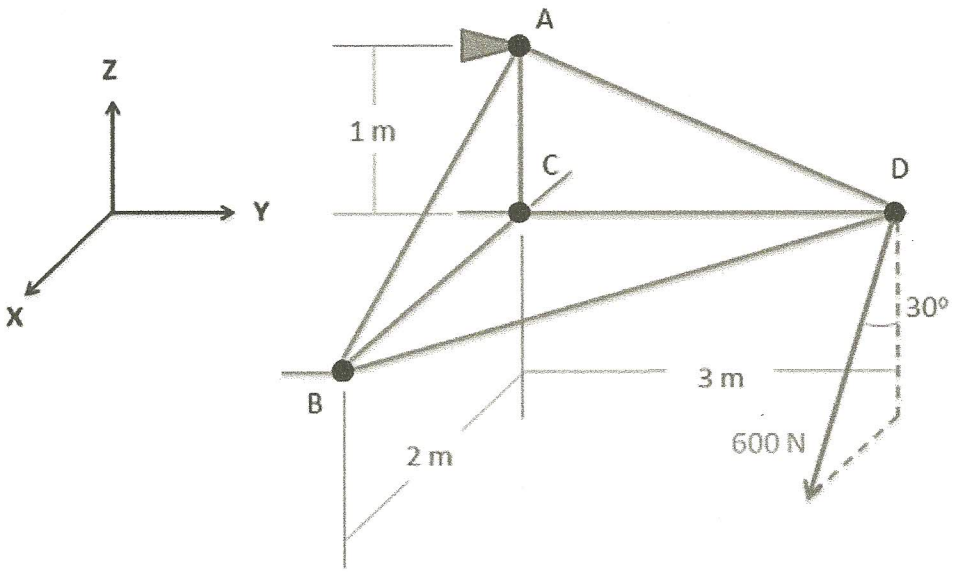
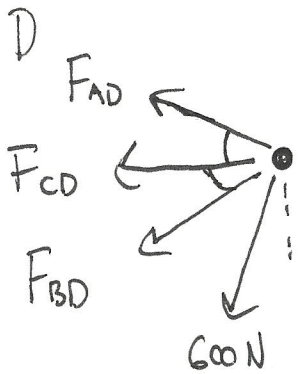
Question 3

Find the force acting in each of the members of the truss shown below. Remember to specify if each member is in tension or compression.



Calculations:

Ship reaction forces. Start at point D



$$\Sigma F_x = \frac{2}{\sqrt{2^2+3^2}} F_{BD} + 600\sin(30) = 0$$

$$\Sigma F_y = -\frac{3}{\sqrt{1^2+3^2}} F_{AD} - F_{CD} - \frac{3}{\sqrt{2^2+3^2}} F_{BD} = 0$$

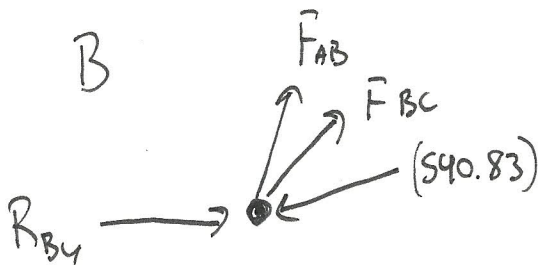
$$\Sigma F_z = \frac{1}{\sqrt{3^2+1^2}} F_{AD} - 600\cos(30) = 0$$

$$F_{BD} = \frac{-600\sin(30)}{\frac{2}{\sqrt{2^2+3^2}}} = -540.83\ N$$

$$F_{AD} = \frac{600\cos(30)}{\frac{1}{\sqrt{3^2+1^2}}} = 1643.17\ N$$

$$F_{CD} = \frac{-3}{\sqrt{1^2+3^2}}(1643.17) - \frac{3}{\sqrt{2^2+3^2}}(-540.83) = -1108.85\ N$$

B



$$\sum F_x = -\frac{2}{\sqrt{2^2+1^2}}F_{AB} - F_{BC} + \frac{2}{\sqrt{2^2+3^2}}(540.83) = 0$$

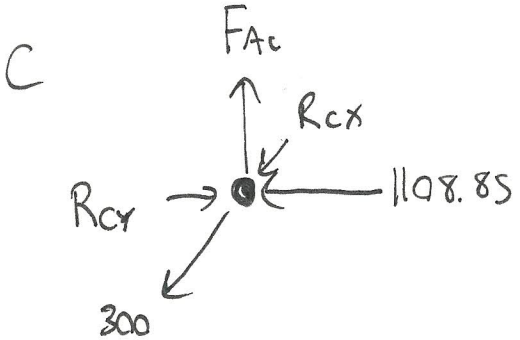
$$\sum F_y = R_{BY} - \frac{3}{\sqrt{3^2+2^2}}(540.83) = 0$$

$$\sum F_z = \frac{1}{\sqrt{2^2+1^2}}F_{AB} = 0$$

$$F_{AB} = 0$$

$$F_{BC} = \frac{2}{\sqrt{2^2+3^2}}(540.83) = 300\ N$$

C



$$\sum F_z = F_{AC} = 0$$

$$F_{AC} = 0$$

Solution:

$F_{AB} = 0$

$F_{AC} = 0$

$F_{AD} = 1643.17\ N\ T$

$F_{BC} = 300\ N\ T$

$F_{BD} = 540.83\ N\ C$

$F_{CD} = 1108.85\ N\ C$