

List of Figures

| | | |
|------|--|----|
| 1.1 | Kepler's planetary model for outer planets (Adapted from Murray and Dermott (1999)) | 2 |
| 1.2 | Schematic diagram of RTBP in a dimensionless synodic coordinate system | 5 |
| 1.3 | Lagrangian points in classical RTBP | 12 |
| 1.4 | Notation for computation of L_1 | 14 |
| 1.5 | Notation for computation of L_2 | 14 |
| 1.6 | Notation for computation of L_3 | 15 |
| 2.1 | The third, fourth and fifth order Analytic solutions around L_1 with $q_1 = 0.979$ and $A_2 = 2.424052106866 \times 10^{-12}$ | 40 |
| 2.2 | xy projections of the third, fourth and fifth order analytic solutions around L_1 with $q_1 = 0.979$ and $A_2 = 2.424052106866 \times 10^{-12}$ | 41 |
| 2.3 | xz projections of the third, fourth and fifth order analytic solutions around L_1 with $q_1 = 0.979$ and $A_2 = 2.424052106866 \times 10^{-12}$ | 41 |
| 2.4 | yz projections of the third, fourth and fifth order analytic solutions around L_1 with $q_1 = 0.979$ and $A_2 = 2.424052106866 \times 10^{-12}$ | 42 |
| 2.5 | The third, fourth and fifth order Analytic solutions around L_2 with $q_1 = 0.979$ and $A_2 = 2.424052106866 \times 10^{-12}$ | 44 |
| 2.6 | xy projections of the third, fourth and fifth order analytic solutions around L_2 with $q_1 = 0.979$ and $A_2 = 2.424052106866 \times 10^{-12}$ | 44 |
| 2.7 | xz projections of the third, fourth and fifth order analytic solutions around L_2 with $q_1 = 0.979$ and $A_2 = 2.424052106866 \times 10^{-12}$ | 45 |
| 2.8 | yz projections of the third, fourth and fifth order analytic solutions around L_2 with $q_1 = 0.979$ and $A_2 = 2.424052106866 \times 10^{-12}$ | 45 |
| 2.9 | The third, fourth and fifth order Numerical solutions around L_1 with $q_1 = 0.979$ and $A_2 = 2.424052106866 \times 10^{-12}$ | 46 |
| 2.10 | xy projections of the third, fourth and fifth order numerical solutions around L_1 with $q_1 = 0.979$ and $A_2 = 2.424052106866 \times 10^{-12}$ | 47 |
| 2.11 | xz projections of the third, fourth and fifth order numerical solutions around L_1 with $q_1 = 0.979$ and $A_2 = 2.424052106866 \times 10^{-12}$ | 47 |

| | | |
|------|--|----|
| 2.12 | yz projections of the third, fourth and fifth order numerical solutions around L_1 with $q_1 = 0.979$ and $A_2 = 2.424052106866 \times 10^{-12}$ | 48 |
| 2.13 | The third, fourth and fifth order Numerical solutions around L_2 with $q_1 = 0.979$ and $A_2 = 2.424052106866 \times 10^{-12}$ | 49 |
| 2.14 | xy projections of the third, fourth and fifth order numerical solutions around L_2 with $q_1 = 0.979$ and $A_2 = 2.424052106866 \times 10^{-12}$ | 49 |
| 2.15 | xz projections of the third, fourth and fifth order numerical solutions around L_2 with $q_1 = 0.979$ and $A_2 = 2.424052106866 \times 10^{-12}$ | 50 |
| 2.16 | yz projections of the third, fourth and fifth order numerical solutions around L_2 with $q_1 = 0.979$ and $A_2 = 2.424052106866 \times 10^{-12}$ | 50 |
| 2.17 | Effect of radiation pressure on the position of halo orbits around L_1 and L_2 | 51 |
| 2.18 | Effect of radiation pressure on the period of halo orbits around L_1 and L_2 | 52 |
| 2.19 | Effect of radiation pressure on the size of halo orbits around L_1 and L_2 | 53 |
| 2.20 | Sun-Earth system | 54 |
| 2.21 | Effect of oblateness on the size of halo orbits around L_1 and L_2 | 55 |
| 2.22 | Effect of oblateness on the position of L_1 and L_2 | 56 |
| 2.23 | Effect of oblateness on the period of halo orbits around L_1 and L_2 . . . | 56 |
| 2.24 | Effect of oblateness on the size of halo orbits around L_1 in the Earth-Moon system | 57 |
| 2.25 | Effect of oblateness on the size of halo orbits around L_2 in the Earth-Moon system | 57 |
| 3.1 | Variation in location of Lagrangian points against variation in mass factor | 68 |
| 3.2 | Variation in x -amplitude for halo orbits around Lagrangian points against variation in mass factor | 71 |
| 3.3 | Variation in period of halo orbits around Lagrangian points against variation in mass ratio | 72 |
| 3.4 | Change in size of halo orbits against mass ratio | 72 |
| 3.5 | Halo orbits around L_1 and L_2 for Sun-Planet systems | 72 |
| 3.6 | Variation in initial distance and velocity of spacecraft for halo orbits around L_1 against variation in mass ratio | 73 |
| 3.7 | Variation in initial distance and velocity of spacecraft for halo orbits around L_2 against variation in mass ratio | 73 |
| 3.8 | Halo orbits around L_1 and L_2 for Sun-Earth and Sun-Earth+Moon systems | 73 |
| 4.1 | Out of plane stability index ν_3 | 93 |
| 4.2 | L_1 Halo family stability indices ν_1 and ν_3 | 93 |

| | | |
|------|--|-----|
| 4.3 | Variation in size of halo orbits around L_1 against variation in radiation pressure | 94 |
| 4.4 | Variation in size of halo orbits around L_2 against variation in radiation pressure | 95 |
| 4.5 | Variation in size of halo orbits around L_3 against variation in radiation pressure | 96 |
| 4.6 | Variation in location of Lagrangian points against variation in radiation pressure | 97 |
| 4.7 | Variation in amplitude of orbits against variation in radiation pressure | 98 |
| 4.8 | Variation in period of orbits against variation in radiation pressure | 99 |
| 4.9 | Variation in size of orbits around L_1 in CRTBP and ERTBP | 100 |
| 4.10 | Variation in size of orbits around L_2 in CRTBP and ERTBP | 101 |
| 4.11 | Variation in amplitude of halo orbits around L_1 and L_2 | 101 |
| 5.1 | Maximum permissible value of energy constant against eccentricity | 106 |
| 5.2 | Length of excluded region against eccentricity | 107 |
| 5.3 | Variation in location of periodic orbits due to variation in radiation pressure | 109 |
| 5.4 | Variation in diameter of periodic orbits due to variation in radiation pressure | 111 |
| 5.5 | Variation in shape and size of orbits due to variation in eccentricity for $C = 3.017$ and $q = 1$ | 112 |
| 5.6 | Stability of f -family orbits | 113 |
| 5.7 | Variation in shape and size of islands due to variation in C for $e = 0.09$ and $q = 1$ | 115 |
| 5.8 | Variation in period of orbits due to variation in radiation pressure | 116 |
| 5.9 | Variation in shape and size of orbits due to variation in radiation pressure for $C = 2.97$ | 117 |
| 5.10 | Variation in shape and size of islands due to variation in radiation pressure for $C = 2.97$ | 118 |
| 5.11 | Variation in shape and size of islands due to variation in energy constant C for $q = 1$ | 119 |
| 5.12 | Variation in shape and size of orbits due to variation in energy constant for $q = 1$ | 120 |
| 6.1 | PSS for $e = 0.052$, $q = 0.99$ and $C = 2.8$ | 125 |
| 6.2 | Periodic orbits corresponding to islands of Fig. 6.1 | 126 |
| 6.3 | Variation in location of 1 : 2 resonant orbits against variation in e for $C = 2.77$ | 128 |

| | | |
|-----|--|-----|
| 6.4 | Variation in semi-major axis of 5 : 6 resonant orbits against variation in e for $C = 2.85$ | 128 |
| 6.5 | Variation in e_s against variation in e for $C = 2.85$ | 129 |
| 6.6 | Variation in location of 5 : 6 resonant orbits against variation in e for $C = 2.85$ | 131 |
| 6.7 | Variation in size of 1 : 2 resonant orbits due to variation in q for $C = 2.77$ | 131 |
| 6.8 | Variation in size of orbits against variation in Jacobi constant | 132 |
| 6.9 | Exterior first order resonant PSS and orbits for $C = 2.85$ | 137 |
| 7.1 | PSS of Sun-Saturn system for $e = 0.052, q = 0.98$ and $C = 2.88$ | 142 |
| 7.2 | First order interior resonant orbits corresponding to Fig. 7.1 | 142 |
| 7.3 | Variation in location of 3 : 2 resonant orbits for $C = 2.90$ | 143 |
| 7.4 | Variation in a_s and e_s against variation in e for 5 : 4 resonant orbits for $C = 2.92$ | 145 |
| 7.5 | Variation in size and shape of 3 : 2 resonant orbits with $q = 1$ and $C = 2.88$ | 146 |
| 7.6 | Variation in size and shape of 2 : 1 resonant orbits with $e = 0.03$ and $C = 2.88$ | 147 |
| 7.7 | Variation in size and shape of 4 : 3 resonant orbits with $e = 0.09$ and $q = 0.99$ | 148 |