

16.10 This problem asks for us to compute the elastic moduli of fiber and matrix phases for a continuous and oriented fiber-reinforced composite. We can write expressions for the longitudinal and transverse elastic moduli using Equations 16.10b and 16.16, as

$$E_{cl} = E_m(1 - V_f) + E_f V_f$$

$$33.1 \text{ GPa} = E_m(1 - 0.30) + E_f(0.30)$$

And

$$E_{ct} = \frac{E_m E_f}{(1 - V_f)E_f + V_f E_m}$$

$$3.66 \text{ GPa} = \frac{E_m E_f}{(1 - 0.30)E_f + 0.30E_m}$$

Solving these two expressions simultaneously for E_m and E_f leads to

$$E_m = 2.6 \text{ GPa} \quad (3.77 \times 10^5 \text{ psi})$$

$$E_f = 104 \text{ GPa} \quad (15 \times 10^6 \text{ psi})$$