List of Tables

Table 1.1 Comparison between parallel and serial manipulators 5
Table 2.1 Possible architectures for 3DOF spatial parallel manipulator limb 29
Table 2.2 Assembly constraints of the 3-PRS manipulator using Pro-Engineer 40
Table 2.3 Type of joints used in parallel manipulator configuration 40
Table 2.4 Details of servo motor 42
Table 2.5 Possible actuation of servo motor and locked joints 43
Table 2.6 Parameters measured with respect to time for position analysis 43
Table 3.1 Values of $x_3$, $x_2$ and $x_1$ and corresponding values of $\theta_3$, $\theta_2$ and $\theta_1$ for case-(a) 54
Table 3.2 Variation of $\theta_1$ with linear actuation by $T_1$ determined analytically 55
Table 3.3 Values of $x_3$, $x_2$ and $x_1$ and corresponding values of $\theta_3$, $\theta_2$ and $\theta_1$ for case-(b) 56
Table 3.4 Values of $x_3$, $x_2$ and $x_1$ and corresponding values of $\theta_3$, $\theta_2$ and $\theta_1$ for case-(c) 57
Table 3.5 Values of $x_3$, $x_2$ and $x_1$ and corresponding values of $\theta_3$, $\theta_2$ and $\theta_1$ for case-(d) 57
Table 3.6 Co-ordinates of centre point of spherical joint with respect to actuation $T_1$ 60
Table 3.7 Moving platform coordinates and tip coordinates variation with respect to linear actuation $\Delta T_1$ 61
Table 3.8 DH parameters for limb-1 89
Table 3.9 DH parameters for limb-2 93
Table 3.10 DH parameters for limb-3 97
Table 4.1 Analytical solution of tool tip coordinates as a proof of axis symmetry for single actuation 110
Table 4.2 Analytical solution of moving platform coordinates as a proof of axis symmetry for single actuation 111
Table 4.3 Servo motor actuations for tip coordinates determination 118
Table 4.4  Consideration of different cases to trace curves for workspace analysis
Table 4.5  Variation of tool tip coordinates for maximum actuation of 100mm for any combination
Table 4.6  Variation of moving platform centre point coordinates for maximum actuation of 100mm for any combination
Table 5.1  Variation of condition and reciprocal of condition number for all roots of Bezout’s resultant
Table 5.2  Condition and reciprocal of condition number with given structural parameters for 3-PRS configuration
Table 5.3  The resulting jacobian matrices for all above eight roots
Table 5.4  Variation of $\theta_1$, determinant of jacobian, condition number, reciprocal of condition number for single linear actuation of limb-1 for entire range
Table 5.5  Variation of $\theta_1, \theta_2$, determinant of jacobian, condition number, reciprocal of condition number for simultaneous double actuations of limb-1 and limb-2 for entire range
Table 5.6  Variation of manipubality index with single and double actuation
Table 5.7  Global condition index for 3-PRS configuration
Table 5.8  Variation of $\theta_1, \theta_2, \theta_3$, determinant of jacobian, condition number, reciprocal of condition number for Triple linear actuations as a general case
Table 5.9  Position coordinates for spherical joint centers for all configurations for a solution
Table 5.10 Moving platform center point coordinates and tool tip coordinates for all real solutions of a configuration
Table 5.11 Jacobian matrices for all real solutions of a configuration
Table 5.12 Distance between centre of spherical joints and length of connecting links for all real solutions of a configuration
Table 6.1  Instantaneous kinematics and statics description
Table 6.2  Comparison between complex number and dual number