Bike Crank (Part 2) - Pre-Analysis & Start-Up

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Pre-Analysis & Start-Up

Pre-Analysis

The results of each gauge can be approximated using beam theory as shown in this document. Note that the document uses a different bike crank and a different gauge location so while the process is the same, you will obtain different results. Also, know that the hand calculation uses *tensor* shear strain while ANSYS reports *engineering* shear strain (which is two times the tensor shear strain).

It is always a good idea to make some rough hand-calculations in order to validate the simulation result. So before even starting our simulation, let's try to get a rough idea of what our answers will be. Here, we provide you with the main steps to follow and give you the final answer for the left gauge for you to verify that you did the work properly.

Main steps:

1. Find sigma_x, sigma_y and tau_xy from beam theory. (Hint: Use the local height)
2. Using Hooke's Law, find epsilon_x, epsilon_y and epsilon_xy. You might find it easier to work with matrices.
3. Perform a strain transformation, if needed. This will allow you to find strains with respect to a rotated coordinate system. (Hint: There are generally 3 ways to do this and they are shown below.)
    a. Mohr's circle (not recommended)
    b. Strain transformation formulas
    c. Transformation matrix

*Caution: Know the definition of "engineering" shear strain,

γ_{xy}

and be careful with the sign of your angle when doing the transformation.

And finally, think about whether shear stress or shear strain can be neglected and when that is the case. Final answer:

Start-Up

This tutorial assumes that you have completed the bike crank tutorial. The ANSYS project file generated from the bike crank tutorial is used as a starting point for this tutorial. The following video will show you how to make a copy of your previous analysis system within the project page.

Summary of steps in the above video:

1. Go to Project Schematic where your previous bike crank simulation resides
2. Click on the downward arrow on the leftmost upper of the static structural box
3. Click on Duplicate and rename the second project to Crank part 2

Go to Step 2: Geometry

Go to all ANSYS Learning Modules