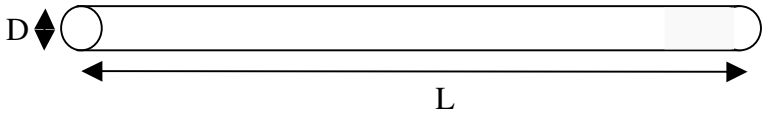
Problem 1) A long, thin solid cylinder (D = diameter, L = length) has the ability for uniform internal energy generation given by the rate $\dot{g}$ (W/m^3). Initially, the cylinder is at a uniform temperature T_i. At time = 0, the internal energy generation is turned on (i.e. $\dot{g}$ is initiated) and maintained at a constant rate, and the cylinder is immediately suspended in a bath of temperature T_b, noting that $T_b > T_i$. The bath provides heat transfer to the cylinder with a uniform convection coefficient h (W/m^2 K), and is well-circulated such that the bath temperature is constant at T_b. The cylinder has uniform and constant thermal conductivity k (W/m K).

In addition: hD/k is much less than 1, & L is much greater than D.

- Solve for time at which point the surface heat flux is zero. Present your answer in variable form.



Problem 2) A part is molded of solid metal in the shape of a hemisphere (D = diameter). The part if removed from the mold with a uniform temperature T_i, and immediately placed on a conveyer belt (t=0), where it is subjected to a uniform spray of coolant such that the entire surface is wetted and is maintained at a constant and uniform surface temperature equal to the saturation temperature of the fluid (T_{sat}). Note that $T_i > T_{sat}$ such that phase-change occurs.

(A) Solve for the temperature distribution of the part as a function of time.

(B) Provide an expression for total amount of energy (W) removed as a function of time on the conveyer belt.

You may leave integrals in answers as necessary.