Q.1. Considering thermal conduction and convection through a fin shown in Figure 1, compute the temperature (T) across the fin for the given length (L), thermal conductivity (K), area of cross section (A), film coefficient (β), and perimeter of cross section (P) using two 3-node line elements. You may use the Matlab software for computations. **[7 marks]**

GDE: $-\frac{d}{dx}\left(KA\frac{dT}{dx}\right) + P\beta T - P\beta T_\infty = 0$ $\quad 0 < x < L$

BC: $T(x)|_{x=0} = 300°C, \; T(x)|_{x=L} = 30°C$

Given $K = 370\ W/mK, A = 10^{-5}m^2, \beta = 30\ W/m^2°C, T_\infty = 30°C, L = 0.25m$
Perimeter $P = 12 \times 10^{-3}m$

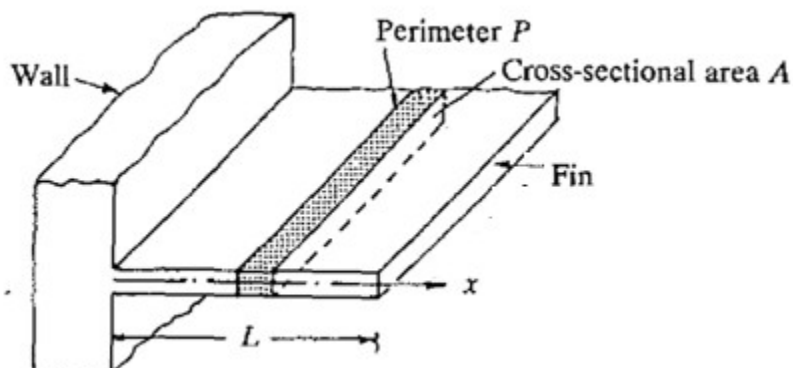

Figure 1