ME 323 - Summer 2024 - Quiz 2

Q1.1 Conceptual question 6.14a

Q1.2 Conceptual question 6.14b

Q2.1 Conceptual question 6.16 – TRUE/FALSE

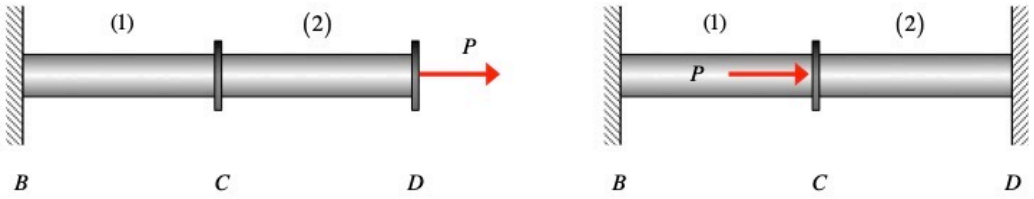
Q2.2 Conceptual question 6.16 – explanation

Q3.1 Conceptual question 6.17 – TRUE/FALSE

Q3.2 Conceptual question 6.17 – explanation

Q4 Conceptual question 6.19

Conceptual question 6.14



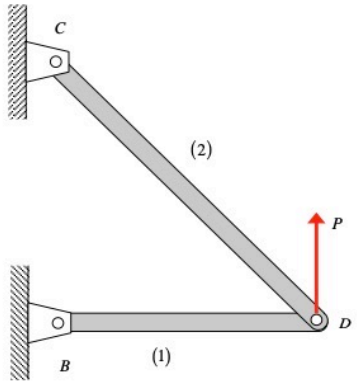
Rod I ***Rod II***

In Rods I and II above, member (1) is made up of steel, whereas the material of member (2) is unknown.

a) TRUE or FALSE In Rod I, the stress in member (2) depends on the material makeup of member (2). DETERMINATE

b) TRUE or FALSE: In Rod II, the stress in member (2) depends on the material makeup of member (2). INDETERMINATE

Conceptual question 6.16

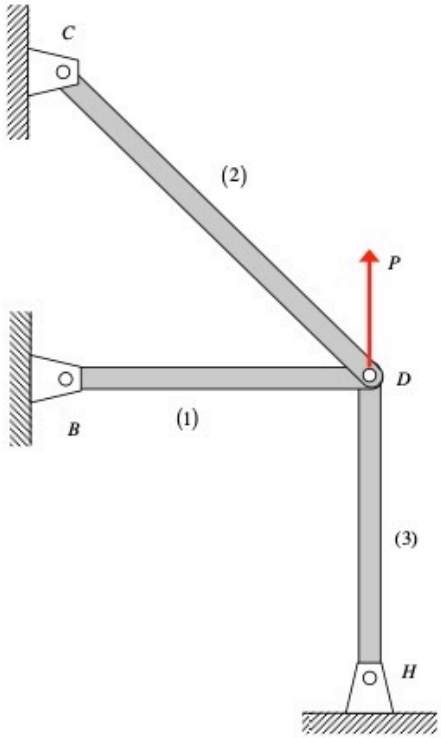


Consider the truss shown above made up on members (1) and (2).

TRUE or *FALSE* The stress in member (1) depends on the material makeup of member (2). DETERMINATE

Provide a written explanation for your answer.

Conceptual question 6.17

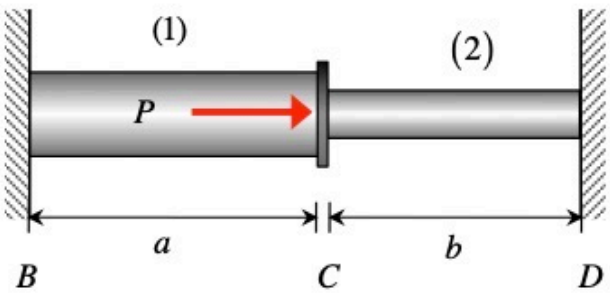


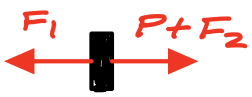
Consider the truss shown above made up on members (1), (2) and (3).

TRUE or *FALSE*: The stress in member (1) depends on the material makeup of members (2) and (3). INDETERMINATE

Provide a written explanation for your answer.

Conceptual question 6.19





$\Sigma F = P + F_2 - F_1 = 0$

$\hookrightarrow P = F_1 - F_2$

$e_1 = \frac{F_1 a}{E_1 A_1}$

$e_2 = \frac{F_2 b}{E_2 A_2}$

A structure is made up of axial members (1) and (2) shown above with a load of P acting at the rigid connector C. You are asked to re-design the structure by changing the length *b* of member (2) in order to decrease the normal stress in that member. You are *not* able to change any other aspect of the design such as the material or the cross sectional area of the member. Circle the answer below that describes best your design options.

a) A *decrease* in the length *b* of member (2) will decrease the normal stress in the element.

b) An *increase* in the length *b* of member (2) will decrease the normal stress in the element.

c) Changing the length *b* of member (2) cannot change the normal stress in the element.

$e_1 = -e_2 \Rightarrow \frac{F_1 a}{E_1 A_1} = -\frac{F_2 b}{E_2 A_2} \Rightarrow F_1 = -\frac{E_1 A_1}{E_2 A_2}\frac{b}{a} F_2 \Rightarrow$

$P = -F_2\left[\frac{E_1 A_1}{E_2 A_2}\frac{b}{a} + 1\right] \Rightarrow F_2 = \frac{-P}{\frac{E_1 A_1}{E_2 A_2}\frac{b}{a} + 1} \Rightarrow |F_2| \downarrow \text{ as } b \uparrow$