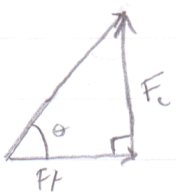
643. JF

Resultant



$$\text{Resultant}^2 = 550^2 + 9786^2 - 2 \times 550 \times 9786 \times \cos(90)$$

$$R^2 = 96068296$$

$$R = 9801.4 \text{ N}$$

$$\theta = \frac{9786}{550}$$

$$= 17.7927$$

$$= \text{Tan}^{-1} \text{ Ans}$$

$$= 86.7832^{\circ}$$

Moments about which the forces act

$$M = \frac{550 + 9786}{9801.4}$$

$$= 1.05 \text{ m}$$

Deflection

If the maximum required deflection is 0.156 ± 0.0005 m then we can work backwards to work out I and therefore b and d

$$\delta max = \frac{Fl^3}{3EI}$$

$$\delta \times 3EI = Fl^3$$

$$I = \frac{Fl^3}{\delta \times 3E}$$

$$I = \frac{9801.4 \times 0.6739^3}{0.1565 \times 3 \times (2 \times 10^{11})}$$

$$I = 3.195 \times 10^{-8}$$

$$3.195 \times 10^{-8} = \frac{bd^3}{12}$$

If we assume square cross section

$$= \frac{d^4}{12}$$

$$I \times 12 = d^4$$

$$d = 0.0249 \text{ m}$$