1. A brass rod ($k = 133\ W/m°C$) has length of 25 cm and 5 mm in diameter extends horizontally from a casting at 200°C. The surface of the rod is exposed to ambient air at 20°C with convection heat transfer coefficient of $h = 100\ W/m^2°C$. Determine the temperature of the rod at 15 cm from the casting? What is the rate of heat loss from the rod?
2. Two long copper rods ($k = 379\ W/m°C$) of diameter $D = 10$ mm are soldered together end to end, with solder having a melting point of 650°C. The rods are in air at 25°C with convection coefficient of $10\ W/m^2°C$. What is the minimum power input needed to effect the soldering?
3. Consider a stainless steel spoon ($k = 15.1\ W/m°C$) partially immersed in boiling water at 100°C in a kitchen at 25°C. The handle of the spoon has a cross section of 2 mm x 1 mm, and extends 50 mm. in the air from the free surface of the water. If the heat transfer coefficient at the exposed surfaces of the spoon handle is $30\ W/m^2°C$, determine the temperature difference across the exposed surface of the spoon handle.
4. A copper ($k = 379\ W/m\ °C$) fin with circular cross section with an area of $0.25\ cm^2$ and length of 2.5 cm is attached to a wall with temperature of 175°C. The ambient fluid temperature is 20°C, with $h = 35\ W/m^2°C$. Calculate the heat-transfer rate and tip temperature for two cases: (a) The fin has an insulated tip, and (b) Heat is convected from the tip surface area.

5. Consider the use of straight, stainless steel (304) fins ($k = 15.3\ W/m°C$) of rectangular and triangular profiles on a plane wall whose temperature is 100°C. The adjoining fluid is at 20°C, and the associated convection coefficient is $75\ W/m^2°C$. Each fin is 6 mm thick and 20 mm long. Compare the efficiency, the effectiveness, and the heat loss per unit width associated with the two kinds of fins.
6. A hot surface at 100°C is to be cooled by attaching 3-cm-long, 0.25-cm-diameter aluminum pin fins ($k = 237\ W/m°C$) to it, with a center-to-center distance of 0.6 cm. The temperature of the surrounding medium is 30°C, and the heat transfer coefficient on the surfaces is $35\ W/m^2°C$. Determine the rate of heat transfer from the surface for a 1 m x 1 m section of the plate. Also determine the overall effectiveness of the fins.
7. Steam in a heating system flows through tubes whose outer diameter is $D_1 = 3$ cm and whose walls are maintained at a temperature of 120°C. Circular aluminum fins ($k = 180\ W/m°C$) of outer diameter $D_2 = 6$ cm and constant thickness $t = 2$ mm are attached to the tube. The space between the fins is 3 mm, and thus there are 200 fins per meter length of the tube. Heat is transferred to the surrounding air at 25°C, with a combined heat transfer coefficient of $60\ W/m^2°C$. Determine the increase in heat transfer from the tube per meter of its length as a result of adding fins.