



Philadelphia University

Faculty of Engineering

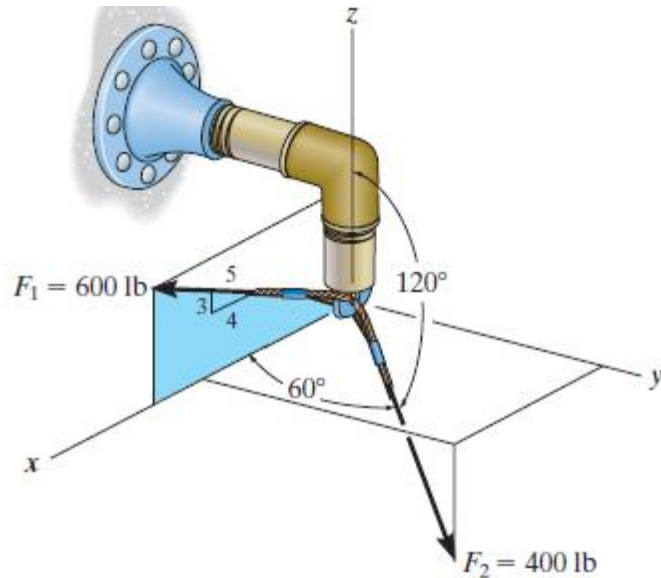
Mech. Engineering Department

Statics(620211)

Quiz:1-B .1<sup>st</sup> sem. 2014/15

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Express each force acting on the pipe in Cartesian vector form.



**Rectangular Components:** Since  $\cos^2 \alpha_2 + \cos^2 \beta_2 + \cos^2 \gamma_2 = 1$ , then  $\cos \beta_2 = \pm \sqrt{1 - \cos^2 60^\circ - \cos^2 120^\circ} = \pm 0.7071$ .

However, it is required that  $\beta_2 > 90^\circ$ , thus,  $\beta_2 = \cos^{-1}(0.7071) = 45^\circ$ . By resolving  $F_1$  and  $F_2$  into their  $x$ ,  $y$ , and  $z$  components, as shown in Figs. *a* and *b*, respectively,  $F_1$  and  $F_2$ , can be expressed in Cartesian vector form, as

$$F_1 = 600 \left( \frac{4}{5} \right) (+i) + 0j + 600 \left( \frac{3}{5} \right) (+k)$$

$$= [480i + 360k] N$$

Ans.

$$F_2 = 400 \cos 60^\circ i + 400 \cos 45^\circ j + 400 \cos 120^\circ k$$

$$= [200i + 283j - 200k] N$$

Ans.