

OPTI 421/521 – Introductory Opto-Mechanical Engineering

Homework 9

1.) Fasteners, modeling in SolidWorks, and bill of materials

Create a model in SolidWorks of two 0.5” thick aluminum plates bolted together. Use each of the following fasteners:

- ¼ -20 hex head cap screw with washer
- ¼ -20 socket head cap screw, with countersink
- M4 Phillips round head screw
- ¼ -20 flat head screw
- #10-32 button head screw

For the threads, use each of the following options:

- Threaded through hole
- Threaded blind hole (the hole does not go all the way through the material)
- Clearance hole, with lock washer and nut
- Helicoil insert

Create an assembly drawing and complete mechanical drawings for both plates
Create a bill of materials, calling out all of the fasteners needed AND specifying their part number from Copper State, McMaster-Carr or your favorite supplier.

2. Adhesives

Choose a single type of adhesive (epoxy, RTV, urethane, UV curing, ...) Write a brief paragraph on the appropriate use of this type material for optical applications. Discuss limitations. Find the specifications of at least 2 similar products of this type. Compare and contrast these. Provide the complete data sheets for these.

3. Dynamic modeling

Create a SolidWorks model of a cantilever beam made of aluminum, 10 cm long, 1 cm x 1 cm cross section. Use CosmosWorks to determine the lowest modes of vibration. Show each mode and give the resonant frequency. Compare the frequency of the lowest mode to a hand calculation. Add a 1 kg mass to the end of the beam. Show the modes and compare the lowest mode to a hand calculation.

3) Rules of Thumb

Provide three rules of thumb using the standard format.