4-1 An array of twenty-six (26) aluminum fins (k=180 W/m-K) 2mm thick, 30mm long, and 70mm wide make up a heat sink for a computer chip. The base of the heat sink is 70mm by 77mm and 7mm thick and integrally attached to the fins. Note this allows for a 3mm spacing between the fins. If the heat transfer coefficient is 20 W/m²-K and the air temperature in the cabinet might reach 30°C, calculate the heat dissipated by the fins if the bottom of the heat sink is at 50°C.

4-2 One hundred circumferential fins of rectangular profile are mounted on a tube 25mm in diameter and 1.0 meter long. The fins are aluminum and are 10mm long and 2mm thick. The temperature of the base of the fins is 180°C and the convection environment is 20°C with h=50W/m²-K. Calculate the heat loss per unit meter of tube length.

4-3 Determine the finite difference equation for an internal node on a fin of uniform cross section $A_{cs}$ and perimeter $P$. The nodes are uniformly spaced $\Delta x$ units apart. Consider that the fin

a. loses heat by convection only to the surroundings with $h$ and $T_{env}$

b. loses heat by convection as in b but also radiation. The radiation heat loss is $q_{rad}=\varepsilon\sigma A_{surface}(T^4 - T_{env}^4)$. 