Problem M7 and M8 (this is a two hour question)

A simply supported aluminum alloy beam is 3 m long and has a cross-section which is an "I" cross-section 200 mm high and 100 mm wide. A uniform distributed load of 6 kN/m acts on the left hand two thirds of the beam. The Young's modulus of the aluminum alloy is 70 GPa. The yield stress is 300 MPa.
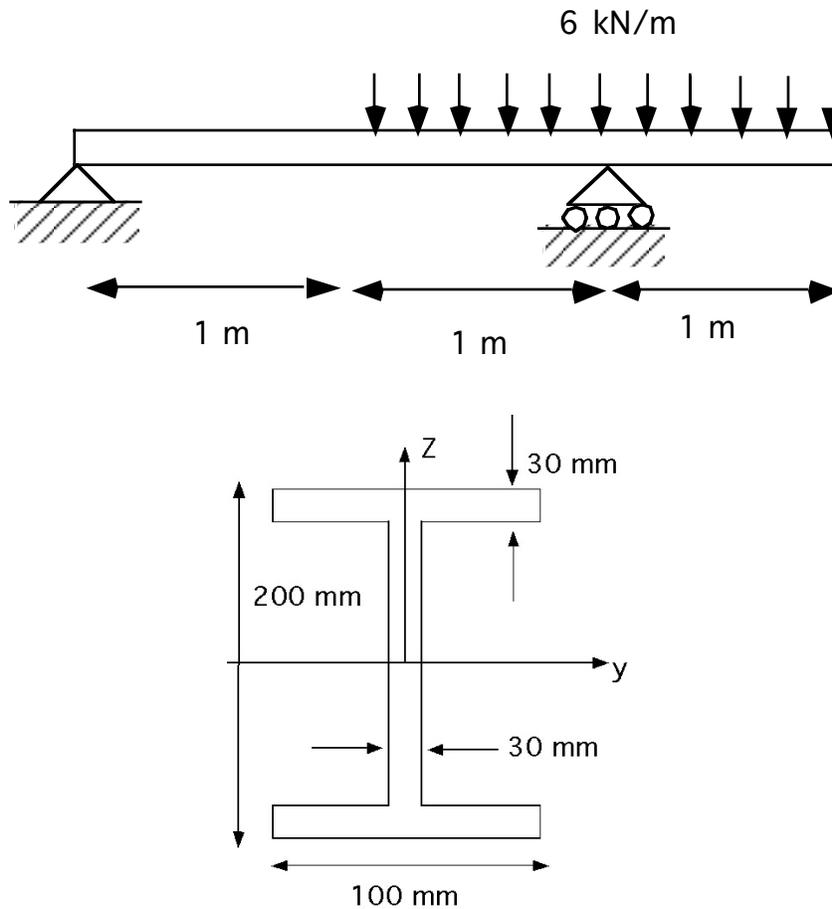
a) Determine the loading, shear force and bending moment as functions of the distance x measured from the left end of the beam. Draw the appropriate diagrams.

b) Determine the maximum deflection(s) of the beam and its (their) location(s).

c) Determine the magnitudes and locations of the maximum axial stress, σ_{xx} and the maximum shear stress, $\sigma_{xz.}$ Will the aluminum alloy yield?