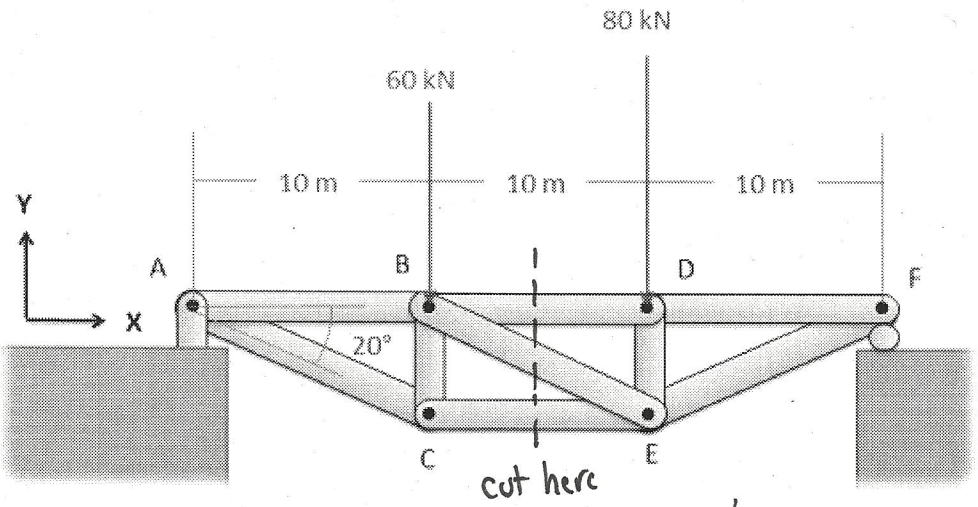
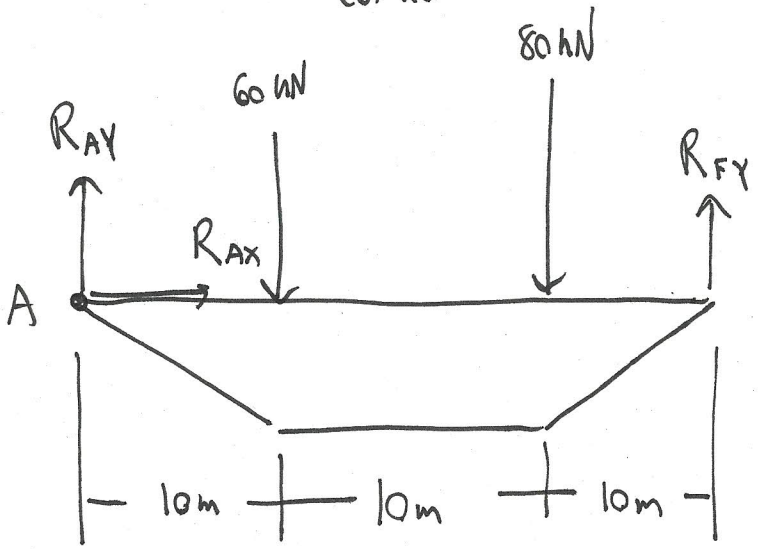
Question 1:

Find the forces acting on members BD and CE. Be sure to indicate if the forces are tensile or compressive.





$$\Sigma F_x = R_{AX} = 0$$

$$\Sigma F_y = R_{AY} + R_{FY} - 60 - 80 = 0$$

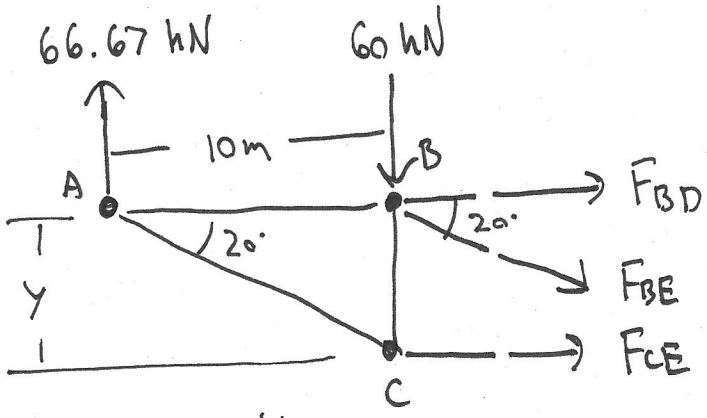
$$\Sigma M_A = -(60)(10) - (80)(20) + (R_{FY})(30) = 0$$

$$R_{AX} = 0$$

$$R_{FY} = \frac{(60)(10) + (80)(20)}{30} = 73.33 \text{ kN}$$

$$R_{AY} = 60 + 80 - 73.33 = 66.67 \text{ kN}$$

Now cut bridge in half



$$\tan(20) = \frac{y}{10}$$

$$y = 10 \tan(20) = 3.64 \text{ m}$$

$$\sum F_x = F_{BD} + \cos(20) F_{BE} + F_{CE} = 0$$

$$\sum F_y = 66.67 - 60 - \sin(20) F_{BE} = 0$$

$$\sum M_B = (F_{CE})(3.64) - (66.67)(10) = 0$$

$$F_{BE} = \frac{6.67}{\sin(20)} = 19.50 \text{ kN}$$

$$F_{CE} = \frac{(66.67)(10)}{3.64} = 183.16 \text{ kN}$$

$$F_{BD} = -\cos(20)(19.50) - 183.16 = -201.48$$

Solution:

$$F_{BD} = 201.48 \text{ kN } C$$

$$F_{CE} = 183.16 \text{ kN } T$$