Problem 1 (25%):

The reinforced concrete beam shown is subjected to a positive bending moment of 200 kN.m. Knowing that the modulus of elasticity is 25 GPa for the concrete and 200 GPa for the steel, determine (*a*) the stress in the steel, (*b*) the maximum stress in the concrete.
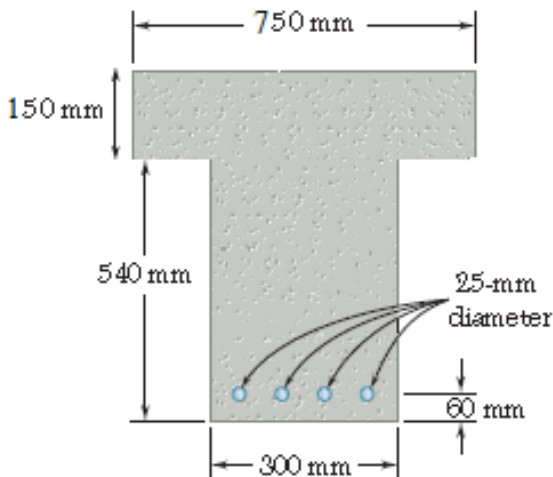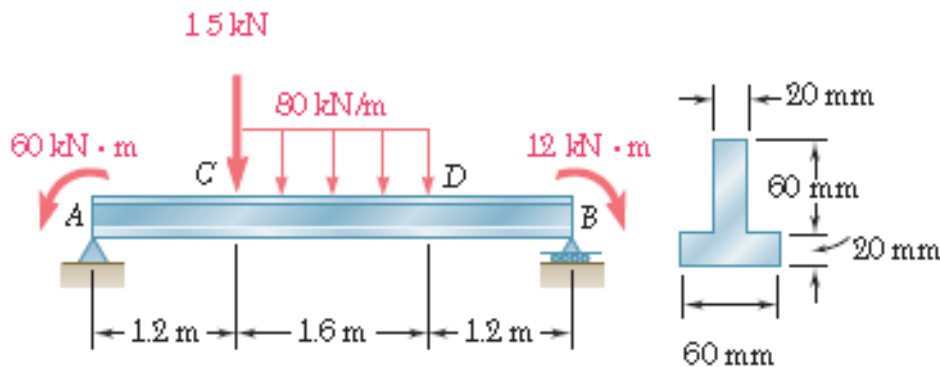

Problem 2 (40%):

-

Beam AB is subjected to the load shown below.
   a) Calculate reactions at A and B
   b) Draw the shear and bending moment diagrams
   c) Determine the maximum compression and tension stresses
   d) Determine the maximum shear stress

Problem 3 (20%):

For a beam having the cross section shown, determine the largest allowable vertical shear if the shearing stress is not to exceed 50 MPa.
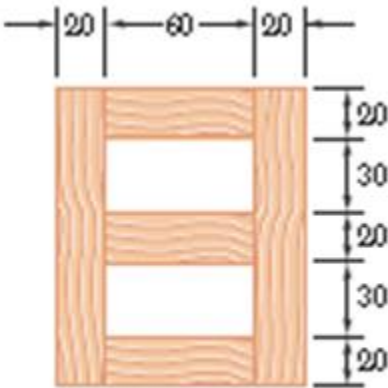
Dimensions in mm

Problem 4 (15%):

.
Three boards are nailed together to form a beam shown, which is subjected to a vertical shear of 8 kN. Knowing that the spacing between the nails is $s = 50$ mm and that the allowable shearing stress in each nail is 200 MPa, determine the minimal bolt diameter.