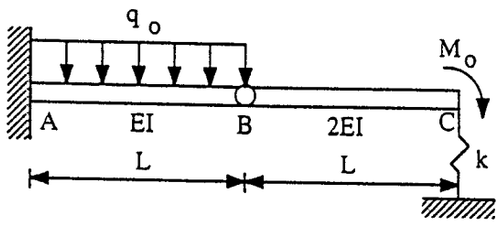
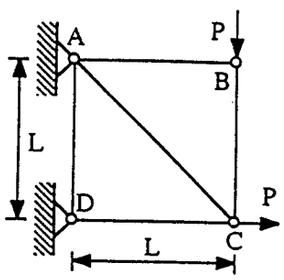
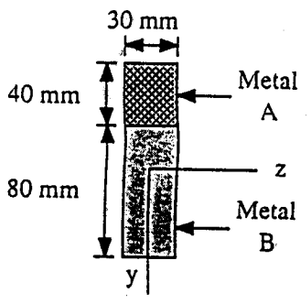
1. The beam ABC has a fixed support at A, a pin at B, and a translational spring support with spring constant k at C. Use the load-deflection differential equations, $EI(x)w(x)'''' = q(x)$, and appropriate boundary conditions to set up the simultaneous equations for determining the deflection w(x) of the beam. Do <u>not</u> solve the simultaneous equations. (20%)



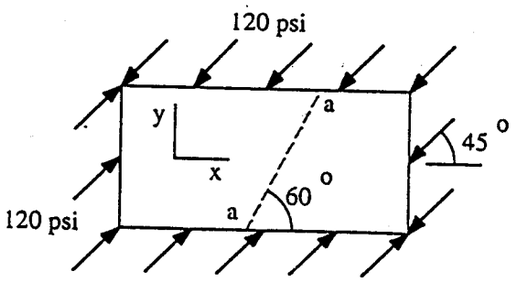


2. Calculate the forces in all members and the vertical displacement of joint C. All bars have the same axial rigidity EA. (20%)

3. The cross section of a composite beam is made of two metals. The moduli of elasticity for metals A and B are E_a = 75 GPa and E_b = 200 GPa. The allowable normal stresses for these two metals are σ_a = 50 MPa and σ_b = 80 MPa. Determine the maximum moment M_z that can be applied to this composite beam. (20%)



4. The stresses acting uniformly at the edges of a rectangular panel as shown. (i) Determine the stress components on planes parallel and perpendicular to a-a. Sketch the results on a properly oriented element. (ii) Calculate the maximum and minimum principal stresses. (20%)



5. A circular steel shaft ABC is fixed at supports A and C. The segment BC of the shaft is subjected to a constant distributed torsional loading of q = 200 lb-ft/ft. Segment AB has a diameter of 1.5 in. and segment BC has a diameter of 0.75 in. Assume G = 11300 ksi. (i) Determine the reactions at supports A and B. (ii) Calculate the angle of twist at B. (20%)