Homework SET1

Mechanics of materials

**Problem 1:**

Two axial forces are applied to the bar shown below.

1. Determine the internal force, *PAB*, in portion *AB* of the bar. **Specify tension or compression.**
2. Determine the normal stress, σ*AB*, in portion *AB* of the bar. **Specify tension or compression.**



**Problem 2:**

The U-shaped part is attached to the wall at the left. An overlapping glue joint, of length = 3 in. is used to joint the U-shaped part to a flat bar. A tensile axial load of *P* is applied to the flat bar. The thicknesses of the U-shaped part and the flat bar are both *t*, and the widths of both are *w*. The lengths of the U-shaped part and the flat bar are both *L*

*t* = 1 in. *w* = 4 in. = 3 in. *L* = 12 in. 􀁁

For the overlapping glue joint, the ultimate shear stress for the glue is 200 psi. If a factor of safety is 2.0 required, what is the maximum allowable load, *P*, which can be applied?



**Problem 3**

The piece of material, shown below, has undeformed dimensions of: *Lx* = 3 in., and *Ly* = 2 in., and *Lz* = 1 in. The Young’s modulus is E = 1\*106 psi and Poisson’s ratio is ν=1/4 Two loads, *Px* and *Py* are applied, as shown below.

*Lx* = 3 in. psi 6110*E*=×

*Ly* = 2 in. ν= 1/4

*Lz* = 1 in.

*Px* = 300 lb. *Py* = 600 lb.

a) Determine the change length in the *x*–direction, δ*x*, due to the applied forces

b) The change in length in the *z*–direction is defined as δ*z*.



**Problem 4**

Determine the deformation of the steel rod shown under the given loads

