \left(\lambda r \frac{dT}{dr} \right) + \dot{\Phi}''' = 0$$

Which boundary conditions are applicable for solving this problem.

$$2\pi r_1 L \alpha (T_1 - T_A) = V \cdot \dot{\Phi}'''$$

Is applicable. It describes that the heat leaving equals the heat that is generated.

$$T(0) = T_0$$

Is not applicable, since the gradient at $r=0$ will not be zero, as it should.

$$\left(\frac{dT}{dr} \right)_{r=0} = 0$$

Is applicable. It described that, due to the symmetry, at $r=0$ the gradient of the temperature profile will be zero.

$$T(r_1) = T_1$$

Is applicable. It describes that the temperature profile should equal T_1 at the boundary.

$$\left(\frac{dT}{dr} \right)_{r=r_1} = 0$$

Is not applicable. It describes that the temperature profile has a zero gradient at the boundary. As can be seen in the figure, this is not the case.

