EE 368 机器人运动与控制方法（Robotic Motion and Control）

Reference Solutions to Assignment #1

Q-1. A vector ${}^{A}P$ is rotated about $\hat{Y}_A$ by 30 degrees and is subsequently rotated about $\hat{X}_A$ by 45 degrees. Give the rotation matrix that accomplishes these rotations in the given order.

Solution: Using triangular relationships and projections, we have

$$ {}^{C}_{A}R = \begin{bmatrix} 0 & 0 & -1 \\ -0.5 & 0.866 & 0 \\ 0.866 & -0.5 & 0 \end{bmatrix}, \quad {}^{C}_{A}T = \begin{bmatrix} 0 & 0 & -1 & 2.0 \\ -0.5 & 0.866 & 0 & 1.5 \\ 0.866 & -0.5 & 0 & -2.6 \\ 0 & 0 & 0 & 1 \end{bmatrix} $$

Q-2. Referring to Figure Q-2, give the value of ${}^{C}_{A}R$ and ${}^{C}_{A}T$.

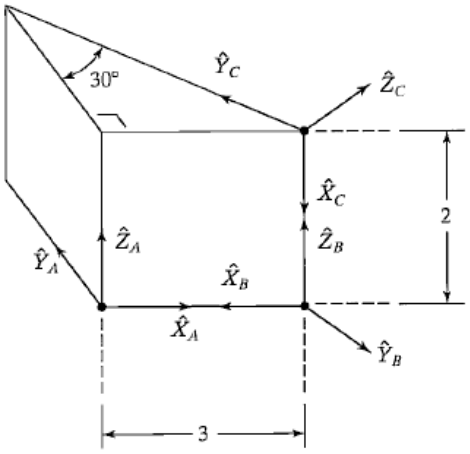

Figure Q-2

Solution: Using triangular relationships and projections, we have

$$ {}^{C}_{A}R = \begin{bmatrix} 0 & 0 & -1 \\ -0.5 & 0.866 & 0 \\ 0.866 & -0.5 & 0 \end{bmatrix}, \quad {}^{C}_{A}T = \begin{bmatrix} 0 & 0 & -1 & 2.0 \\ -0.5 & 0.866 & 0 & 1.5 \\ 0.866 & -0.5 & 0 & -2.6 \\ 0 & 0 & 0 & 1 \end{bmatrix} $$