1. (30%) The simply supported beam has the cross-sectional area shown in Figure 1.
   Determine
   (1) (15%) the absolute maximum bending stress in the beam.
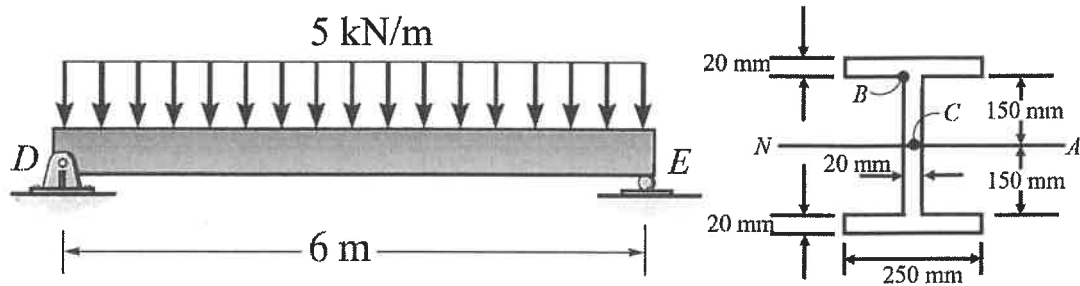   (2) (15%) what is the stress at point B?

Figure 1

2. (20%) The solid rod shown in Figure 2 has a radius of 20 mm. If it is subjected to the force of 2 kN, determine the state of stress at point A.
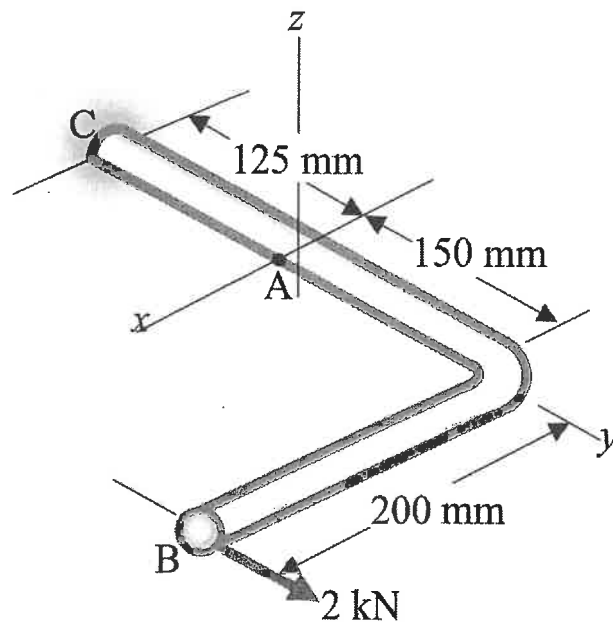

Figure 2

3. (25%) The beam has a square cross-sectional area. If it is fixed supported at its base and a horizontal force is applied at its end as shown, **Using Mohr's circle,** determine the maximum in-plane shear stress and the principal stresses at A.
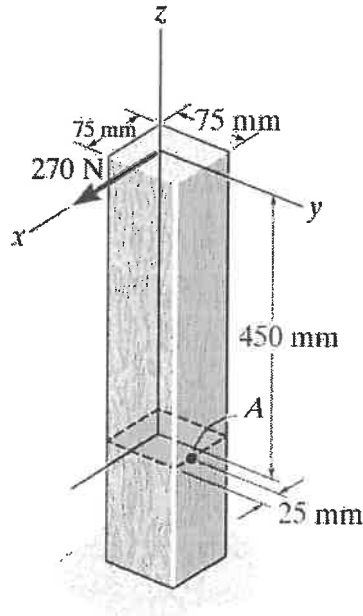
Figure 3

4. (25%) Determine the minimum depth h of the beam that will safely support the loading shown. The allowable bending stress is $\sigma_{allow} = 147$ MPa and the allowable shear stress is $\tau_{allow} = 70$ MPa. The beam has a uniform thickness of 75 mm.
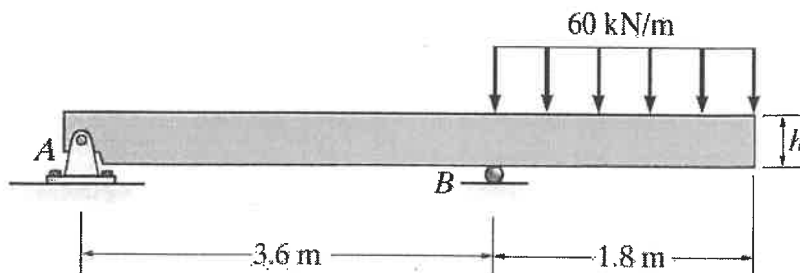
Figure 4