PREFACE

The present dissertation entitled " The properties of Gravitational and Free Gravitational Fields of the Space-time of Infinitely Conducting Relativistic Fluids." comprises of four chapters. The whole work is centered around the dynamical features of the space-time composed of relativistic ferrofluid under its characteristic pro properties as infinite conductivity and variable magnetic permeability.

The Ist chapter is of introductary nature in which only preliminary requirements necessary for the development of dissertation work are given. The evolution of the stress energy tensor for Infinitely Conducting Ferrofluid is also presented along with the essential field equations and geometrical symmetry concepts.

The IInd chapter throws light on the weak conservation laws emerging out of contracted Bianchi Identities relevant to the Infinitely Conducting Ferrofluid.

We have proved here,

(1) Magnetic field terms occur explicitely in the equation of continuity.

(2) The magnetic field affects the deviation of the

part of fluid particles from geodesic path.

(3) The flow of the Infinitely Conducting Ferrofluid cannot be adiabatic.

The dynamical symmetry termed as Einstein Collineation plays a central role in the chapter III encountered by the stress energy tensor for Infinitely Conducting Ferrofluid. The necessary conditions for the space-time of Infinitely Conducting Ferrofluid to admit Einstein Collineation along the preferred directions (flow lines and magnetic lines) are derived.

The last chapter IV is concerned with the geometrical symmetry known as C-space characterised by the divergence free Weyl conformal curvature tensor. It is shown that the space matter current tensor is always conservative. In context of C-space of Infinitely Conducting Ferrfluid it is proved that, the conservation of magnetic permeability along the magnetic lines is the necessary and sufficient condition for the conservation of the matter energy density, the isotropic pressure and the magnitude of the magnetic lines in the direction of magnetic lines.

The electric type and magnetic type components designed from the free gravitational field characterised by Weyl Conformal Curvature tensor are introduced. It

is established that in the C-space of Infinitely Conducting Ferrofluid under the constraint that flow is essentialy expanding the gravitational tidal force is due to magnetic field only.

HISTORICAL CONTEMPLATION

The existence of astronomical objects like pulsars and neutron stars possessing intense gravitational field coupled with strong magnetic field has motivated many research workers to study relativistic magnetohydrodynamics. The thermonuclear evolution of such supermassive objects contain a large proportion of Iron at the end of thermonuclear process. The interior of such objects may approximate to a characteristic behaviour of Infinitely Conducting Ferrofluid.

The synthesis of Ferrofluid is given by Neuringer and Rosensweig (1964). An elegant account of magnetofluid is reported by Lichnerowicz (1978). It is shown by Ray and Bannerji (1980) that the variation of magnetic permeability affects the growth of magnetic energy. The conservation of magnetic permeability for the flow congruence of materially transported Ferrofluid is due to Jangam (1982). It is proved by Gumaste (1984) that if the stress energy tensor of Ferrofluid is Fermi-Walker transported then the magnetic permeability is conserved.

These works have enlighted us to investigate the dynamical features of Infinitely Conducting Ferrofluid evolving out of dynamical symmetry, known as Einstein Collineation and geometrical symmetry like C-space.