

ES120 Spring 2018 – Section 3 Notes

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Problem 1:

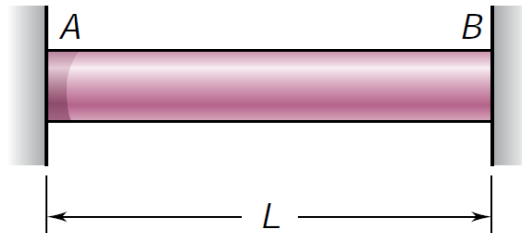
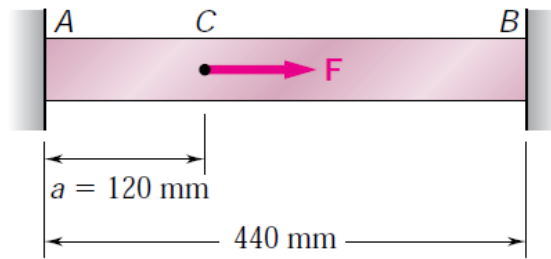


Figure 1

A uniform steel rod of cross-sectional area A is attached to rigid supports and is unstressed at a temperature of 45°F . The steel is assumed to be elastoplastic with $\sigma_Y = 36 \text{ ksi}$ and $E = 29 \times 10^6 \text{ psi}$. Knowing that $\alpha = 6.5 \times 10^{-6}/^{\circ}\text{F}$, determine the stress in the bar (a) when the temperature is raised to 320°F , (b) after the temperature has returned to 45°F .

Problem 2:**Figure 2**

Bar AB has a cross-sectional area of 1200 mm^2 and is made of a steel that is assumed to be elastoplastic with $E = 200 \text{ GPa}$ and $\sigma_Y = 250 \text{ MPa}$. Knowing that the force F increases from 0 to 520 kN and then decreases to zero, determine (a) the permanent deflection of point C, (b) the residual stress in the bar.