PREFACE

The present dissertation entitled "CURVATURE INHERITANCE SYMMETRY IN INCOHERENT MAGNETOFLUID SPACE-TIME" deals with the study of some geometrodynamical properties of the space-time comprising incoherent magnetofluid distribution which is an important case of physically viable relativistic charged matter distribution known as Relativistic magnetofluid distribution (Lichnerowicz, 1967).

A new geometrical symmetry known as curvature inheritance symmetry in Riemmanian spaces with applications to fluid space-times is introduced by Duggal, 1992. We have directed our efforts to examine the implications of dynamical behaviour of the space-time filled with incoherent magnetofluid distribution, especially when such space-time admits a group of conformal motions and curvature inheritance symmetry.

The salient features of the work carried out in this dissertation are given below.

CHAPTER I - BASIC CONCEPTS AND SYSTEM EQUATIONS

The basic object describing the dynamical nature of the space-time is stress-energy tensor. The formulation of stress-energy tensor associated with relativistic incoherent magnetofluid distribution (RIM distribution) is presented in the Section 1. Moreover the timelike and spacelike eigen values of this stress energy tensor are evaluated.

In Section 2, the validity of energy conditions is tested for RIM distribution.

In Section 3, some geometrical symmetries known as conformal motions, curvature inheritance symmetry are stated.

In Section 4, the field equations for RIM distribution are given.

In the Section 5, the Maxwell equations for the magnetic field comprised in RIM distribution are given.

The Section 6, deals with some differential identities leading to equation of continuity and equations of stream lines.

A particular case of homogeneous magnetic field leading to some interesting results is also considered in last section.

CHAPTER II - RIM DISTRIBUTION AND A GROUP OF CONFORMAL MOTIONS

It is proved in the Section 1 that the RIM distribution admitting conformal motions along the timelike flow vector as well as along the spacelike magnetic field vector degenerate into group of motion.

The Section 2, is related to some dynamical properties of RIM distribution admitting a group of conformal motions along arbitrary vector ξ. We have proved the following.

"For RIM distribution admitting a conformal groups of motions along vector $\bar{\xi}$

$$\text{(i) } L_{\xi} = 6(\nabla_{cd}\psi)g^{cd} + R^{a}_{b}\,\nabla_{a}\xi^{b}$$

$$\text{(ii) } L_{\xi}(\mu h^{2}) = -8(\nabla_{cd}\psi)g^{cd} + 4B\psi - (\nabla_{ab}\psi)u^{a}u^{b} - 2R^{a}_{b}\,\nabla_{a}\xi^{b}."$$

The Section 3 is devoted to special conformal motions and associated consequences. Here we have shown that RIM distribution admits special conformal motions then the conformal potential ψ depends mainly on the magnetic field.

CHAPTER III - CURVATURE INHERITANCE IN RIM DISTRIBUTION

In this chapter we have examined the implications of curvature inheritance symmetry with reference to the space-time of RIM distribution.

In first case, we have found that the curvature inheritance degenerates into curvature collineation along the symmetry vector $\bar{u}$ if the expansion vanishes.

In second case, dealing with the curvature inheritance where the magnetic field vector $\bar{h}$ acts as symmetry vector we have shown that it leads to curvature collineation. Moreover, the matter density and the magnitude of magnetic field remain invariant along this vector.

CHAPTER IV - CONFORMAL MOTIONS AND CURVATURE INHERITANCE (JOINT EFFECT)

This chapter throws light on implications of RIM distribution admitting group of conformal motions and curvature inheritance symmetry of the space-time. In this case we have proved claim : If RIM distribution admits CKV and CI both then

$$h^a L_\xi h_a = 0 \iff \rho = \frac{3}{8} \mu h^2 .$$

In section 2, we have shown that the curvature inheritance symmetry degenerates into curvature collineation if CKV is a special CKV.

The last section is devoted to design a space-time model compatible with RIM distribution admitting a group of conformal motions. This is a spherically symmetric static model.