

TWO-DIMENSIONAL STEADY HEAT CONDUCTION

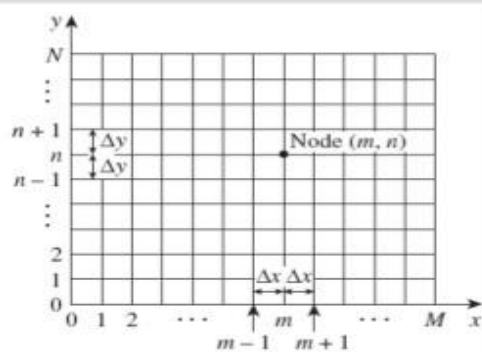


FIGURE 5-23

The nodal network for the finite difference formulation of two-dimensional conduction in rectangular coordinates.

Sometimes we need to consider heat transfer in other directions as well when the variation of temperature in other directions is significant.

We consider the numerical formulation and solution of two-dimensional steady heat conduction in rectangular coordinates using the finite difference method.

1 Limitations

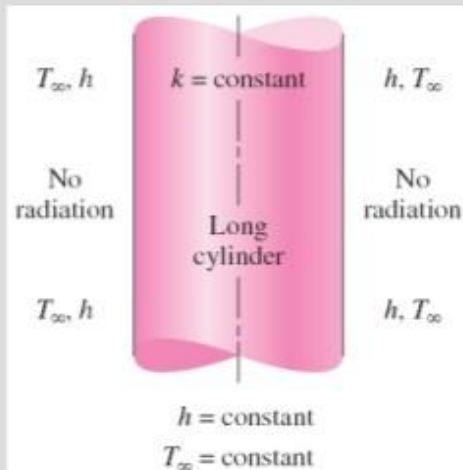


FIGURE 5-2

Analytical solution methods are limited to simplified problems in simple geometries.

Analytical solution methods are limited to *highly simplified problems in simple geometries*.

The geometry must be such that its entire surface can be described mathematically in a coordinate system by setting the variables equal to constants.

That is, it must fit into a coordinate system *perfectly* with nothing sticking out or in.

Even in simple geometries, heat transfer problems cannot be solved analytically if the *thermal conditions* are not sufficiently simple.

Analytical solutions are limited to problems that are simple or can be simplified with reasonable approximations.