SYNOPSIS

The investigation embodied in the thesis "Some Scalar and Electromagnetic Distributions in General Theory of Relativity" comprises of seven chapters.

In Chapter I the motivations and physical relevance of the investigations undertaken in later chapters have been elaborated in the light of the current work of the other authors.

The problem of obtaining exact solutions corresponding to the coupled electromagnetic and scalar fields has been undertaken in Chapter II. A technique has been developed to obtain non-static solutions in the case of Einstein-Rosen cylindrically symmetric metric. Applying this method a set of time dependent exact solutions have been obtained and identified with some of the solutions of Rao et al. (1972) who have solved the field equations directly.

In Chapter III, the more general exact solutions of the problem considered in Chapter II has been obtained by the help of the technique as in Chapter II. These solutions correspond to the wave solutions discussed by Einstein and Rosen (1937) and Rosen (1954) when the coupled field is ignored.

The physical interpretations of the results obtained in Chapter III is carried out in Chapter IV from the view point of the singularities as well as the periodic nature of the solutions. The behaviour of the scalar field, electromagnetic field and the metric field has been fully discussed.

Since the Brans-Dicke theory seems to offer a better understanding of the Machian effects than the conventional Einstein theory of gravitation, we have obtained exact solutions of Brans-Dicke Maxwell fields for the three parameter cylindrically symmetric Marder's (1958b) metric in Chapter V. These solutions have been generated from those obtained in Chapters II and III of Einstein's theory by conformal transformations.

Continuing our studies in Brans-Dicke fields, we have considered a conformally flat metric and obtained exact solutions of the theory by solving the field equations. One of these solutions has been shown to be related conformally to the zero-mass scalar field solution of the Einstein's theory. The physics involved in all these solutions has been discussed. These results constitute the content of the Chapter VI.

Since class restrictions are of considerable physical interest as they can be related to the symmetries involved in fundamental particles [Fronsdal (1959), Rosen (1965), etc.], we have taken for study in the concluding chapter a class one spherically symmetric metric under constant curvature embedding.

It has been shown that it cannot sustain an electromagnetic field. This result is analogous to the investigation done by Pandey and Kansal (1968) who have discussed the problem for psuedo-Euclidean embedding.