Canonical-type connection on almost contact manifolds with B-metric

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Abstract

In the differential geometry of the manifolds with additional structures, there are important the so-called natural connections, i.e. linear connections with torsion such that the additional structures are parallel with respect to them. There exists a significant interest to these natural connections which have some additional geometric or algebraic properties, for instance about their torsion (such as canonical-type connections).

In the present work we consider natural connections of canonical type on the almost contact manifolds with B-metric. These manifolds are the odd-dimensional extension of the almost complex manifolds with Norden (anti-Hermitian) metric and the case with indefinite metrics corresponding to almost contact metric manifolds. We define the connection under consideration. We determine the class of the considered manifolds where this connection and the odd-dimensional analogue of the B-connection coincide. We consider the group G of the general conformal transformations of the almost contact B-metric structure. We determine the invariant class of the considered manifolds and a tensor invariant of G. We establish that the torsion of the canonical-type connection is invariant exactly in the subgroup G_0 of G. We characterize the basic classes of the considered manifolds by the torsion of the canonical-type connection.