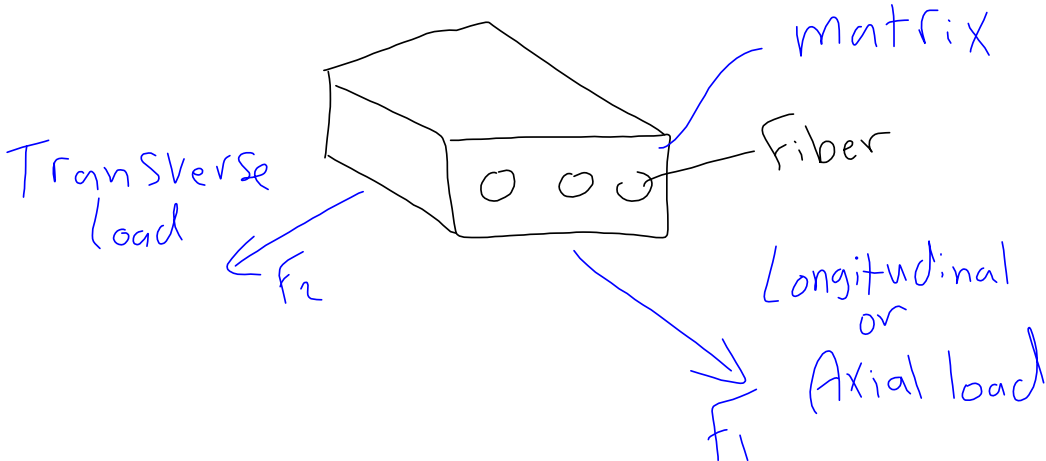
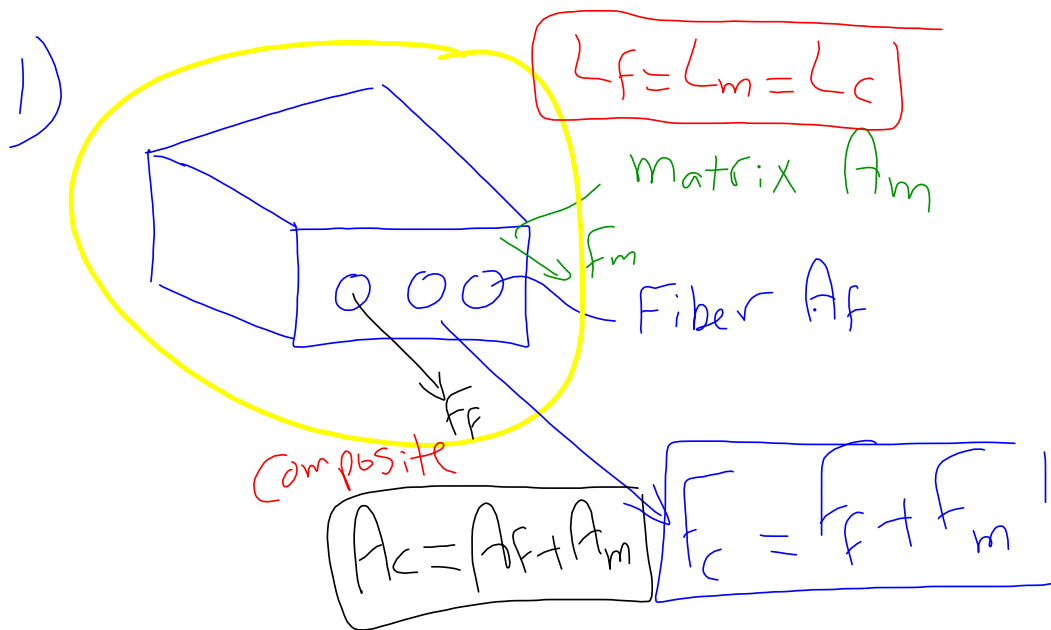


Composite?





$$\sigma_c = \frac{F_c}{A_c} \quad / \quad \sigma_m = \frac{F_m}{A_m} \quad / \quad \sigma_f = \frac{F_f}{A_f}$$

$$\frac{A_c}{A_c} = \frac{A_m}{A_c} + \frac{A_f}{A_c}$$

$$1 = V_m + V_f$$

V_f = Fiber Volume Fraction

$$V_f = \frac{\text{Fibers Vol.}}{\text{Composite Vol.}}$$

$$= \frac{A_f \times L_f}{A_c \times L_c} = \frac{A_f}{A_c}$$

How calculate properties:

$$G_c = G_f \cdot V_f + G_m \cdot V_m \quad \text{--- (1)}$$

$$\frac{F_c}{A_c} = \frac{F_f}{A_c} + \frac{F_m}{A_c} \Rightarrow G_c = G_f \cdot V_f + G_m \cdot V_m$$

$$E_c = E_f \cdot V_f + E_m \cdot V_m \quad \text{--- (2)}$$

$$TS_c = TS_f \cdot V_f + TS_m \cdot V_m \quad \text{--- (3)}$$

$$\frac{F_f}{F_m} = \frac{E_s \cdot \Delta_f}{E_m \cdot \Delta_m} \quad - (4)$$

$$E_c = E_f = E_m \quad ? \text{ why}$$

$$E = \frac{\Delta}{L_0}$$

$$2) \quad E_c = E_f \cdot V_f + E_m \cdot V_m$$

$$G_c = G_m = G_f \quad ?$$

$$\frac{1}{E_c} = \frac{V_f}{E_f} + \frac{V_m}{E_m}$$

$$V_f + V_m = 1$$

or

$$V_f \% + V_m \% = 100\%$$

$$E_1 > E_2$$

Problem 1

Case 1

Longitudinal

$$TS_c = TS_f \cdot \checkmark f_f + TS_m \cdot \checkmark f_m$$

3600 MPa
45%
||
0.45

~~65 MPa~~ 55% = 0.55

35 MPa NOT 65 MPa
Given

$$E_c = E_f \cdot V_f + E_m \cdot V_m$$

$\underbrace{\hspace{1.5cm}}_{131 \text{ GPa}} \quad \underbrace{\hspace{1.5cm}}_{0.45} \quad \underbrace{\hspace{1.5cm}}_{2.4 \text{ GPa}} \quad \underbrace{\hspace{1.5cm}}_{0.55}$

Problem ② E_1, E_2, E_m, E_f

case 1

$$E_1 = E_m v_m + E_f v_f$$

$(1 - v_f)$
 $\downarrow v_{f1}$

case 2

$$\frac{1}{E_2} = \frac{v_m}{E_m} + \frac{v_f}{E_f}$$

$(1 - v_f)$
 $\downarrow v_{f2}$

if $v_{f1} = v_{f2} \Rightarrow \text{OK}$
 if $v_{f1} \neq v_{f2} \Rightarrow \text{cannot}$

Problem ③

$$F_f = 97\% F_c \Rightarrow F_m = 3\% F_c$$

1) $v_f = ?$ $E_1 = \underbrace{E_f \cdot v_f}_{?} + \underbrace{E_m \cdot v_m}_{?} (1 - v_f)$
 2 unknowns ?

$$\frac{F_f}{F_m} = \frac{E_f \cdot v_f}{E_m \cdot v_m} \Rightarrow \frac{97\% F_c}{3\% F_c} = \frac{E_f v_f}{E_m (1 - v_f)}$$

2) $TS_c = TS_f \cdot v_f + TS_m \cdot v_m$

\Downarrow 50MPa NOT 76MPa
 \Downarrow $v_f \ll$