**Conduction Heat Transfer Homework Series 1**

Due Date: 90.12.22

1. A slab,$ 0\leq x\leq L$, is initially at zero temperature. For times$ t>0$ the boundary surface at $x=L$ is kept insulated, while the surface at $x=0$ is subjected to a constant heat flux$ q"$. Obtain expressions for the heat flux distribution$ q"\left(x,t\right)$ and the temperature distribution$ T\left(x,t\right)$ in the slab for times$ t>0$.

2. In a one-dimensional semi-infinite medium,$ 0\leq x\leq \infty $, initially, the region$ 0\leq x\leq L$ is at a constant temperature$ T\_{0}$, and everywhere outside this region is at zero temperature. For times$ t>0$ the boundary surface at$ x=0$ is kept at the constant temperature$ T\_{0}$. Obtain an expression for the temperature distribution$ T\left(x,t\right)$ in the medium for times$ t>0$. Determine an expression for the heat flux at the surface$ x=0$.

3. A rectangular region$ 0\leq x\leq a, 0\leq y\leq b$ is initially at a temperature$ F\left(x,y\right)=T\_{0}\left(1-x/a\right)$. For times$ t>0$ the boundary at$ x=0$ is kept at temperature$ T\_{0}$ and all other boundary surfaces dissipate heat by convection into an environment at zero temperature. The heat transfer coefficients are the same for all of these three boundaries. Obtain an expression for the temperature distribution$ T\left(x,y,t\right)$ in the region for times$ t>0$.

4. Obtain an expression for the steady-state temperature distribution$ T\left(x,y\right)$ in an infinite strip$ 0\leq x\leq a, 0<y<\infty $, for the case where the boundary at$ y=0$ is insulated, the boundary surface at *x* = 0 is kept at a temperature *f* (*y*) and the boundary at $x=a$ is kept at zero temperature.