ME 192 Exam 1 Makeup Problem

10/6/14

Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Score \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. **(6 points)**

Assume that the joint-by-joint compound transformation matrices may be extracted from a six axis robot with all rotation and translation angles and values set to zero. Show how to find, and  from the matrices. Each transformation matrix has the format: .





is found by taking out the portion of the compound rotation matrix 







 is found by taking the difference between the origins of frame {3} and {4} expressed in frame {0} terms and expressing the difference in frame {3} terms.

1. **(4 points)**

What are the three rules the class has followed in assigning joint-by-joint frames?

1. In joint framing, always set the Z axis first coinciding with the axis of rotation or translation. Set the X axis according to the Z axis of the succeeding frame.
2. Allow the between-frame rotation only about the X axis of the predecessor frame.
3. Allow the within-frame rotation or translation only about or in the direction of the Z axis.
4. 5 point take home extra credit (Due 10-8-14). Submit in one page, typed including a schematic.

The Denavit-Hartenberg link parameters provide a two dimensional displacement (e.g., X and Z) for the succeeding joint. How can you incorporate a third axis displacement (e.g., Y| X and Z) in the frame set up? How would the link offset or link length value(s) change in such set up?