

**Another Sample Midterm Examination**  
**Computer Aided Engineering MECH4259**  
**Summer XXXX < 2021**

**UNIVERSITY OF WINDSOR**  
**DEPARTMENT OF MECHANICAL, AUTOMOTIVE, AND ENGINEERING**

**In summer 2021, the  
midterm will have  
only 3 questions as  
discussed in lecture**

**Time: Three hours**  
**Total points is 100**

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**Name:**

**UWIN email address:**

**Student ID:**

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**Please read carefully:**

- 1- It is your responsibility to save your work regularly in case of Computer/CATIA crash.
- 2- It is your responsibility to organize your directories so that time is not wasted to find your files.
- 3- Although you are in computer room, this is officially a testing environment. You are not allowed to communicate with one another.
- 4- Ask the instructor/TA if clarification is needed.
- 5- The final is open book only (no photocopy of the book or electronic copy is allowed).
- 6- While writing the final, you cannot use cell phone or access internet on your computer.
- 7- For the finite element problems, use “Linear” element with default element “size” and “sag” unless stated otherwise.

<b>Problem 1</b> <b>20 points</b>	
<b>Problem 2</b> <b>20 points</b>	
<b>Problem 3</b> <b>20 points</b>	
<b>Problem 4</b> <b>20 points</b>	
<b>Problem 5</b> <b>20 points</b>	
<b>TOTAL</b> <b>100 points</b>	

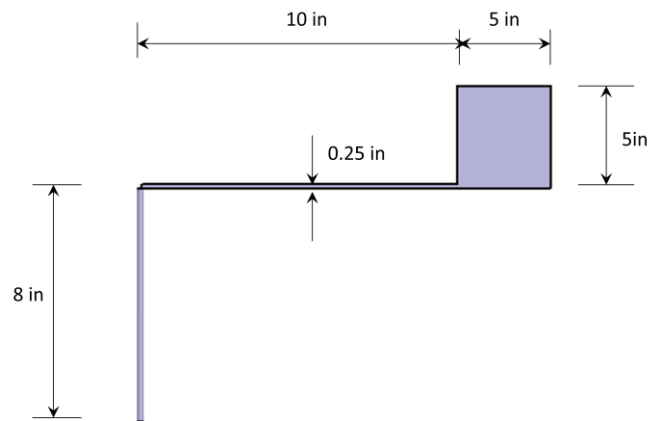
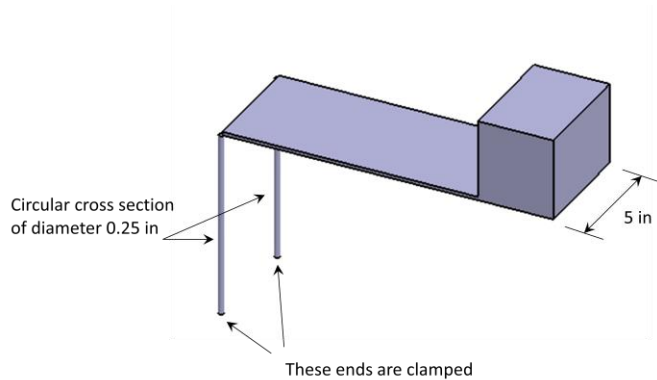
### Problem 1 (20 points)

**Use symmetry to reduce the model as much as possible (if applicable).**

The steel structure (default material properties in CATIA) shown below is **subjected to a total force of 50 lbf applied on the top face of the block.**

Model the problem with the **most appropriate elements** and run it.

All components are perfectly welded together.



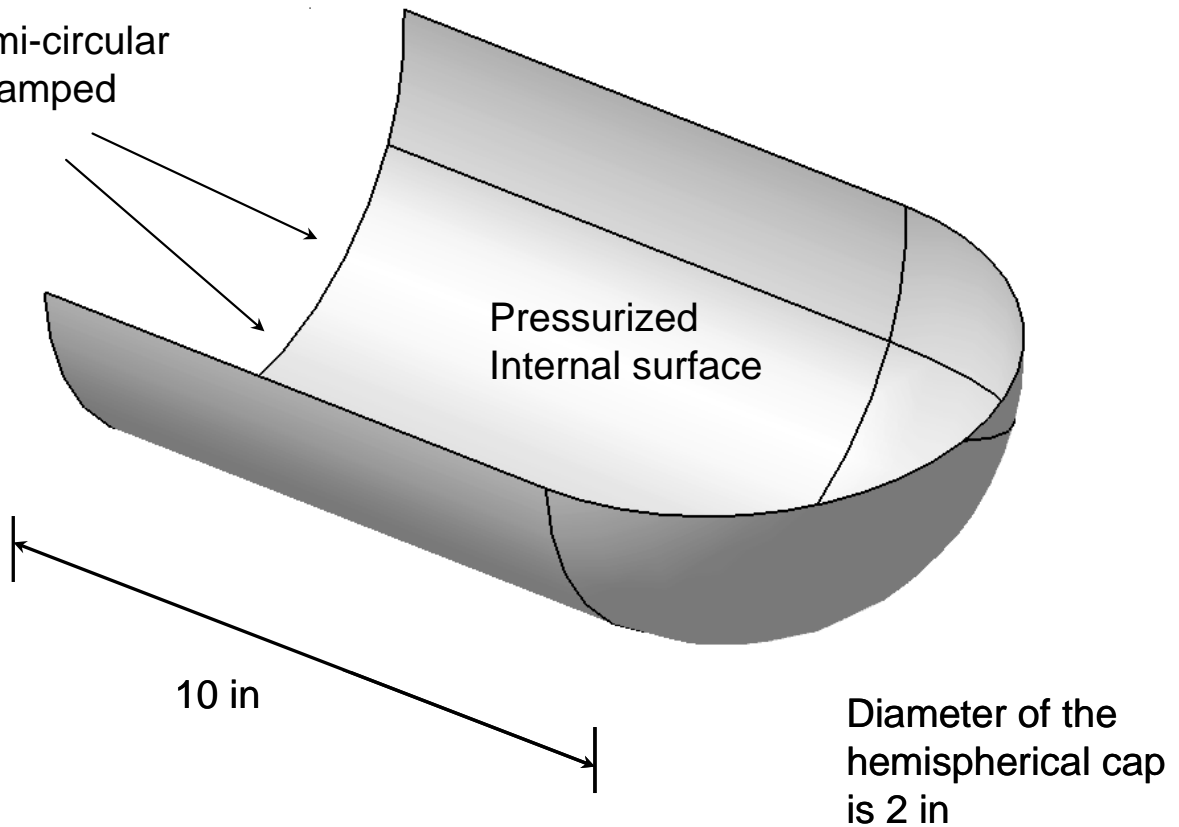
**Total points/20:**\_\_\_\_\_

**Problem 2 (20 points):**

The steel part shown below has a thickness of  $\frac{1}{10}$  inch.

A pressure of  $P = 30$  psi is applied to the indicated surface and the edge shown is clamped. Use symmetry to reduce the model.

Left semi-circular  
edge clamped



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**Use symmetry to reduce the model as much as possible (if applicable).**  
**Use the most appropriate element to solve this problem with CATIA.**

Total points/20: \_\_\_\_\_

**Problem 3 (20 points):**

The steel assembly, shown below, is supported by two, **3 in long pins** which are **symmetrically inserted in the tube shown**. The pins are clamped at both ends and the top face of the triangular part is subjected to a pressure of 10 psi

$$W = 12 \text{ in}$$

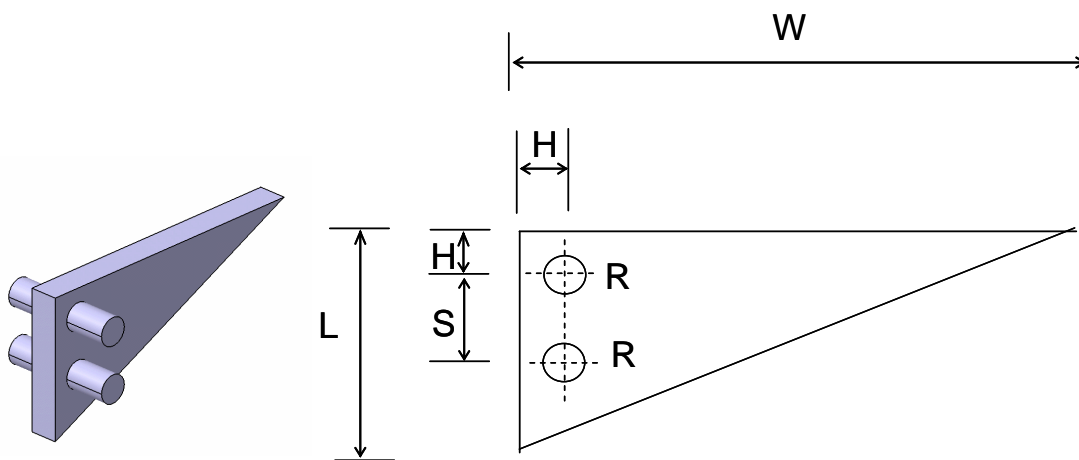
$$L = 6 \text{ in}$$

$$H = 1 \text{ in}$$

$$S = 2 \text{ in}$$

$$R = 0.5 \text{ in}$$

**The thickness of the triangular piece is 2 inches.**



**Use symmetry to reduce the model as much as possible (if applicable).**  
**Use the most appropriate element to solve this problem with CATIA.**

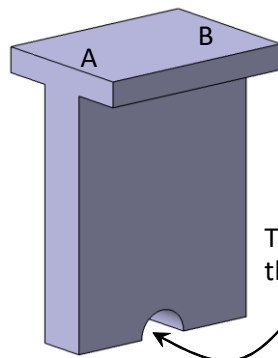
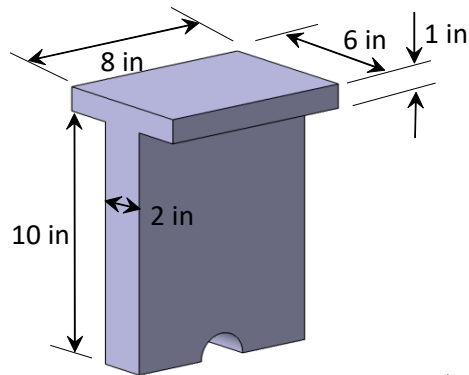
**Model the problem in Catia and upload the appropriate files.**

**Total points/20:\_\_\_\_\_**

**Problem 4 (20 points)**

Consider the steel structure shown below subject to the indicated acceleration.

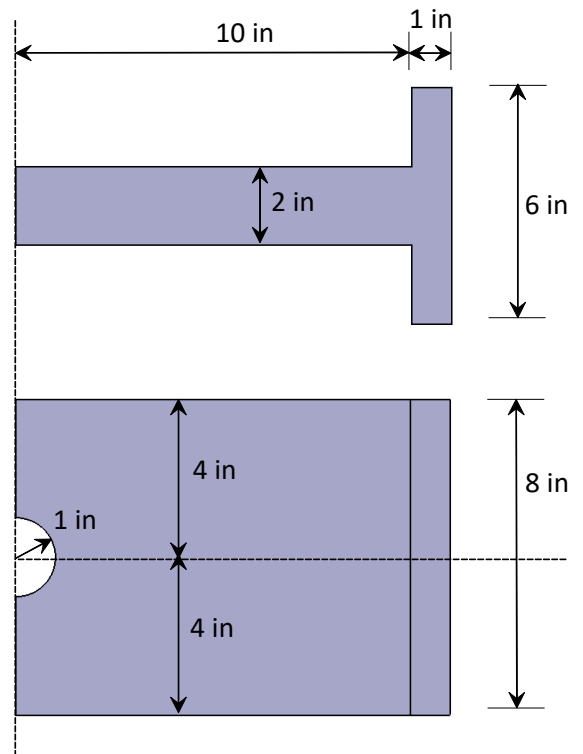
**Use symmetry to reduce the model as much as possible (if applicable).**  
**Use the most appropriate element to solve this problem with CATIA.**



Acceleration of  
 $1000 \text{ in/s}^2$

The inside surface of  
the hole is clamped

Make sure that the mesh  
around the hole is finer



Total points/20: \_\_\_\_\_

**Problem 5 (20 points)** **Note: Ordinarily I do not tell you what kind of elements should be used. You must make that decision yourself. In this particular problem however, I am asking you to use “BEAM” elements.**

**THE BEAM ELEMENT PROBLEM** (25 points):

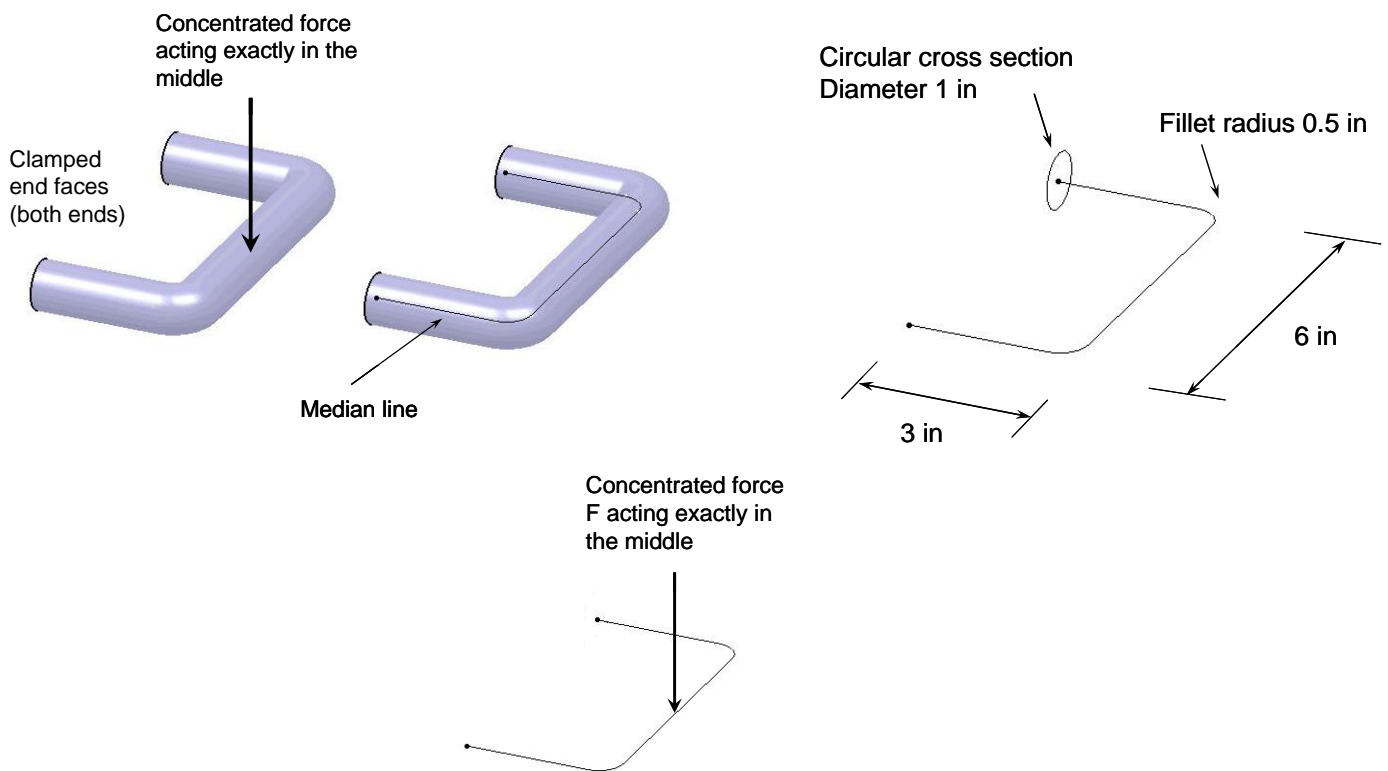
The clamp shown below is made of steel with the default material properties specified in the CATIA database.

The median curve and the associated dimensions are displayed on the wireframe and the diameter of the cross section is  $d = 1$  in.

The force  $F$  is applied exactly in the middle to displace the clamp by 0.01 in.

For the analysis, use beam elements.

**Use symmetry to reduce the model as much as possible (if applicable).**  
**Incomplete reduced model will receive partial credits only.**



**Total points/20:** \_\_\_\_\_

