PREFACE

The contents of this thesis is based on the researches carried out by the author since July, 1979 on certain problems of electromagnetic fields in general relativity.

The two long range fields, known to us, are the electromagnetic and the gravitational fields. In the Newtonian scheme of things, the two were completely unassociated with one another. However, in general relativity gravitational fields are given a geometric interpretation - the space time manifold cease to be Euclidean in the presence of a non-vanishing energy-stress-momentum tensor. Electromagnetic field now becomes coupled with gravitation - firstly the electromagnetic field, according to Maxwelllean ideas is associated with energy, stress and momentum and acts as a 'source' of the gravitational field. Secondly the demand of the principle of covariance modifies Maxwell's equations in the sense that the metric tensor components and their derivatives appear explicitly in these equations. A study of electromagnetic fields in general relativity or in other words of the coupled Einstein-Maxwell equations thus becomes
a worthwhile exercise and the present thesis is an effort in that direction.

The thesis is divided into three chapters besides a brief introduction. The contents of chapter I is in the form of three papers while those of chapters II and III constitute one paper each. Most of the material of the thesis have been published in standard journals and the rest are awaiting publication. The main results arrived at in the papers are spelt out in the introduction.

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Shyamal Kumar Saha

( SHYAMAL KUMAR SAHA )
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