ME 323, Spring 2008, Tues. April 22
Homework #**3**, due Tues. April 29 beginning class, (text: Incropera & DeWitt, ID)

Reading (ID) 4.1, 4.3.3, 4.4, skim all other sections

- 2-D Steady State Heat Conduction: Various approaches
- Shape factor resistance analogy
- Discretization of governing PDE's for finite difference solution

Problems (ID):

4.13 (Two parallel pipelines …)
4.14 (A tube of diameter 50mm …) (b) Find the shape factor using the flux plot method
4.25 (a) (An igloo….)

A. The complete governing equation for heat conduction in a thin cylindrical disk is

$$r\, c_p \frac{\partial T}{\partial t} = k\left[\frac{1}{r}\frac{\partial}{\partial r}\left(r\frac{\partial T}{\partial r}\right) + \frac{1}{r^2}\frac{\partial^2 T}{\partial q^2} + \frac{\partial^2 T}{\partial z^2}\right] + \dot{q}$$

- Assuming steady heat conduction with no heat generation, simplify the above equation for the problem of 2-D heat conduction in r, q directions only (B.C.s are unspecified).
- Using finite difference approximations, show sketch of node network geometry (i.e. $T(i\text{-}1,j)$, $T(i+1,j)$, …, $r(j)$, $q(i)$ etc.)
- Discretize the resulting equation for generic internal node temperature $T(i,j)$.

ME 323, Spring 2006, Thurs. April 24
Homework #**4**, due Thurs. May 1 beginning class, (text: Incropera & DeWitt, ID)

Reading (ID) 5.1, 5.2, 5.4, 5.5.2, 5.5.3, 5.6.2, 5.6.3, skim all other sections

- Transient Heat Conduction
- Lumped capacitance method
- 1-D methods: Cartesian, cylindrical, spherical (analytic, charts)

Problems (ID):

6th edition

5.5
5.10
5.35
5.49 (a)