EE4304/ME4245   Robotics   Term 1, 1996/97
Quiz 1   *27 August 1996*   *14:00-15:00*

1. (30 Marks) Figure 1 show two joint axes z_0 and z_1. Complete the Cartesian coordinate frame assignment for Frame 1 according to the Denavit-Hartenberg convention given in class. Identify the four Denavit-Hartenberg kinematic parameters that relates Frames 1 and 0.
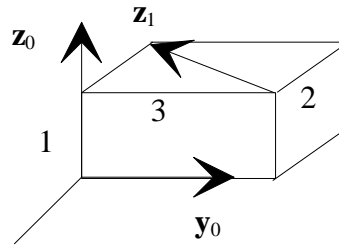

Figure 1

2. (30 Marks) A cuboid is initially at the configuration shown in Figure 2. It undergoes a rigid-body rotation about an axis directed from A to B by 30 degrees. Determine the new coordinates of the corner C of the cuboid in Frame 0. Express your answer in terms of matrix and/or vector products or known quantities. You do not need to provide the numeric answer.
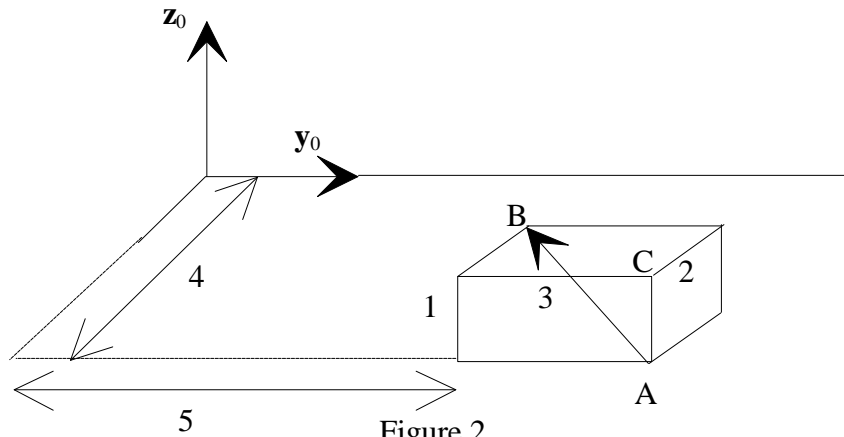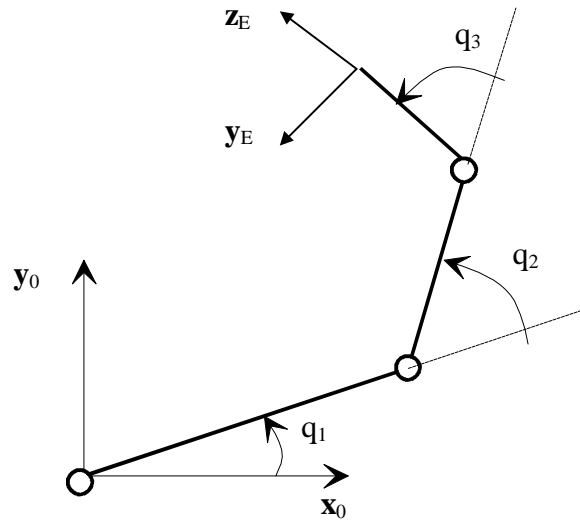

Figure 2

3. (40 marks) A 3-dof planar robot is shown in Figure 3. All joints are rotational and all the joint axes a respectively starting from the base. Assume that $L_1 > L_2 > L_3$.

(a) Derive an expression for the homogeneous transformation matrix ^0T_E as a function of q_1, q_2, and q_3. (*Hint*: *You may be able to do determine the orientation by inspection.*)

(b) Identify the decoupled subsystem if any for this robot.

END OF QUIZ