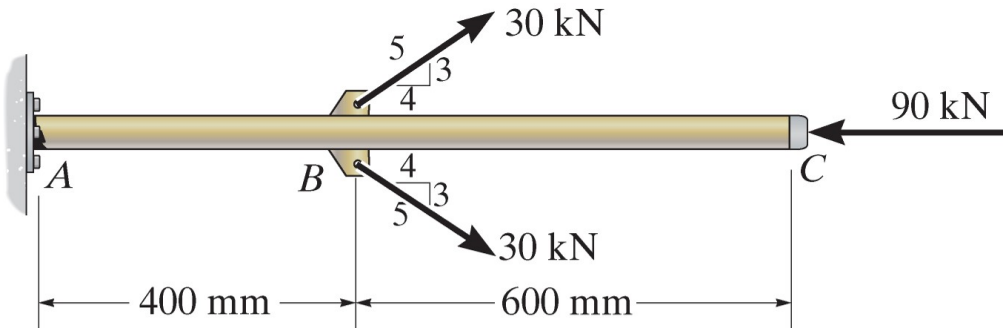
Name:

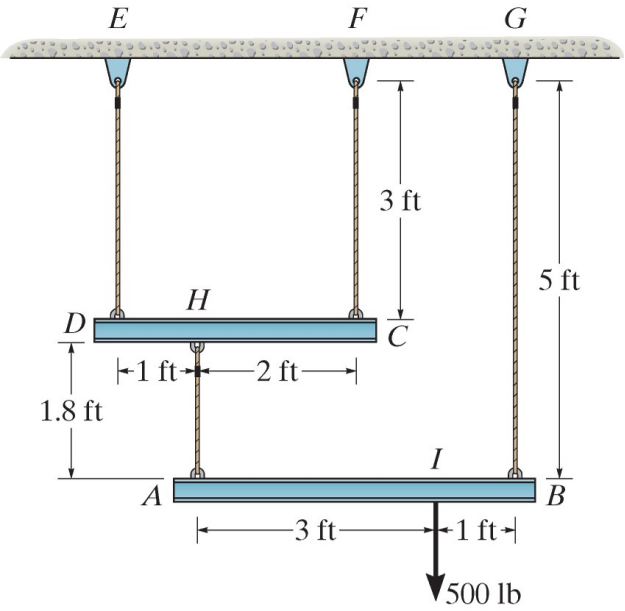
Homework 3

Due 15 Sep 2020

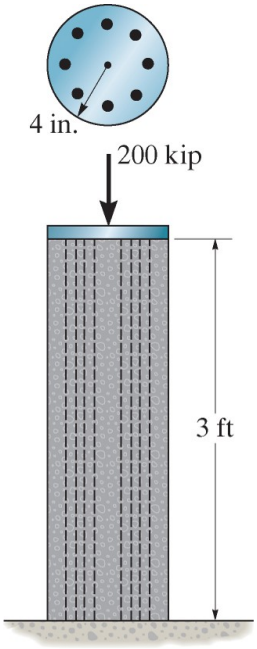
1. The 30 mm diameter steel rod is subjected to the loading shown. Find the displacement at C.



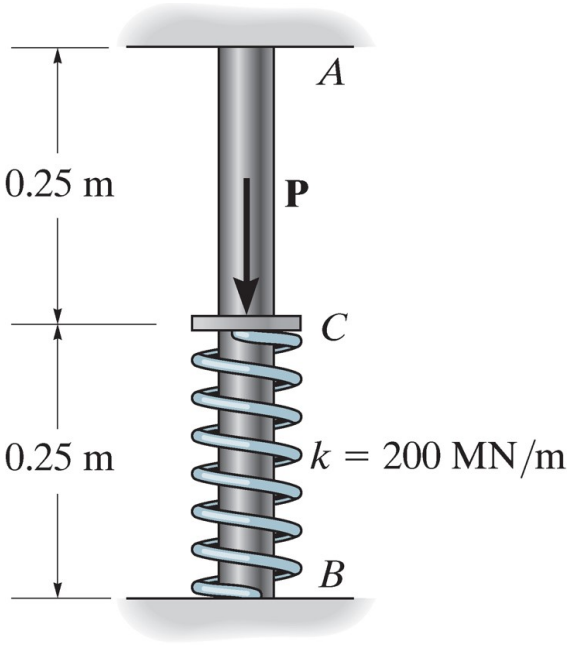
2. The load is supported by four stainless steel wires that are connected to rigid members AB and DC. Determine the vertical displacement of the 500 lb load if each wire has a cross-sectional area of $0.035\,\text{in}^2$.



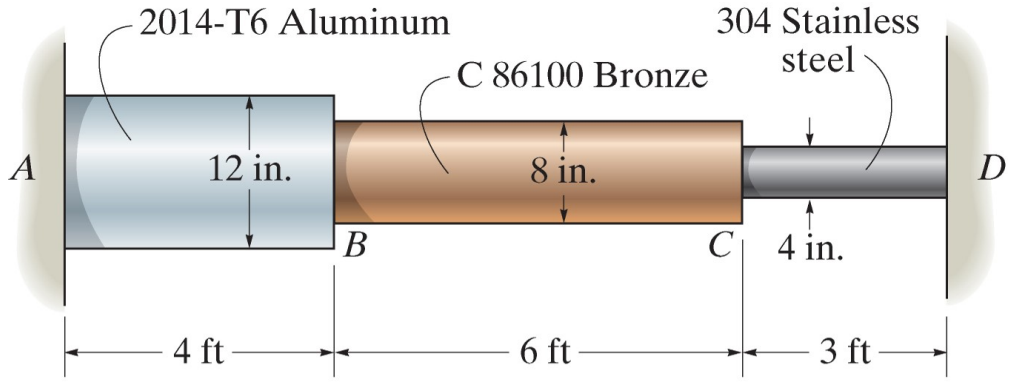
3. The column shown is constructed from concrete with A992 steel rebar. If the column is subjected to an axial force of 200 kip, find the required rod diameter such that 60% of the axial force is carried by the concrete.



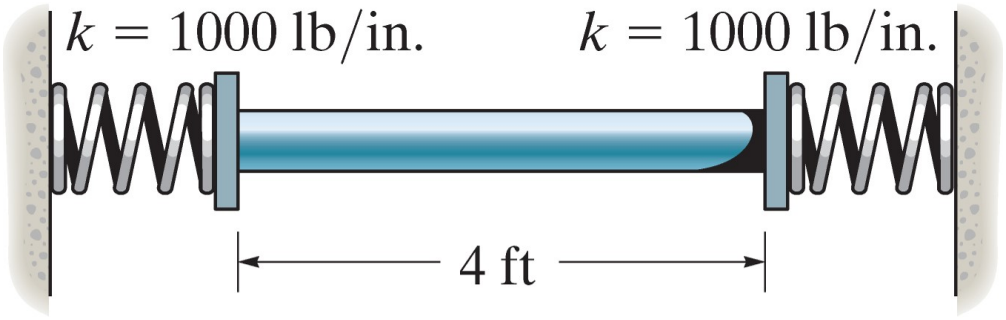
4. The post is made from 2024 aluminum and has a diameter of 50 mm. It is fixed at A and B and has a coiled spring attached to a rigid collar at C. If the spring is initially uncompressed, find the compression in the spring when a load of $P = 75\,\text{kN}$ is applied to the collar.



5. The assembly has shown fits snugly with no internal force at $70°F$. Find the average normal stress in each material when the temperature is raised to $200°F$.



6. The rod shown is made from aluminum and has a diameter of 0.25 in. If the rod is 4 ft long when the springs are compressed 0.5 in and the temperature of the rod is $40°F$, find the force in the rod when the temperature is $150°F$.



7. The device shown is used to measure temperature. Bars AB and CD are made of tungsten ($\alpha = 4.5 \times 10^{-6}\ ^\circ C^{-1}$) and aluminum ($\alpha = 23 \times 10^{-6}\ ^\circ C^{-1}$), respectively. At room temperature ($20^\circ C$) the rigid bar AE is horizontal. Find the vertical displacement of the pointer when the temperature is $200^\circ C$.