تکلیف سری هشتم موعد تحویل ۱۵ دی‌ماه

از فصل دهم و یازدهم کتاب "introduction to finite elements in engineering, by: handrupatla"

10.4. Consider a pin fin (Fig. P10.4) having a diameter of 0.3 in. and length of 6 in. At the root, the temperature is 147°F. The ambient temperature is 80°F and $h = 5$ BTU/(h · ft² · °F). Take $k = 25.5$ BTU/(h · ft · °F). Assume that the tip of the fin is insulated. Using a two-element model, determine the temperature distribution and heat loss in the fin (by hand calculations).

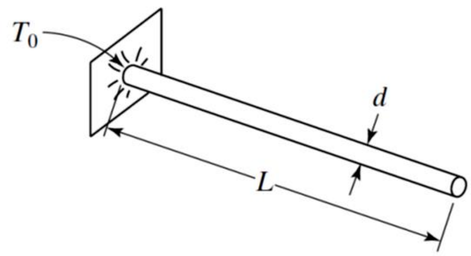

FIGURE P10.4

10.16. A thermal diffuser of axisymmetric shape is shown in Fig. P10.16. The thermal diffuser receives a constant thermal flux of magnitude $q_1 = 400{,}000$ W/m² · °C from a solid-state device on which the diffuser is mounted. At the opposite end, the diffuser is kept at a uniform value of $T = 0$°C by isothermalizing heat pipes. The lateral surface of the diffuser is insulated, and thermal conductivity $k = 200$ W/m·°C. The differential equation is

$$\frac{1}{r}\frac{\partial}{\partial r}\left(r\frac{\partial T}{\partial r}\right) + \frac{\partial^2 T}{\partial z^2} = 0$$

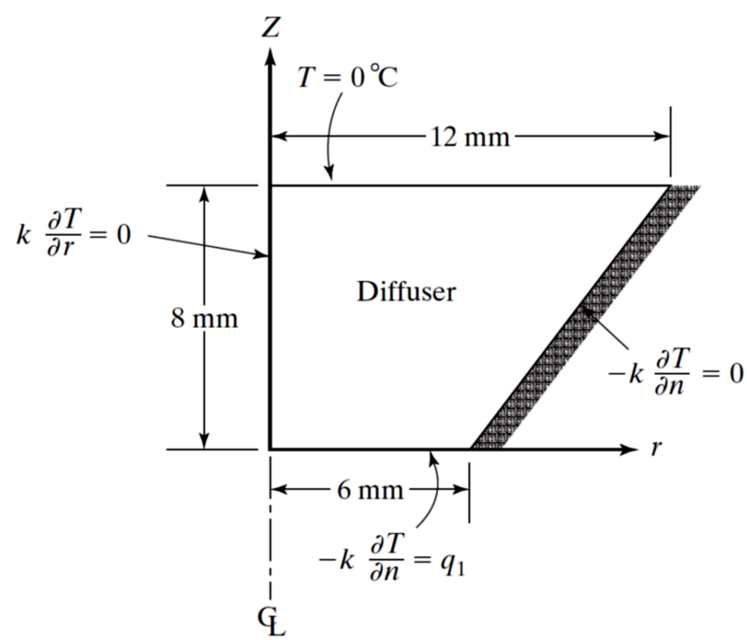

FIGURE P10.16

10.32. A single fin is attached to a base plate to remove heat generated by a computer chip underneath. The power generated by the chip is 8 W. Treating this as a uniform heat flux into the base, determine the maximum temperature at the base (Fig. P10.32). Use the following data:

Fin volume (w^2L) $= 125\ \text{mm}^3$

Try with $w = 2$ and $w = 5$ and compare

$h_{\text{base}} = 100\ \text{W/m}^2\cdot{}^\circ\text{C}$, $h_{\text{fin}} = 200\ \text{W/m}^2\cdot{}^\circ\text{C}$, $T_\infty = 25^\circ\text{C}$

Material: aluminum, thermal conductivity $k = 210\ \text{W/m}\cdot{}^\circ\text{C}$

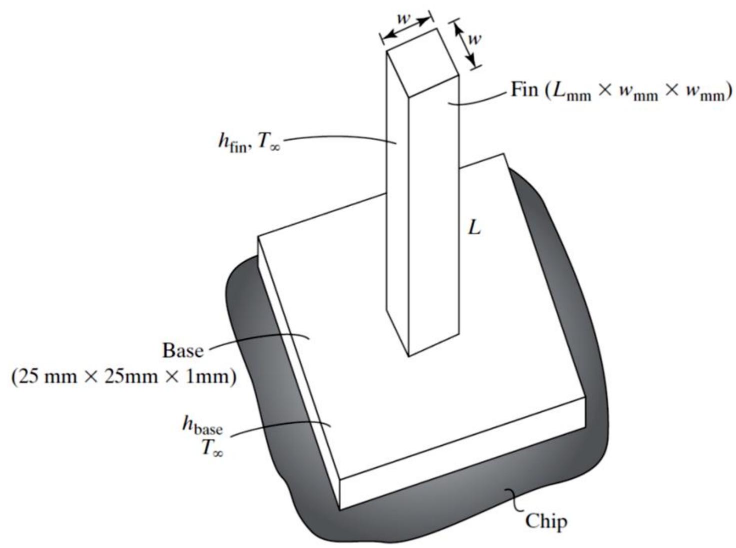

FIGURE P10.32

11.4. Determine all natural frequencies of the simply supported beam shown in Fig. P11.4. Compare the results obtained using the following:

(a) A one-element model.

(b) A two-element model.

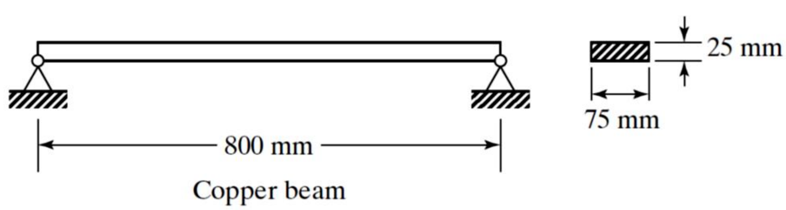

FIGURE P11.4

11.15. A rigid body with mass M and inertia I_c about its center of gravity is welded on to the end of a planar beam element as shown in Fig. P11.15. By writing the kinetic energy of the mass as $\frac{1}{2}M\,\mathrm{v}^2 + \frac{1}{2}I_C\omega^2$, and relating v and ω to $\dot{Q}_1$ and $\dot{Q}_2$, determine the 2×2 mass matrix contribution to the beam node.

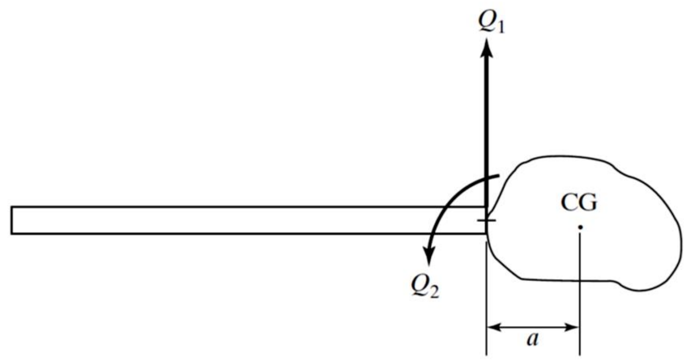

FIGURE P11.15