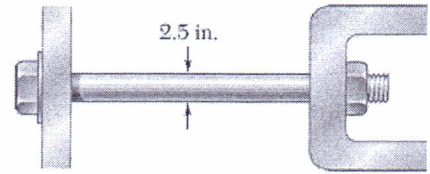




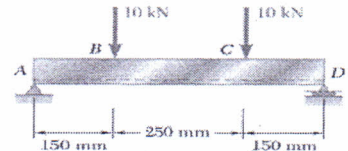
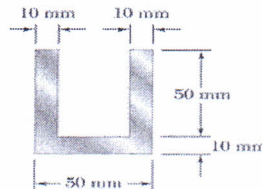
Question 1: [12 Marks]

The change in diameter of a large steel bolt is carefully measured as the nut is tightened. Knowing that $E = 29 \times 10^6$ psi and $\nu = 0.30$, determine the internal force in the bolt, if the diameter is observed to decrease by 0.5×10^{-3} in.



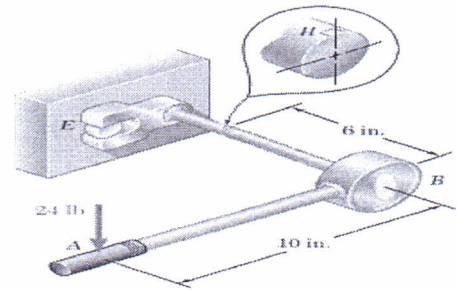
Question 2: [13 Marks]

Two vertical forces are applied to a beam of the cross section shown. Determine the maximum tensile and compressive stresses in portion BC of the beam.



Question 3: [15 Marks]

A mechanic uses a crowfoot wrench to loosen a bolt at E . Knowing that the mechanic applies a vertical 24-lb force at A , determine the principal stresses and the maximum shearing stress at point H located as shown on top of the $3/4\text{-in.}$ diameter shaft. Using analytical and graphical methods.



Question 4: [10 Marks]

1. Principle plan is a plan on which the shear stress is

- (a) Zero (b) Maximum (c) Minimum

2. If the radius of a wire stretched by a load is doubled, it's Young's modulus will be

- (a) Doubled (b) halved (c) Remain the same

3. Two shafts A and B are made of the same material. The shaft A is solid and has diameter D . the shaft B is hollow with outer diameter D and inner diameter $D/2$. The strength of the hollow shaft in torsion is as that of the solid shaft.

- (a) $1/16$ (b) $3/4$ (c) $15/16$

4. A steel bar of 5 mm diameter is heated from 15°C to 40°C and it is free to expand. The bar will induce stress.

- (a) Tensile Thermal (b) Compressive Thermal (c) No

5. The ratio of lateral strain to axial strain is known as

- (a) Elasticity Modulus (b) Material Strength (c) Poisson's Ratio

Best Wishes

Associate Prof. Dr. Noha Fouda