



- 1- A natural convection air heater consists of an array of parallel, equally spaced vertical plates, which may be maintained at a fixed temperature T_s by embedded electrical heater. The plates are of length and width $L=W=300\text{mm}$ and are in quiescent, atmospheric air at $T_\infty=20\text{C}$. The total width of the array cannot exceed a value of $W_{ar}=150\text{ mm}$. For $T_s=75\text{C}$, what is the plate spacing S that maximizes heat transfer from the array? For this spacing, how many plates comprise the array and what is the corresponding rate of heat transfer from the array?
('S' is the distance between two adjacent plates)
- 2- A rectangular cavity consists of two parallel, 0.5 m square plates separated by a distance of 50 mm , with the lateral boundaries insulated. The heated plate is maintained at 325 K and the cooled plate at 275 K . Estimate the heat flux between the surfaces for three orientations of the cavity, $T=90^\circ$, $T=0^\circ$, $T=^\circ$.
- 3- The bottom of a copper pan, 150 mm in diameter, is maintained at 115°C by the heating element of an electric range. Estimate the power required to boil the water in this pan. Determine the evaporation rate. What is the ratio of the surface heat flux to the critical heat flux? What pan temperature is required to achieve the critical heat flux?