

# Homework I - Chapters 1 and 2

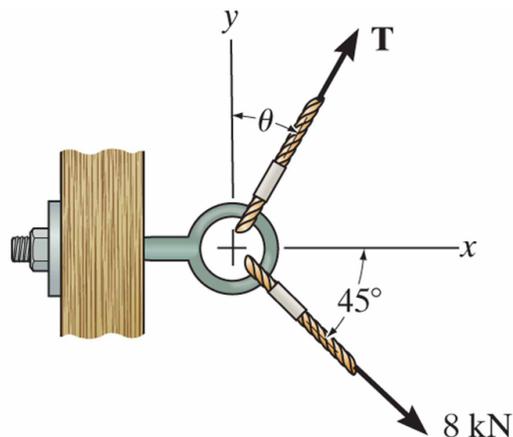
due Friday, 08/04/11, 12:50pm, 370-370

For late homework, you are responsible to arrange drop off with our grader Kaushik Mani, [kmani@stanford.edu](mailto:kmani@stanford.edu). Once you have used up your three late days, you will no longer receive points for your homework. Here are our office hours and emails.

when	when	where	who	email
Tuesdays	06:00 - 07:30pm	Durand 247	Charbel	<a href="mailto:ceid@stanford.edu">ceid@stanford.edu</a>
Wednesdays	02:30 - 04:00pm	Durand 217	Ellen	<a href="mailto:ekuhl@stanford.edu">ekuhl@stanford.edu</a>
Wednesdays	05:00 - 06:30pm	Durand 393	Chris	<a href="mailto:cploch@stanford.edu">cploch@stanford.edu</a>
Thursdays	10:00 - 11:30am	Durand 203	Joules	<a href="mailto:jmgould@stanford.edu">jmgould@stanford.edu</a>
Thursdays	01:00 - 02:30pm	Durand 393	Estevan	<a href="mailto:estevanm@stanford.edu">estevanm@stanford.edu</a>

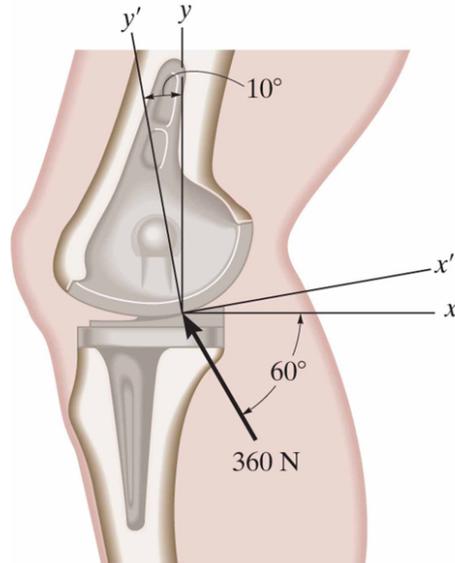
For this homework, you need to be familiar with chapters 1 and 2 of your book! You may skip pages 22-31.

## Problem 1



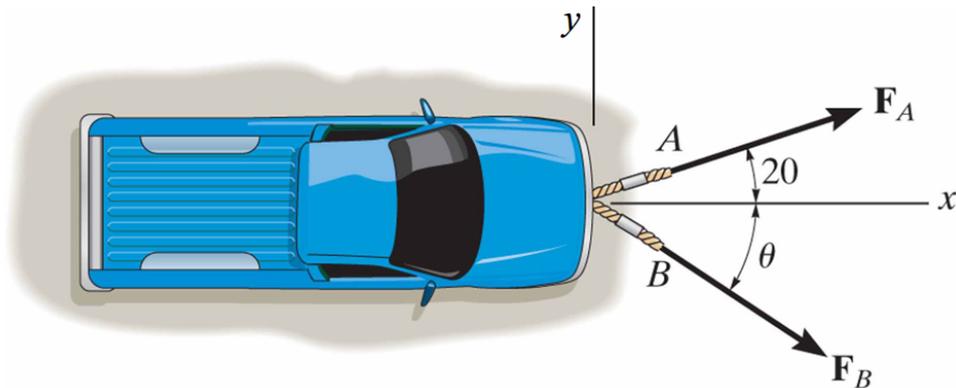
- 1.1 If  $\theta = 60^\circ$  and  $T = 6 \text{ kN}$ , determine the magnitude of the resultant force acting on the eyebolt and its direction measured clockwise from the positive  $x$ -axis.
- 1.2 If the magnitude of the resultant force is to be  $9 \text{ kN}$ , and the resultant force is to be directed along the positive  $x$ -axis, determine the magnitude of the force  $T$  acting on the eyebolt and its angle  $\theta$ .

## Problem 2



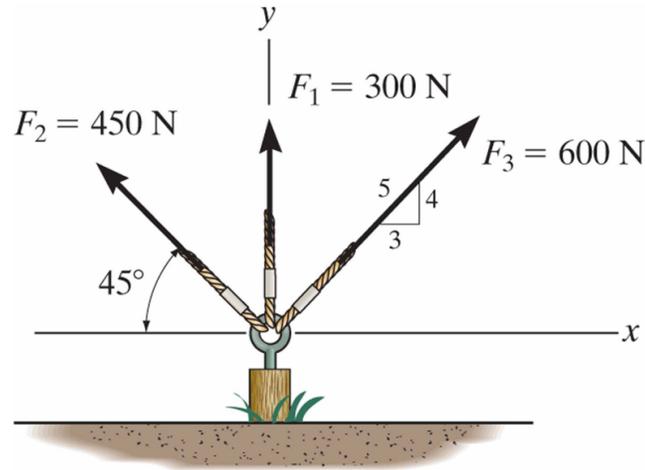
- 2.1 The device is used for surgical replacement of the knee joint. If the force acting along the leg is 360 N, determine its components along the  $x$  and  $y'$  axes.
- 2.2 The device is used for surgical replacement of the knee joint. If the force acting along the leg is 360 N, determine its components along the  $x'$  and  $y$  axes.

## Problem 3



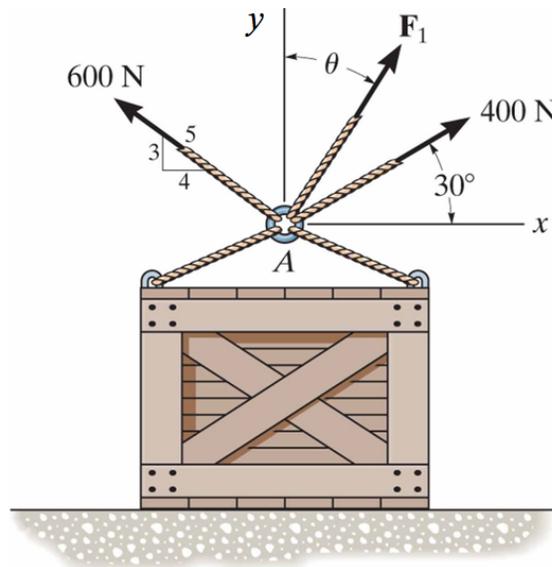
- 3.1 The truck is to be towed using two ropes. Determine the magnitude of forces  $F_A$  and  $F_B$  acting on each rope in order to develop a resultant force of 950 N directed along the positive  $x$ -axis. Set  $\theta = 50^\circ$ .
- 3.2 The truck is to be towed using two ropes. The resultant force is to be directed along the positive  $x$ -axis. Determine the magnitude of the resultant force and the angle  $\theta$  for  $F_A = 500$  N and  $F_B = 700$  N.

## Problem 4



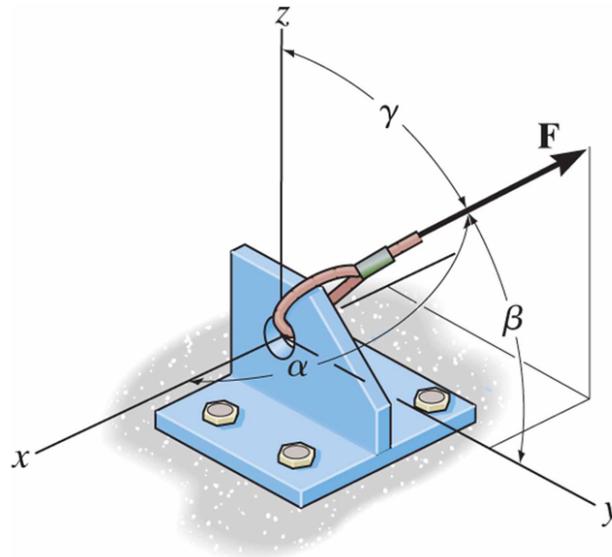
- 4.1 Resolve each force acting on the post into its  $x$  and  $y$  components.
- 4.2 Calculate the  $x$  and  $y$  components of the resulting force of all three forces.
- 4.3 Calculate the magnitude and the direction of the resulting force, i.e., its angle with respect to the positive  $x$ -axis.

## Problem 5



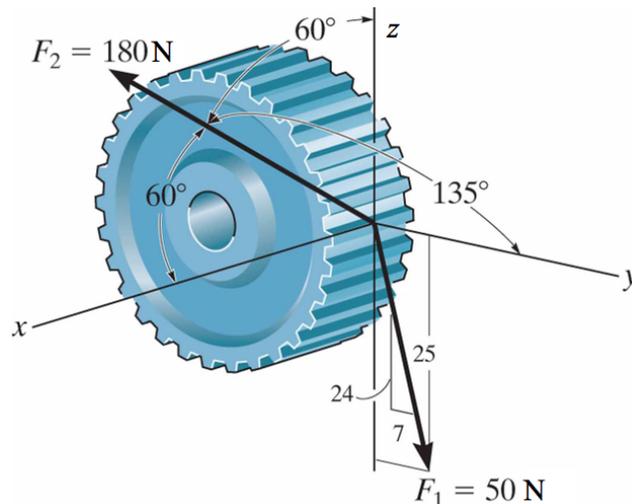
- 5.1 Determine the magnitude of  $F_1$  and its direction  $\theta$ , so that the resultant force is directed vertically upward and has a magnitude of 800 N.
- 5.2 Determine the resultant force in terms of magnitude and direction, i.e., the angle that it forms with the positive  $x$ -axis. Take  $F_1 = 500$  N and  $\theta = 20^\circ$ .

## Problem 6



- 6.1 The force  $F$  acts on the bracket as shown, pointing in the negative  $x$ , the positive  $y$ , and the positive  $z$ -directions. If  $F = 400 \text{ N}$ ,  $\beta = 60^\circ$  and  $\gamma = 45^\circ$ , determine the  $x$ ,  $y$ , and  $z$  components of  $F$ .
- 6.2 The force  $F$  acts on the bracket as shown. If  $F_x = -300 \text{ N}$ ,  $F_z = 600 \text{ N}$ , and  $\beta = 60^\circ$ , determine the magnitude of  $F$ , its  $y$ -component  $F_y$ , and the coordinate direction angles  $\alpha$  and  $\gamma$ .

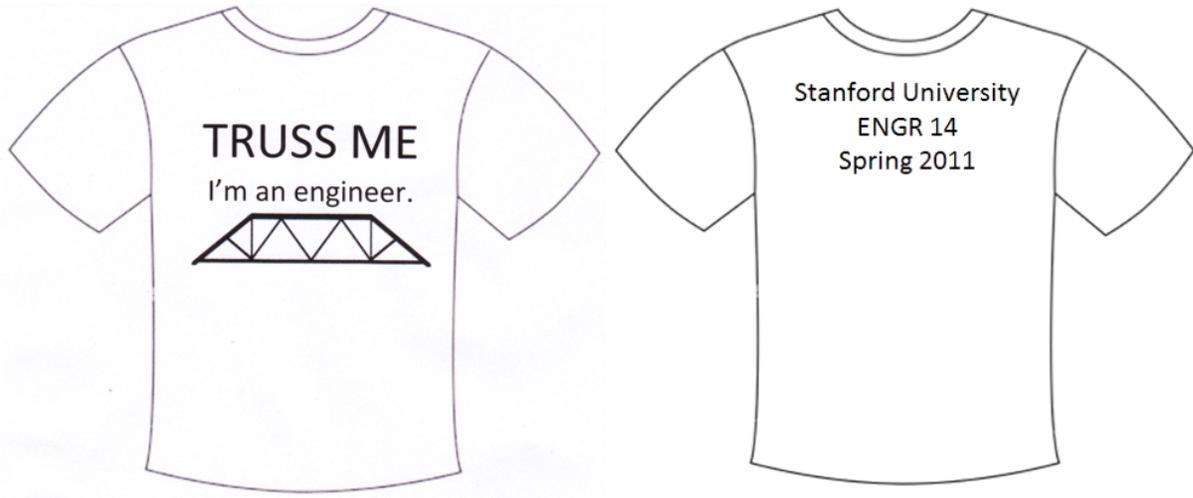
## Problem 7



- 7.1 The spur gear is subjected to two forces caused by contact with other gears. Express each force as a Cartesian vector, where  $F_{1x} = 0 \text{ N}$ .
- 7.2 The spur gear is subjected to two forces caused by contact with other gears. Determine the resultant of the two forces and express it as a Cartesian vector.

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## Problem 8 - Design your own E14 statics T-shirt!



Design your own E14 statics T-shirt. Upload your design into the drop box on your coursework E14 website.

- Designs can only be single color.
- Designs can cover both front and back, but could also be single sided.
- Everybody who uploads one or more designs into the drop box will receive 5 extra bonus points for this homework.
- The top three designs will receive another 5 extra bonus points.
- The best design will be elected as our E14 shirt.
- Everybody in class will receive a free shirt.

As part of the following homework sets, we will ask you to upload photos of yourself or yourself with some of your class mates, wearing your statics T-shirts and illustrating forces. Towards the end of this class, we will make a music video from the best photos.

- 8.1 As part of problem 8.1 of this homework, list the size of your T-shirt order, i.e., men or women, and small, medium, large, or extra large.
- 8.2 As part of problem 8.2 of this homework, list your favorite song for this E14 video. It can be a "force"-related song, or just any song you like.
- 8.3 If you would like to be part of the E14 video team, and participate in photo selection, song selection or song composition, and video making, send us an email or talk to us for details after class.