

6.1 6.4 6.9 6.6 6.12
228 229 230 231 232

CNST 241 HW #6

1. $P = 80$ kips single shear

Dia = $\frac{3}{4}$ " bolts

$$\text{total area} = \frac{\pi (\frac{3}{4})^2}{4} \times 3 \text{ bolts} = 1.325 \text{ in}^2$$

$$\sigma = \frac{P}{A} = \frac{80000 \text{ lbs}}{1.325 \text{ in}^2} = 60,361 \text{ psi} = 60 \text{ ksi}$$

shear stress on bolts is 60 ksi

left plate $\frac{7}{16}$ " THK

$$A = \frac{7}{16} \text{ " } \times 7 \text{ " } = 3.0625 \text{ in}^2 \quad P = 80 \text{ kips}$$

$$\frac{P}{A} = \frac{80 \text{ k}}{3.0625 \text{ in}^2} = 26.1 \text{ ksi tension}$$

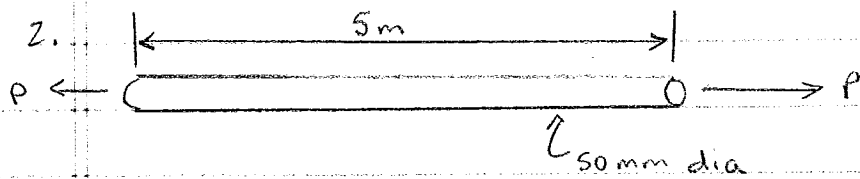
tension stress on $\frac{7}{16}$ " plate = 26.1 ksi

right plate $\frac{1}{2}$ " THK

$$A = \frac{1}{2} \text{ " } \times 7 \text{ " } = 3.5 \text{ in}^2 \quad P = 80 \text{ kips}$$

$$\frac{P}{A} = \frac{80 \text{ k}}{3.5 \text{ in}^2} = 22.9 \text{ ksi T}$$

tension stress on $\frac{1}{2}$ " plate = 22.9 ksi



$$E_s = 210,000 \text{ MPa}$$

$$E_a = 70,000 \text{ MPa}$$

$$\delta_s = 75 \text{ mm}$$

$$\sigma = \frac{P}{A} \quad E = \frac{\sigma}{\epsilon} \quad \epsilon = \frac{\delta}{L}$$

for the steel $\delta_s = 75 \text{ mm} \times \frac{1 \text{ m}}{1000 \text{ mm}} = 0.075 \text{ m}$

$$\epsilon_s = \frac{0.075 \text{ m}}{5 \text{ m}} = 0.015 \text{ m/m}$$

$$\sigma = E_s \cdot \epsilon = 210,000 \text{ MPa} \times 0.015 \text{ m/m} = 3150 \text{ MPa}$$

for the aluminum $\delta_s = 75 \text{ mm} = 0.075 \text{ m}$

$$\epsilon_a = 0.015 \text{ m/m}$$

$$\sigma_a = E_a \cdot \epsilon = 70,000 \text{ MPa} \times 0.015 \text{ m/m} = 1050 \text{ MPa}$$

$$P = \sigma \cdot A = 1050 \text{ MPa} \times \frac{\pi (0.050 \text{ m})^2}{4} = 2.1 \text{ MN}$$

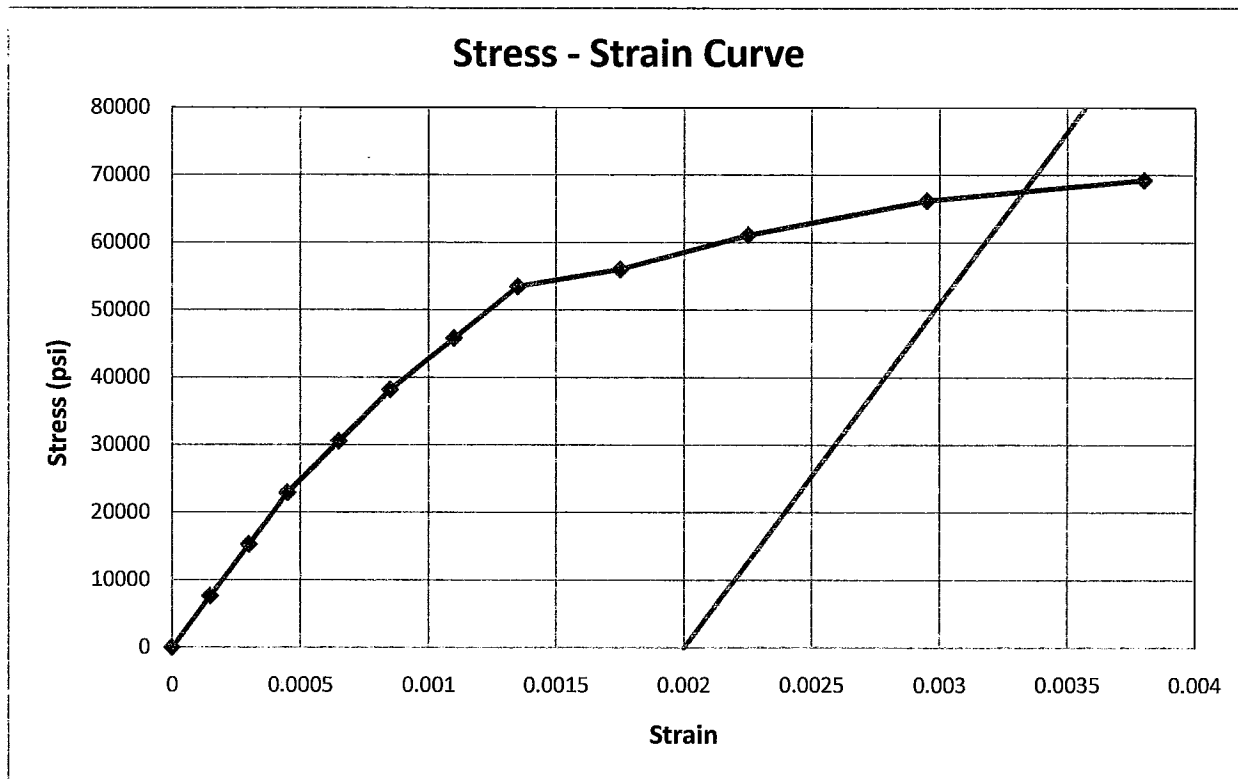
Problem 3

Gage Length = 2" and diameter = 0.5"

Cross Sectional Area =

0.20 in²

Load (lb)	Deformation (inches)	Stress (psi)	Strain	E (psi)
0	0	0	0.00000	0
1500	0.0003	7639	0.00015	50930000
3000	0.0006	15279	0.00030	50930000
4500	0.0009	22918	0.00045	50930000
6000	0.0013	30558	0.00065	47012000
7500	0.0017	38197	0.00085	44938000
9000	0.0022	45837	0.00110	41670000
10500	0.0027	53476	0.00135	39612000
11000	0.0035	56023	0.00175	32013000
12000	0.0045	61115	0.00225	27162000
13000	0.0059	66208	0.00295	22444000
13600	0.0076	69264	0.00380	18227000



Yield 1 = 53000 psi

E 1 = 50×10^6 psi

Yield 2% = 68,000 psi

E 2% = 50×10^6 psi