

Question 4a)

upwards force

$$F = P \times A$$

$$= P \times dL$$

Downwards force

$$F = 2\sigma_h \times dL$$

$$2\sigma_h dL = P dL$$

$$2\sigma_h = P$$

$$\sigma_h = \frac{P}{2}$$

b)

the limiting factor is that hoop stress is twice the longitudinal stress.

c) 10275 g/cm³ UNITS

$$d) P_{max} = \frac{2\sigma_h L}{d} = \frac{2 \times 195 \times 10^6 \times 8.4 \times 10^{-3}}{3.4} = 39000,000 \text{ Pa}$$

$$P = \rho g h = 10275 \times 9.81 \times$$

$$P_{max} = \frac{2\sigma_h L}{d} = \frac{2 \times 195 \times 10^6 \times 8.4 \times 10^{-3}}{3.4}$$

$$= 390000$$

$$= 390 \text{ kPa}$$

e)

g)

f)

if class not so good

Question 2

- A) ~~Define~~ Define the problem,
- i customer needs
 - ii develop Statement
 - iii criteria for success
- b) ~~gather relevant information information~~
~~state a problem~~
- is it the problem,
 - is there really a need for ~~problem~~
- c) new solution
- existing problems
- c) Generate multiple solution
~~state a problem~~
- D) Analyse and select solution
- e) test and implement solution
- B) ~~integrate~~ integrate for in test and implement solution

Question for

$$a) \quad \sigma_{\theta} = \tau_{xy} \sin 2\theta$$

$$AB \cos \theta = \cancel{AB} AC + x_y \sin \theta + BC \cos \theta$$

$$\theta = \frac{AC}{AB} + x_y \sin \theta + \frac{BC}{AB} \cos \theta$$

now

$$\frac{AC}{AB} = \cos \theta \text{ and } \frac{BC}{AB} = \sin \theta$$

$$\begin{aligned} \sigma_{\theta} &= \tau_{xy} \sin \theta \cos \theta + \tau_{xy} \sin \theta \cos \theta \\ &= 2\tau_{xy} \sin \theta \cos \theta \\ &= \cancel{\sin \theta} \sin \theta \cos \theta = \frac{1}{2} \sin 2\theta \end{aligned}$$

$$\text{since } \sin \theta \cos \theta = \frac{1}{2} \sin 2\theta$$

$$\sigma_{\theta} = \tau_{xy} \sin$$