ME4245/EE4304 Robotics 1st Semester, 98/99

Quiz 1

Name:_____ Matric #:_____

You do not need to simplify nor numerically evaluate the expressions for your answers:

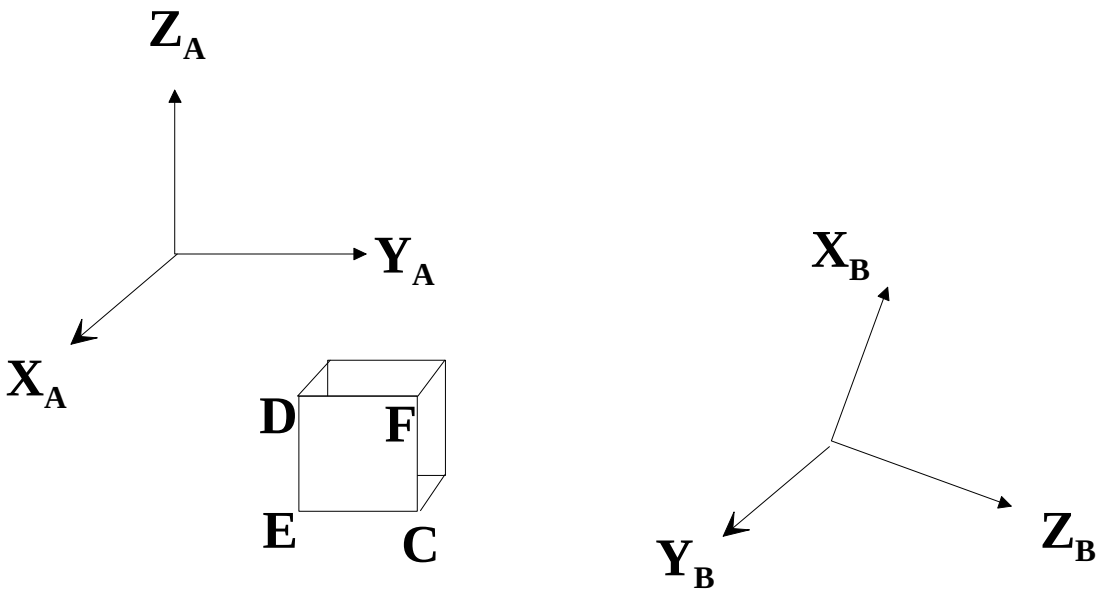
1. Two Frames A & B are initially coincident. Frame A is fixed, while Frame B moves according to the following sequence:
   i) Rotation about X_A of 30 degrees
   ii) Rotation about Y_B of 60 degrees
   iii) Rotation about Z_A of 90 degrees, and
   iv) Translation of (1,2,3) along Frame B.

   Find the new position and orientation of Frame B in Frame A. (Express this as a homogeneous transformation matrix.

Ans:

T = Rot(z, 90°) Rot(x, 30°) Rot(y, 60°) Trans(1,2,3)

2. In the figure below, the origin of frame B is at (5,10,-3) with respect to Frame A, and the corner C of the cube is at (6, 7,1) with respect to Frame A. The cube has a side of dimension 1 unit. The DECF face the cube, yz plane of Frame A and xz plane of Frame B are all parallel. The cube is rotated by 30 degrees about Y_B. Find the new coordinates of E in Frame A after this rotation.



Ans:

${}^{A}P_{E} = (6 \quad 6 \quad 1 \quad 1)^{T}$

${}^{A}P_{E} = {}^{A}T_{B}\ \mathrm{Rot}(y, 30°)\ {}^{B}T_{A}\ {}^{A}P_{E}$