Cankaya University
Faculty of Engineering
Mechanical engineering Department

Prof.Dr.N.Onur

HW 2
Spring 2017

1)

Obtain an expression for the steady-state temperature distribution $T(r, z)$ in a 2-D solid cylinder, $0 \leq r \leq b$, $0 \leq z \leq L$ for the following boundary conditions: The boundary at $z = 0$ is kept at temperature $F(r)$, and the boundaries at surfaces $r = b$ and $z = L$ dissipate heat by convection into a medium at zero temperature. Assume the heat transfer coefficients h to be the same for two convective surfaces.

2)

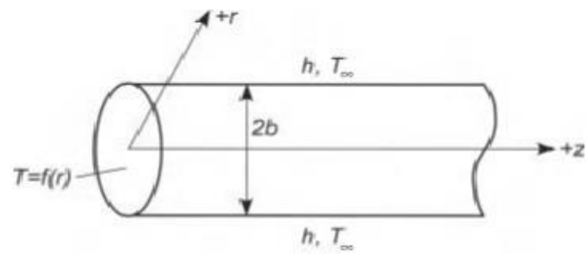
Obtain an expression for the steady-state temperature distribution $T(x, y)$ in a 2-D rectangular region $0 \leq x \leq a, 0 \leq y \leq b$ for the following boundary conditions: The boundary at $x = 0$ is kept insulated, the boundary at $y =$ b is kept at a temperature $f(x)$, and the boundaries at $x = a$ and $y = 0$ dissipate heat by convection into an environment at zero temperature. Assume the heat transfer coefficient h to be the same for both convective boundaries.

3)

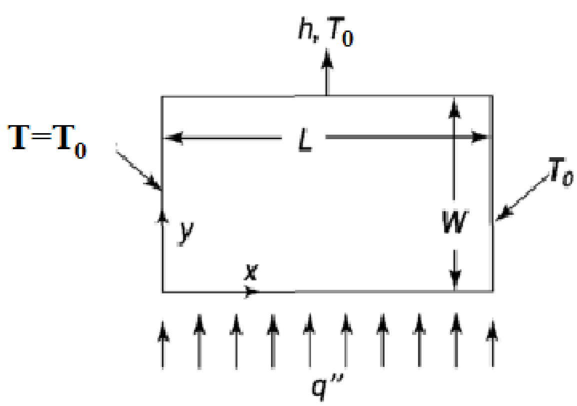
Consider the 2-D, steady-state rectangular region $0 \leq x \leq a$, $0 \leq y \leq b$ in which internal energy is generated at a constant rate g_0 (W/m^3) and subjected to the following boundary conditions: The boundaries at $x = 0$ and $y = 0$ are kept insulated, whereas the boundaries at $x = a$ and $y = b$ are kept at zero temperature. Calculate the temperature distribution $T(x, y)$.

3)

A 2-D, semi-infinite, solid cylinder of radius b is maintained at steady-state conditions with a convective boundary condition at $r = b$ with convection coefficient h and fluid temperature T_∞, and with the end face at $z = 0$ maintained at the prescribed temperature distribution $T(z = 0) = f(r)$. The problem is illustrated in We note here that the $\mathrm{Bi} = hb/k$ is not $\ll 1$; hence we maintain the r dependency and have $T = T(r, z)$.



4) Obtain the steady temperature distribution T(x,y) for the problem given below.



5)

A solid cylinder of radius r_o and length L generates heat at a volumetric rate of q'''. One plane surface is maintained at T_o while the other is insulated. The cylindrical surface is at temperature T_a. Determine the temperature distribution at steady state.

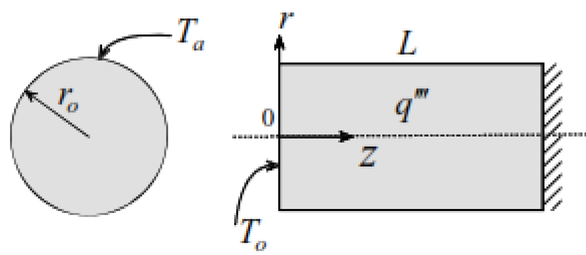


Fig. 3.5