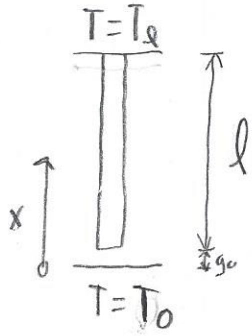

$$k\,\frac{\partial T(0,t)}{\partial x} = \frac{1}{r}\,T(0,t)$$

$$\frac{1}{r} = h(p) = H\,f(\pi)$$

$$\Delta\ell(t) = \alpha \int_0^\ell T(x,t)\,dx$$

$$g(t) = g_0 - \alpha \int_0^\ell T(x,t)\,dx > 0$$

$$P(t) = \frac{E}{\ell}\left\{\alpha \int_0^\ell T(x,t)\,dx - g_0\right\} \geq 0$$

$$\sigma = E\,\epsilon$$

$$\epsilon = \frac{\partial u}{\partial x}$$

Nondimensionalize

$$\theta_\ell = \frac{\alpha T_\ell \ell}{g_0} \qquad \pi = \frac{P\ell}{E g_0} \qquad \theta_0 = \frac{\alpha T_0 \ell}{g_0} \qquad p = \frac{K}{g_0 H}$$

$$\boxed{p\,\frac{d\tau_0}{dx} = \tau_0\,f(\pi)}$$

Low Applied Temperatures

$$\tau_\ell < 1$$

$$T(x,t) = T_\ell$$

$$\tau_\ell + \tau_0 - \lambda \geq 0$$

$$\tau_\ell \geq 1$$

$$0 \leq \tau_0 \leq \tau_\ell$$

High Applied Temperature

$$\tau_\ell \geq \lambda$$

$$T(x,t) = T_\ell\,\frac{x}{\ell}$$

$$\boxed{f(\pi) \geq 0}$$

$$\boxed{f(0) = 0}$$

$$\boxed{\frac{1}{\lambda}\tau_\ell - 1 \leq \pi < \tau_\ell - 1}$$

$$\left[\pi - \left(\frac{1}{\lambda}\tau_\ell - 1\right)\right] f(\pi) = p\,(\tau_\ell - 1 - \pi)$$

$$\alpha(\pi)\,f(\pi) = p\,b(\pi)$$

$$\frac{d}{d\pi}\left[\alpha(\pi) f(\pi)\right] > \frac{d}{d\pi}\left[p\,b(\pi)\right]$$

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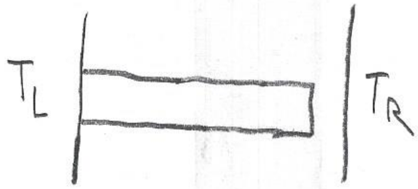
or

$$\boxed{\left[\pi - \left(\frac{1}{\lambda}\tau_\ell - 1\right)\right] f'(\pi) + f(\pi) + p > 0}$$

$\boxed{\text{Pelesko}}$



Nondimensionalizing

$$\theta = \frac{T - T_L}{T_R - T_L} \qquad t = \frac{K}{\rho C_p L^2} t' \qquad x = \frac{x'}{L} \qquad u = \frac{u'}{L} \qquad \sigma = \frac{\sigma'}{E}$$

Equations

$$\frac{\partial \theta}{\partial t} = \frac{\partial^2 \theta}{\partial x^2} \qquad 0 < x < 1$$

$$\frac{\partial^2 u}{\partial x^2} = \mu \frac{\partial \theta}{\partial x} \qquad 0 < x < 1$$

$$\sigma = \frac{\partial u}{\partial x} - \mu \theta \qquad 0 < x < 1$$

BC's

$$\theta(0,t) = 0$$

$$u(0,t) = 0$$

$$\left.\begin{cases} u \leq 0 \\ \sigma \leq 0 \\ u\sigma = 0 \end{cases}\right\} \text{ at } x = 1$$

$$R(\eta) \frac{\partial \theta}{\partial x}(1,t) = 1 - \theta(1,t)$$

Defining

$$\mu = \alpha (T_R - T_L)$$

$$R(\eta) = \frac{K \hat{R}(\eta)}{L}$$

$$\eta = \sigma(1,t) - u(1,t)$$

$$\varepsilon(x,t) = \frac{\partial u(x,t)}{\partial x}$$

$$\frac{\partial N(x,t)}{\partial x} = -\bar{p}(x,t)$$

$$\bar{p}(x,t) = p(x,t) - \rho\frac{\partial^2 u}{\partial t^2}$$

$$N(x,t) = E(x)\{\varepsilon(x) - \alpha(x)T(x,t)\}$$

$$\varepsilon^T = \alpha(x)T(x,t)$$

$$\varepsilon(x,t) - \varepsilon^t(x,t) = \varepsilon^M(x,t)$$

$$u(0,t) = \bar{u}_0(t)$$

$$u(\ell,t) = u_\ell(t)$$

$$N(0,t) = \bar{N}_0(t)$$

$$N(\ell,t) = \bar{N}_\ell(t)$$

$$\frac{\partial}{\partial x}\left\{E(x)A(x)\left[\frac{\partial u(x,t)}{\partial x} - \alpha(x)T(x,t)\right]\right\} = -p(x,t) + \rho\frac{\partial^2 u(x,t)}{\partial t^2}$$

$E =$ constant $\quad A =$ constant $\quad \alpha =$ const

$$\boxed{\frac{\partial^2 u}{\partial x} - \alpha\frac{\partial T}{\partial x} = 0}$$

$$\boxed{\frac{\partial \sigma}{\partial x} + b = \rho\frac{\partial^2 u}{\partial t^2}}$$

$$\boxed{K\frac{\partial^2 T}{\partial x^2} = \rho c\frac{\partial T}{\partial t}}$$