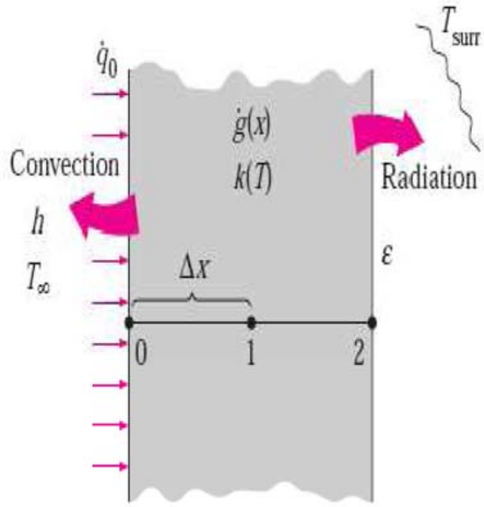
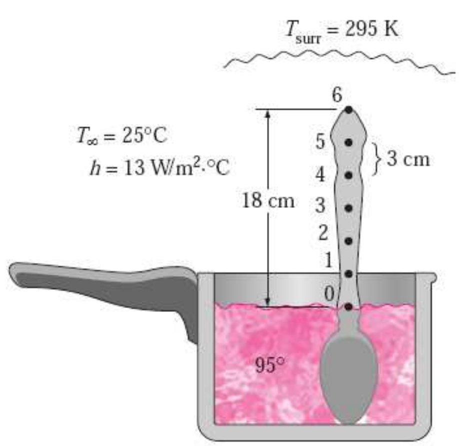
1) Consider steady one-dimensional heat conduction in a plane wall with variable heat generation and variable thermal conductivity. The nodal network of the medium consists of nodes 0, 1, and 2 with a uniform nodal spacing of *x*. Using the energy balance approach, obtain the finite difference formulation of this problem for the case of specified heat flux *q·* to the wall and convection at the left boundary (node 0) with a convection coefficient of *h* and ambient temperature of T_∞, and radiation at the right boundary (node 2) with an emissivity of and surrounding surface temperature of *T*surr.



2) Consider a stainless steel spoon (*k* = 15.1 W/m □ C, ε = 0.6) that is partially immersed in boiling water at 95خC in a kitchen at 25خC. The handle of the spoon has a cross section of about 0.2 cm* 1 cm and extends 18 cm in the air from the free surface of the water. The spoon loses heat by convection to the ambient air with an average heat transfer coefficient of *h* = 13 W/m2 □ خC as well as by radiation to the surrounding surfaces at an average temperature of *T*surr = 295 K. Assuming steady one-dimensional heat transfer along the spoon and taking the nodal spacing to be 3 cm, (*a*) obtain the finite difference formulation for all nodes, (*b*) determine the temperature of the tip of the spoon by solving those equations, and (*c*) determine the rate of heat transfer from the exposed surfaces of the spoon.



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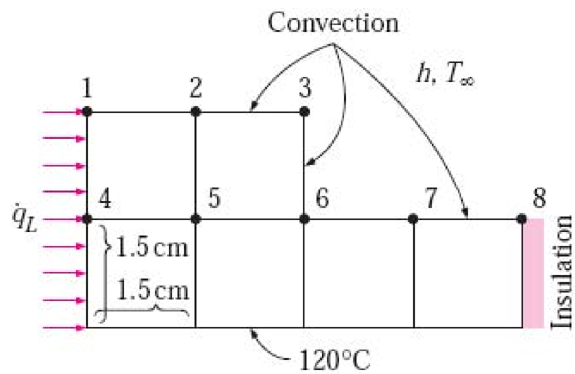
3) Consider steady two-dimensional heat transfer in an L-shaped solid body whose cross section is given in the figure. The thermal conductivity of the body is k = 45 W/m.C , and heat is generated in the body at a rate of $g·$ = (5 * 10^6) W/m3. The right surface of the body is insulated, and the bottom surface is maintained at a uniform temperature of 120ؾC. The entire top surface is subjected to convection with mbient air at T = 30ؾC with a heat transfer coefficient of h = 55 W/m2.C, and the left surface is subjected to heat flux at a uniform rate of $q·$ L = 8000 W/m2. The nodal network of the problem consists of 13 equally spaced nodes with x = y = 1.5 cm. Five of the nodes are at the bottom surface and thus their temperatures are known. (a) Obtain the finite difference equations at the remaining eight nodes and (b) determine the nodal temperatures by solving those equations.



-Please write on ***A4*** *papers. -If you have any question about these problems, do not hesitate to ask via my email address:*

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