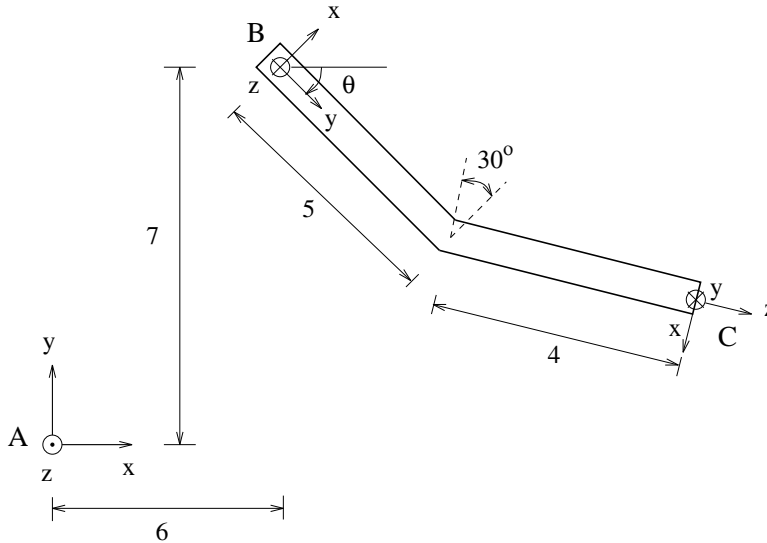


ECE 763

Homework #3



In the diagram, all origins are in the same plane. Coordinate systems B and C are fixed to the link and coordinate system A is an inertial reference.

Problems:

1. Find ${}^A T_B$ (function of θ) and ${}^B T_C$.
2. (a) Find ${}^A T_C$ for $\theta = 0^\circ$, by noting the relationships between the unit vectors and distance between the origins.
 (b) Compare the result of Part (a) with ${}^A T_C = {}^A T_B \cdot {}^B T_C$.
3. (a) Find the cross product of the first two column vectors (3 elements each) of ${}^A T_C$ (function of θ).
 (b) Compare the results of Part (a) with the third column of the matrix.
 (c) Find the dot product of the first and third column vectors.
 (d) Find the dot product of the first row (first 3 elements) with itself.
 (e) Are the results of Parts (c) and (d) as expected?
4. (a) Find ${}^C T_B$, by noting the relationships between the unit vectors and distance between the origins.
 (b) Find ${}^B T_C^{-1}$. Does ${}^C T_B = {}^B T_C^{-1}$?
5. Find ${}^A \mathbf{P}_e$. The point is attached to the link and is in along the $-z_C$ axis by four units. Use matrix-vector multiplication. Let $\theta = 90^\circ$.