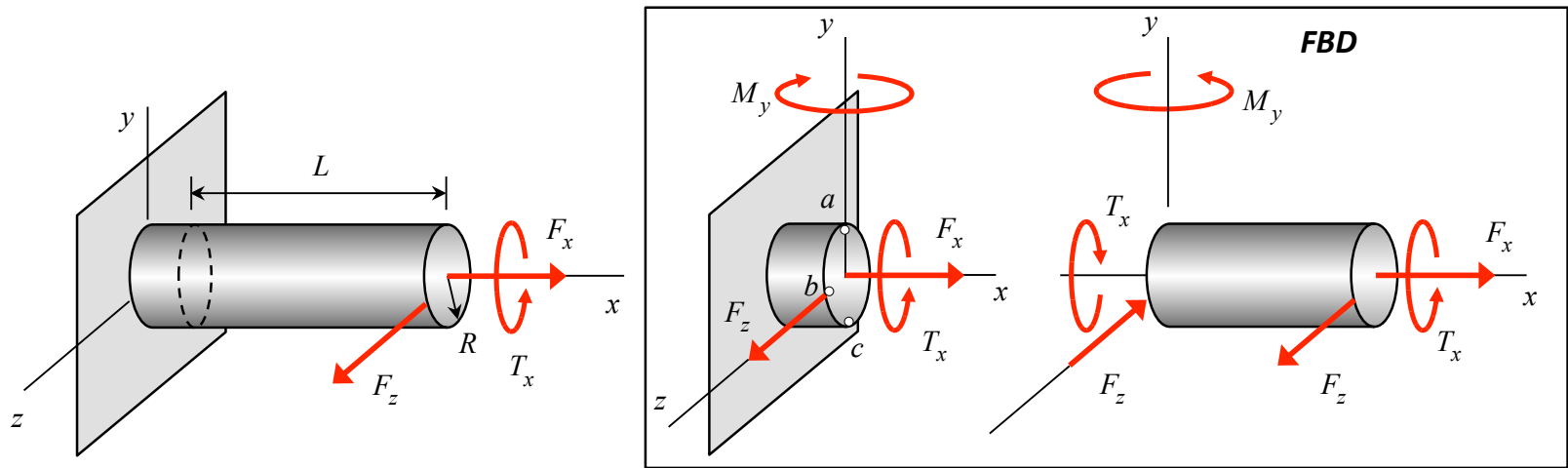
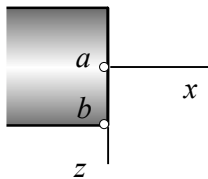


A rod having a radius of R is attached to a fixed wall on its left end, as shown in the figure on the next page. The rod is acted upon by a pair of forces F_x and F_z , and a torque T_x at its free end. It is desired to understand the states of stress at points “a”, “b” and “c” at a location at a distance L from the free end.

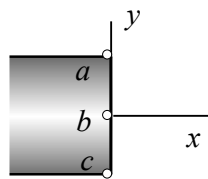
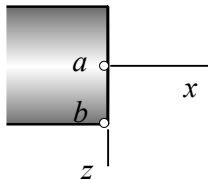
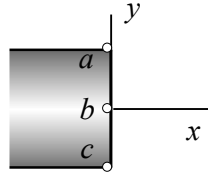
- a) Determine the cross-sectional area A , the polar area moment I_p and the second-order area moment I for the shaft.
- b) Determine the bending moment M_y .
- c) Determine the states of stress at locations “a”, “b” and “c” on the cross section of the cut. Use the figures provided for drawing the distribution of stresses and the table provided for identifying the components of stress for each of the internal loads at the cross section. Please submit this page with your homework to help the grader in assessing your work.
- d) Draw the Mohr’s circle for the state of stress at point “c”. Determine the principal components of stress, the maximum in-plane shear stress and the absolute maximum shear stress for this state of stress. At this step, use the following parameters in your analysis: $F_x = 10\text{ kN}$, $F_z = 20\text{ kN}$, $T_x = 50\text{ kN} \cdot \text{m}$, $R = 0.10\text{ m}$ and $L = 2\text{ m}$.



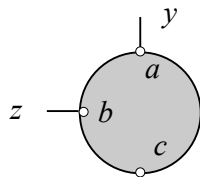
top view



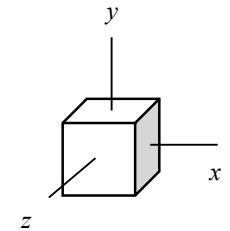
front view



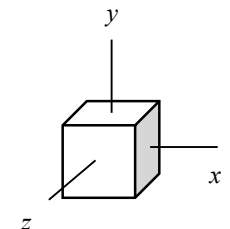
end view



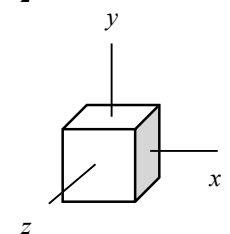
loading	stress comp. @ "a"	stress comp. @ "b"	stress comp. @ "c"



point "a"



point "b"



point "c"