# Final Report

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Preliminary Design of Robotic Systems

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Meiosis

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Table 1: DH Table for 6 DOF Manipulator

| DH | $d_i$ | $\theta_i$ | $a_i$ | $\alpha_i$ |
|---|---|---|---|---|
| 1 | $\ell_1$ | $q_1$ | 0 | $\pi/2$ |
| 2 | $-d$ | $q_2$ | 210 | 0 |
| 3 | 0 | $q_3 + \pi/2$ | 75 | $\pi/2$ |
| 4 | $\ell_3 + \ell_4$ | $q_4$ | 0 | $-\pi/2$ |
| 5 | 0 | $q_5$ | 0 | $\pi/2$ |
| 6 | $\ell_6$ | $q_6$ | 0 | 0 |

$$A = Rot_{z,\theta}\ Trans_{z,d}\ Trans_{x,a}\ Rot_{x,\alpha} \tag{1}$$

Given an arbitrary homogeneous matrix $T_i^{i-1}$ (computed by matrix multiplication of $A$ matrices $\rightarrow \left[A_1 A_2 \cdots A_{i-1} A_i\right]$), the orientation vector $\bar{z}_i$ (with respect to $\varphi$, $\theta$ and $\psi$) and the relative joint position (displacement) vector $\bar{o}_i$ (with respect to $x$, $y$, and $z$) can be obtained via the $3^{rd}$ and $4^{th}$ columns of the matrix respectively, as shown in Equation 2 (given $\beta$ as an arbitrary rotation angle about the $z$-axis).

$$T_i^{i-1} = \begin{bmatrix} c_\beta & -s_\beta & z_i^\varphi & o_i^x \\ s_\beta & c_\beta & z_i^\theta & o_i^y \\ 0 & 0 & z_i^\psi & o_i^z \\ 0 & 0 & 0 & 1 \end{bmatrix} \tag{2}$$