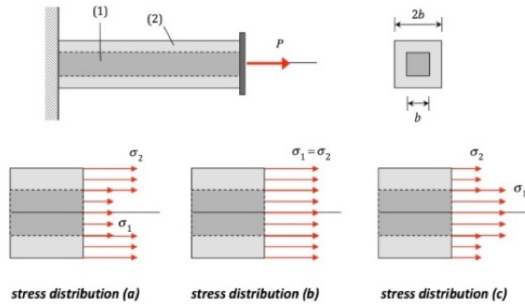


Quiz #2 solution

Q2 Stress distribution

2 Points



The rod shown above is made up of a square core (1) and a square tube (2). The Young's moduli for (1) and (2) are $2E$ and E , respectively. Consider the three normal stress distributions above. Choose the correct stress distribution for this rod:

- Stress distribution (a)
- Stress distribution (b)
- Stress distribution (c)
- None of the above.

$$e_1 = \frac{F_1 L}{2EA_1} = \frac{1}{2} \frac{F_1}{E A_1} = \frac{1}{2} \frac{1}{2} \sigma_1$$

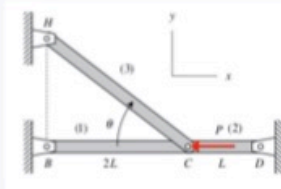
$$e_2 = \frac{F_2 L}{EA_2} = \frac{1}{2} \frac{F_2}{E A_2} = \frac{1}{2} \sigma_2$$

$$e_1 = e_2 \Rightarrow \frac{1}{2} \frac{1}{2} \sigma_1 = \frac{1}{2} \sigma_2$$

$$\Rightarrow \sigma_1 = 2\sigma_2$$

Q3 Truss member load

2 Points



$$\sum F_y = F_3 \sin \theta = 0$$

$$\Rightarrow F_3 = 0$$

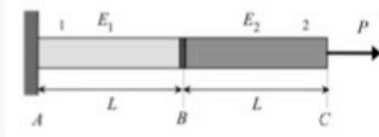
$$\Rightarrow \sigma_3 = 0$$

Consider the three-member truss above with members (1) and (2) being aligned. A load P acts to the left at joint C , with P being aligned with members (1) and (2). Choose the correct response below related to the stress in member (3), σ_3 :

- $\sigma_3 > 0$
- $\sigma_3 = 0$
- $\sigma_3 < 0$
- Not enough information is provided here in order to answer this question.

Q4 Rod stress - 1

2 Points



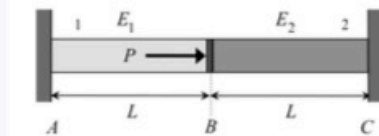
Consider the two-member rod shown above.

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

- TRUE
 - FALSE
 - Not enough information is provided here in order to answer this question.
- Determinate problem \Rightarrow Loads found directly from equilibrium*

Q5 Rod stress - 2

2 Points



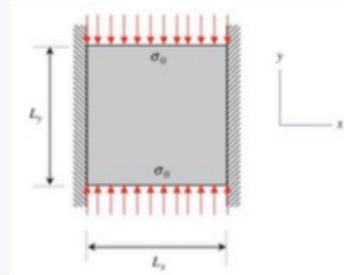
Consider the two-member truss shown above.

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

- TRUE
 - FALSE
 - Not enough information is provided here in order to answer this question.
- Indeterminate problem \Rightarrow material properties are needed to solve*

Q6 Hooke's Law

2 Points



An unstressed block is placed between two fixed, smooth walls. The block is made up of a material having Young's modulus of E and Poisson's ratio $\nu > 0$. A compressive stress σ_0 is applied to the block, as shown above. As a result, the sides of the block are in contact with the walls. Let σ_y and ϵ_y represent the normal stress and strain in the y -direction in the block.

TRUE or FALSE: $\sigma_y = E\epsilon_y$

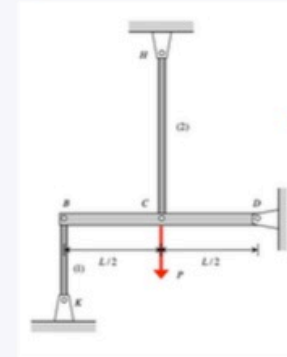
- TRUE
- FALSE
- Not enough information is provided here in order to answer this question.

$$\epsilon_y = \frac{1}{E} [\sigma_y - \nu \sigma_x]$$

$$\sigma_y = E\epsilon_y + \nu \sigma_x$$

Q7 Compatibility equation

2 Points



$$-e_1 = L\theta$$

$$e_2 = \frac{L}{2}\theta$$

$$\rightarrow -\frac{e_1}{e_2} = \frac{L\theta}{L\theta/2} = 2$$

$$\rightarrow e_1 = -2e_2$$

Consider two elastic rods (1) and (2) attached to the rigid bar BD. Let e_1 and e_2 represent the elongation of rods (1) and (2), respectively. Choose the correct compatibility equation below relating e_1 and e_2 for small rotations of BD:

- $e_1 = e_2$
- $e_1 = -e_2$
- $e_1 = 2e_2$
- $2e_1 = e_2$
- $e_1 = -2e_2$
- $-2e_1 = e_2$
- None of the above.
- Not enough information is provided here in order to answer this question.