

A structure is made up of a rigid member CK and three rod elements (1), (2) and (3). The cross-sectional area for each element is A . The material makeup of the three elements is such that the Young's moduli are related by $E_1 = E_3 = E$ and $E_2 = 2E$. The coefficient of thermal expansion for each member is α . A load P is applied to member CK as shown, with the temperature of elements (1) and (3) increased by ΔT . The temperature of element (2) remains unchanged. The load P is given by $P = 2\alpha\Delta TEA$.

- 1) **Equilibrium.** Draw free body diagrams (FBDs) of member CK and joint H. Write down the appropriate equilibrium equations for member CK and joint H using your FBDs. Is this system determinate?
- 2) **Force/elongation equations.** Write down the force/elongation equations for members (1), (2) and (3).
- 3) **Compatibility.** Write down the appropriate compatibility equation(s) relating the elongations of members (1), (2) and (3).
- 4) **Solution.** Solve your equations above for the loads carried by the three members. From these, determine the axial stress in each member. State whether the *stress* in each member is tensile or compressive. State whether the *strain* in each member is tensile or compressive.

Leave your answers in terms of the given parameters of, at most: E , A , ΔT and b . Verify that your answers have appropriate units.

