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

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

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

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):

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5.5
5.10
5.35
5.49 (a)