PREFACE

Recently there has been a revival interest in the foundation of Einstein's theory of general relativity.

Quite a number of theories on relativistic gravitation are formulated. Their predictions along with the available experimental results and the obervational data are compared with those of older theories. But Einstein - Cartan (E-C) theory in comparision with the other theories is the simplest and the most natural modification of the original Einstein's theory of gravitation.

An important field of application for Einstein - Cartan theory is the relativistic astrophysics which deals with the interior of stellar bodies. Since the predictions of Einstein - Cartan theory differ from those of general relativity, only for matter free regions.

Hence it is desirable to understand the full implications of Einstein - Cartan theory for the finite distribution.

As the homogeneous and isotropic cosmological models of the universe can be cast in conformally Minkowskian form the conformally flat metrics are of particular interest Singh and Roy (1966) investigated the exsistence of electromagnatic field that is conformal to some empty-space times. Trautman (1973) pointed out that the spin and torsion may avert gravitation singularities.

Adler (1974) has obtained the ,solutions to the Einstein's equalions for the interior of a static fluid sphere in a closed analytic form by the quadrature method. Kerlic (1975), Skinner and Webbl (1977) etc. discussed the problem of static fluid spheres in Einstein - Cartan theory.

Prasanna (1975, a) obtained the three sets of solutions for static fluid sphere in Einstein - Cartan theory by adopting Hehl's (1973, 1974) approach and Tolman's techniques.

Collinson (1976) has shown that every conformally flat axisymmetric stationary space-time is static.

It has shown by Gurses (1977) that the Schwarzschild interior metric is the only conformally flat static solution of the Einstein field equation with perfect fluid distribution.

Pandey and Tiwari (1981) obtained the solutions of Einstein field equations for static charged conformally flat perfect fluid distribution for spherically symmetry. Some conformally flat solutions of Einstein - Maxwell equations have been presented by A. Banarji and Santos.

Kalyanshetti and Waghmode (1982) considered conformally flat spherically symmetric fluid distribution in Einstein - Cartan theory and obtained non-singular solutions.

In our present work, we sonsider a static charged and uncharged fluid spheres and obtain the non singular solutions by different techniques. Also we study the properties of the solutions.

In chapter I, we have discussed Einstein Cartan theory with the equations of structure and have given the field equations following Trautman (1973).

In chapter 2, we consider a static fluid sphere in Einstein-Cartan theory and present the field equations. Following Prasanna by Hehl's (1973, 1974) approach, we solve these field equations with the equation of state $\overline{P} = \bar{\rho}$ (Zeldovich - fluid). For specific values of an arbitrary constants our model will reduce to static Einstein - Universe.

In chapter 3, we deal with a static charge conformally flat perfect fluid distribution in Einstein - Cartan theory and obtain the field equations and these field equations are solved with the assumptions that the charge $Q = Ar^3$, where A is an arbitrary constsnt and spins of paticles are all aligned in the radial direction only.

The solutions obtained are regular at all points even at the origin $r = 0$, leading to the satisfactory model for point charge. Also the properties of our solutions are discussed.

Chapter 4 deals with a static conformally flat perfect fluid distribution in Einstein-Cartan theory. Here we obtaon the field equations and they are solved with the assumption that the metric coefficient,

$$e^{-\mu} = (A + Br^2 + Cr^3).$$

Also the properties of solution are discussed. It is interesting to note that in the absence of charge our solution will reduce to the solutions of S.B. Kalyanshetti and Waghamode (1982) for conformally flat perfect fluid distribution.

It is worth to note that if the charge is absent then density $\rho = 12AB$ as seen by Som and Bedran (1981). The arbitrary constants appearing in the solutions can be evaluated by comparing the metric with the Reissner-Nordsfrom metric for a mass m_0, redius r_0 and charge Q_0. The constant A_1 appearing in the solution can be evaluated in terms of central density ρ_0.

Here we see that our solutions are free from singularities.

* * *