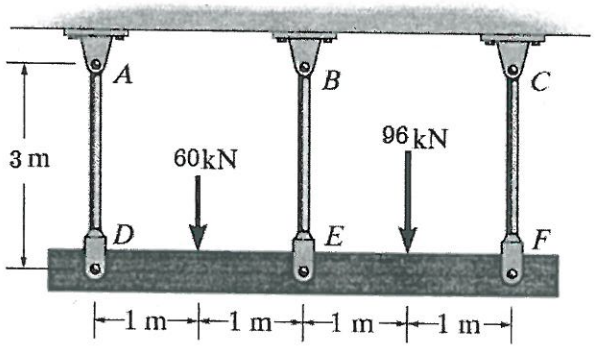
1. The three suspender bars are made of A-36 steel and have equal cross-sectional areas of 450mm^2. Determine the average normal stress in each bar if the rigid beam is subjected to the loading shown. (20%)

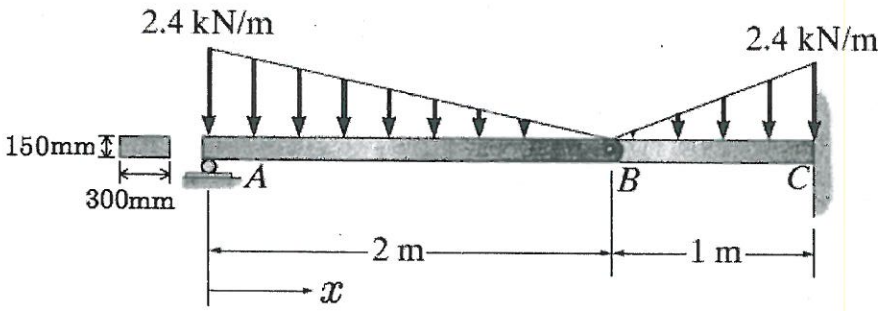


2. A beam having rectangular cross section is subjected to distributed load 2.4kN/m on AB and BC. The cross section of the beam has a height of 15mm and a width of 30mm.

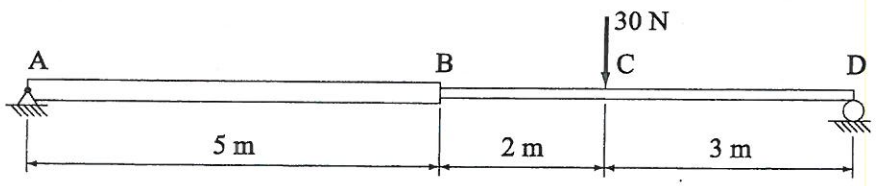
(a) Determine the applied force and moment on the A, B, and C.(6%)

(b) Determine the shear force throughout the beam as function of x and draw the shear force diagram for the beam. (6%)

(c) Determine the position occurred the maximum bending stress, and determine the maximum bending stress. (8%)



3. A simply supported beam 10 m long is loaded with a 30-N downward force at point C. The moment of inertia of the cross section of the beam is $3I_1$ for segment *AB* and I_1 for segment *BD*. The Young's modulus of the beam is ***E***. Determine the deflection at C and the angle at A by the **integration** method. (20%)

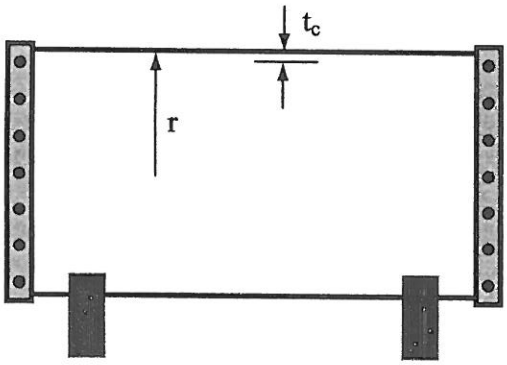


4. A thin-walled cylindrical pressure vessel with a radius r of 1 m and a thickness t_c of 5 mm is subjected to an inner pressure p.

(a) Consider the state of stress in the wall to construct **three** Mohr's circles. (6%)

(b) Determine the maximum pressure p_{max} based on the **maximum-shear** and **distortion-energy** theories. The yield strength of the material is 200 MPa. (8%)

(c) Determine the final thickness of the vessel based on the smaller p_{max} in (b). The Young's modulus is 200 GPa and the Poisson's ratio is 0.3. (6%)



5. An aluminum beam is supported by a pin at one end and an inclined aluminum bar at a third point. The beam is subjected to a downward force of 2 kN at point C. The cross sectional area of the beam is 4000 mm^2, and that of the bar is 400 mm^2. The moment of inertia for the beam around the horizontal axis is $50*10^6$ mm^4. Determine the deflection at point C by the **virtual work** method. Neglect deflection caused by shear. Let E =70 GPa. (20%)