

1. Determine the yield load P_y and the ultimate load P_u for the structure shown in Fig.1 if the horizontal bar AB is rigid and the two identical vertical wires are made of an elastic-plastic material. i.e., (a) plot a load-displacement diagram for point B, (b) determine allowable load P_{allow} using a load factor of 1.5. (25%)
2. What is the bulk modulus K? Can you prove the following formula? (25%)

$$K = \frac{E}{3(1-2\nu)}$$

3. For the stress tensor shown, (a) find the principal stresses and determine the principal direction corresponding to the largest principal value. (25%)

$$[\sigma_{ij}] = \begin{bmatrix} 5 & 3 & -3 \\ 3 & 0 & 2 \\ -3 & 2 & 0 \end{bmatrix} \text{ ksi}$$

4. A rectangular strain rosette is mounted on the surface of a body shown Fig.2. The gauges read

$$\epsilon_{(1)} = 0.002$$

$$\epsilon_{(2)} = 0.003$$

$$\epsilon_{(3)} = 0.004$$

- (a) If $E = 2 \times 10^{11} \text{ Pa}$ and $\nu = 0.3$, what are the stresses at this point?

- (b) What is the normal strain in a direction normal to this surface? (25%)

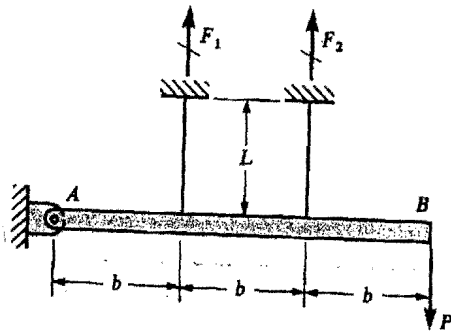


Fig. 1

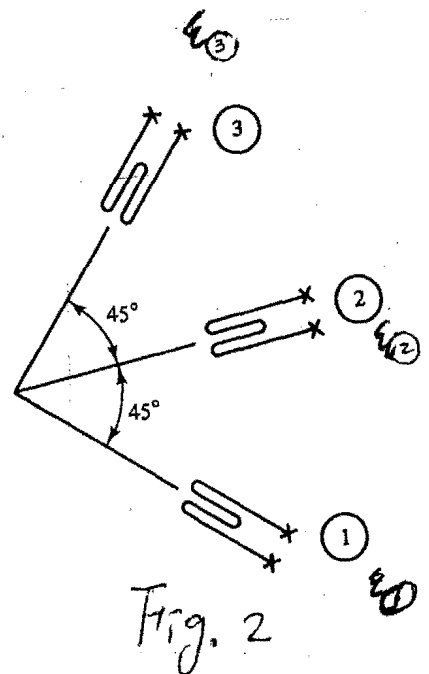


Fig. 2