Name of Scholar: **Amit Mittal**

Name of Supervisor: **Prof. Iqbal Ahmad**

Name of Co- Supervisor: **Dr. K. B. Bhatnagar**

Department: **Mathematics**

Title of Thesis: **"Periodic Motions Generated By Lagrangian Solutions Of The Restricted Problem When The Primaries Are Axes Symmetric Bodies And Source Of Radiation Pressure**

Abstract

The entire work of this thesis has been divided into five chapters

Throughout the studies we have introduced a constant *U* in the Lagrangian (*L*) in such a way that the energy constant (*h*) vanishes at L_4 (the liberation point). We have used **mobile coordinate** system ($Q = (x, y)^T$ on the orbit where the modulus of momentary velocity $V(t) = \left|\dot{Q}(t)\right| = \sqrt{\dot{x}^2 + \dot{y}^2} \neq 0$) to determine the periodic orbits by giving displacement to these coordinates along the **normal** (***N***) and the **tangent** (***M***) directions. We have constructed an algorithm, in two stages, to draw the periodic orbits. These are: first predictor-part and then corrector-part. In each chapter, we have drawn six (or five) families of periodic orbits. And in each family, we have drawn five figures corresponding to the different values of h. These orbits have been numbered 1, 2, 3, 4 and 5 corresponding to values of *h* mentioned in each figure on the left hand top of each figure in each chapter. It is observed that the final orbit passing through the libration point L_4, in each case, is non-symmetrical and therefore, the family can be further continued whereas in the case of Karimov and Sokolsky (1989) model, family terminates when the orbit touches the point L_4.

The entire work of this thesis has been divided in five chapters.

The chapter-1 is introductory in nature. It contains history and development of the problem.

In all other chapters (2 to 5), we have drawn the periodic orbits around the triangular libration point L_4, in the restricted three body problem when the primaries are axis symmetric rigid bodies with radiation pressure. The equatorial plane of the oblate body of mass m_2 is coincident with the plane of motion. All the chapters are divided into 8 sections.

In each chapters, we have drawn periodic orbits for the following:

For chapter-2 (i) for fixed $\mu = .001$, A = 0.0 (Fig 1), (ii) for fixed $\mu = .001$, A = .01 (Fig 2), (iii) for fixed $\mu = .001$, A = .001 (Fig 3), (iv) for fixed $\mu = .001$, A = .0001 (Fig 4), (v) for fixed $\mu = .001$, A = .00001 (Fig 5), (vi) for fixed $\mu = .01$, A = .001 (Fig 6).

For chapter-3 (i) for fixed $\mu = .001$, $\sigma_1 = 0.0$ and $\sigma_2 = .001$ (Fig 1), (ii) for fixed $\mu = .001$, $\sigma_1 = .0001$ and $\sigma_2 = .001$ (Fig 2), (iii) for fixed $\mu = .001$, $\sigma_1 = .001$ and $\sigma_2 = .001$ (Fig 3), (iv) for fixed $\mu = .001$, $\sigma_1 = .001$ and $\sigma_2 = .002$ (Fig 4), (v) for fixed $\mu = .001$, $\sigma_1 = .002$ and $\sigma_2 = .003$ (Fig 5).

For chapter-4 (i) for fixed $\mu = .001$, $A_1 = 0.0$, $A_2 = 0.0$, $A_1' = 0.001$ and $A_2' = 0.0$ (Fig 1), (ii) for fixed $\mu = .001$, $A_1 = .001$, $A_2 = 0.0$, $A_1' = .001$ and $A_2' = 0.0$ (Fig 2), (iii) for fixed $\mu = .001$, $A_1 = .001$, $A_2 = .001$, $A_1' = 0.0$ and $A_2' = 0.0$ (Fig 3), (iv) for fixed $\mu = .001$, $A_1 = .001$, $A_2 = .001$, $A_1' = .001$ and $A_2' = .001$ (Fig 4), (v) for fixed $\mu = .001$, $A_1 = 0.002$ $A_2 = .003$, $A_1' = .004$ and $A_2' = .005$ (Fig 5).

For chapter-5 (i) for fixed $\mu = .001$, A = .001 and p = 0.0 (Fig 1), (ii) for fixed $\mu = .001$, A = .001 and p = .0001 (Fig 2), (iii) for fixed $\mu = .001$, A = .001 and p = 0.001 (Fig 3), (iv) for fixed $\mu = .001$, A = .001 and p = 0.01 (Fig 4), (v) for fixed $\mu = .001$, A = .001 and p = 0.1 (Fig 5).

It has been observed that by taking axis symmetric rigid bodies with radiation pressure, the families of periodic orbits continues beyond L_4 whereas in case of Karimov and Sokolsky (1989), who have not taken axis symmetric rigid bodies, the families terminates at L_4.