

# *Einstein's Connections*

## *Degenerate Cases of the First Class*<sup>1,2</sup>

J. L. NANDA

*Communicated by V. HLAVATÝ*

**Summary.** HLAVATÝ, V., [1] has given a solution of EINSTEIN's first set of equations of unified field theory. Prof. HLAVATÝ has considered the index of inertia 2 only. Recently, MISHRA, R. S., [3], [4] gave the solution by a method, which he calls the method of repeated substitution, which holds for all the three indices of inertia, namely 0, 2, or 4. In this paper we have given the solutions of the first set of equations of unified field theory in the degenerate cases of the first class for index of inertia zero or four. In one degenerate case ( $D = 0$ ,  $K + 1 = 0$ , index of inertia 0) it turns out that the solution always exists but is not unique. In all the other degenerate cases we find the necessary and sufficient condition, both in holonomic and nonholonomic form, for the existence of at least one solution. The method of repeated substitution is employed to express the condition in holonomic form. For index of inertia 2, the degenerate case  $g = 0$  is dealt with in HLAVATÝ [1]. The same case for index of inertia zero can be treated with few modifications. For this reason this case is omitted.

**1. Introduction.** In EINSTEIN's unified field theory the basic real tensor  $g_{\lambda\mu}$  which has sixteen components is non-symmetric and may be split into its symmetric part  $h_{\lambda\mu}$  and skew-symmetric part  $k_{\lambda\mu}$  :

$$(1.1) \quad g_{\lambda\mu} = h_{\lambda\mu} + k_{\lambda\mu} .$$

The tensor  $h_{\lambda\mu}$  is assumed to be of rank four and to be of index of inertia 0, 2, or 4, (henceforth I.I. will stand for index of inertia) according as the signature of  $h_{\lambda\mu}$  is  $(++--)$ ,  $(+++)$ , or  $(++++)$ .

The basic connection  $\Gamma_{\lambda}^{\nu}{}_{\mu}$  is also non-symmetric and is given by 64 equations

$$(1.2) \quad D_{\nu}g_{\lambda\mu} = 2S_{\nu\mu}{}^{\alpha}g_{\lambda\alpha}$$

---

<sup>1</sup> This paper is based upon the author's doctoral thesis of the same title. I wish to express my gratitude to Professor V. HLAVATÝ under whose guidance this work was carried out.

<sup>2</sup> This paper was supported, in part, by a contract with the Aeronautical Research Laboratory.