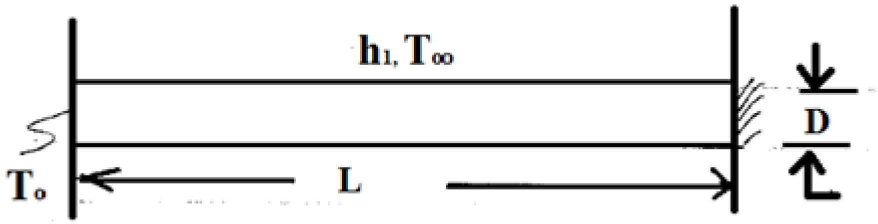
CHAPTER XX

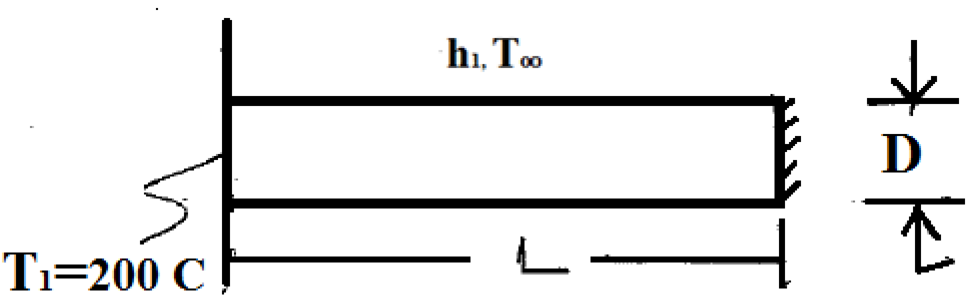
COMPUTATİONAL CONDUCTİON HEAT TRANSFER

EXAMPLE

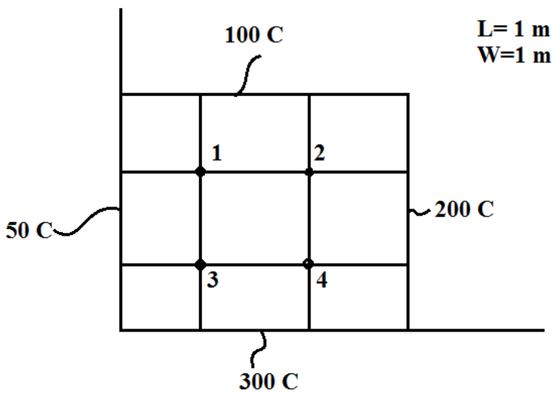
1) An iron rod L= 5 cm long of diameter D= 2 cm with thermal conductibity k= 50 W/m.C placed from a wall and is exposed to an ambient at T_∞= 20 C and h=100 W/m^2.C. The base of rod is at T_o = 320 C and its tip is insulated. Assuming one dimensional conduction, calculate temperature distribution along the rod and the rate of heat flow into the abient solution.



2) A 1 cm diameter 3 cm long carbon steel fin transfers heat from the wall of a heat exchanger at 200 C to a fluid at 25 C with $\bar{h}$= 120 W/m^2.C. Fin tip is insulated. Determine temperature distribution utilning a grip spacing of Δx= L/4.

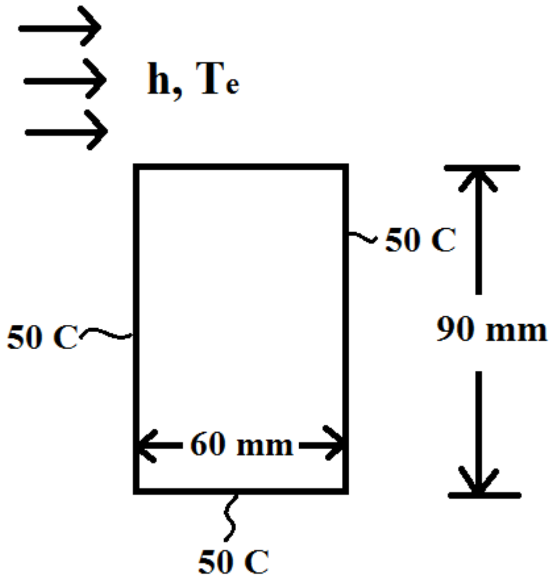


3) Consider two dimensional steady conduction in a squaree cross section with prescribed surface temperatures.



a) Determine the temperatures at nodes 1,2,3 and 4. Estimate the midpoint temperature.

4) A long bar of rectangular cross section is 60 mm by 90 mm on a side and has a thermal conductivity of 1 W/m.K. One surface is exposed to convection process with air at 100 C and a convection coefficient of 100 W/m^2.C while remaining surfaces are maintained at 50 C.



Using a grid spacing of 30 mm determine nodal temperatures and heat rate unit length normal to the page into bar from the air.

5) Develop a numerical solution fort he plate shown: A 0.5 MW/m^3 energy is generated uniformly within the body. Take ΔX= L/2.