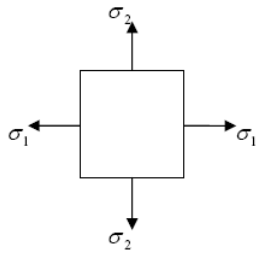
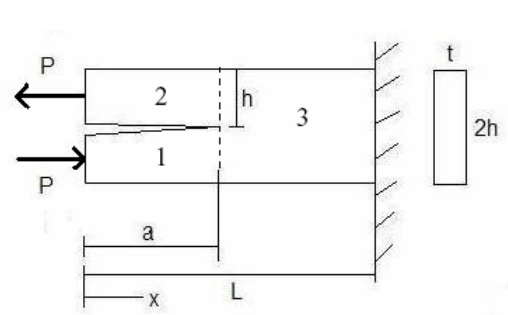
EAS4200C Aerospace Structures Homework #9 (Due: Nov. 23th)

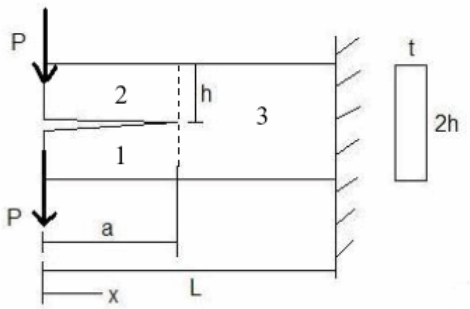
1. An aluminum alloy 2024-T651 (see Table 6.1) panel is subject to biaxial loading as shown in the figure. Assume that s1 = 300 MPa, and s2 can be either tension or compression. Find the maximum values of |s2| in tension and compression that the panel can withstand before yielding according to von Mises yield criterion.



2. Consider the split beams with loading shown in the figures. Loading in both figures are antisymmetric, and both are mode II fracture problems. For the same value of P, which loading is more efficient in cracking the beam? Assume that the beam dimensions and the elastic properties are E = 70GPa, ν = 0.3, a = 0.01m, t = 0.02m, L = 0.15m, h = 0.01m.



(a)



(b)

3. Consider the thin-walled box beam in the figure. The top wall contains a crack parallel to the x-axis. The crack length is 0.02m (i.e., a = 0.01m). Assume that the material is brittle and that modes I and II have the same toughness value of 5MPa√m. If the box beam has already been subjected to a torque T = 100kNm, estimate the maximum additional axial force N by using the mixed mode fracture criterion.