Classification pseudosymmetric (κ, μ)-contact metric manifolds

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Abstract

This paper deals with a classification of the pseudosymmetric contact metric manifolds under the condition that the characteristic vector field ξ belong to the (κ, μ)-nullity distribution in the R. Deszcz sense.

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1 Introduction

Chaki [3]and Deszcz [4] introduced two difierent concept of a pseudosymmetric manifold. In both senses various properties of pseudosymmetric manifolds have been studied. We shall study properties of pseudosymmetric manifolds in the Deszcz sense. A Riemannian manifold is called semisymmetric if $R(X, Y) \,.\, R = 0$. Deszcz [4] generalized the concept of semisymmetry and introduced pseudosymmetric manifolds. Let (M^n, g), $n \geq 3$ be a Riemannian manifold. Let ∇ and R denote the Levi-Civita connection and the curvature tensor of (M, g). We define endomorphism $X \wedge Y$ by

$$(X \wedge Y)Z = g(Y, Z)X - g(X, Z)Y. \tag{1}$$

For a $(0, k)$-tensor field T, the $(0, k+2)$ tensor fields $R.T$ and $Q(g, T)$ are defined by [4]

$$\begin{aligned}&(R.T)(X_1, ..., X_k; X, Y) = (R(X, Y).T)(X_1, ..., X_k)\\ &= -T(R(X, Y)X_1, X_2, ..., X_k) - ... - T(X_1, ..., X_{k-1}, R(X, Y)X_k),\end{aligned} \tag{2}$$

$$\begin{aligned}&Q(g, T)(X_1, ..., X_k; X, Y) = ((X \wedge Y).T)(X_1, ..., X_k)\\ &= -T((X \wedge Y)X_1, X_2, ..., X_k) - ... - T(X_1, ..., X_{k-1}, (X \wedge Y)X_k),\end{aligned} \tag{3}$$

A Riemannian manifold M is said to be pseudosymmetric if the tensors $R.R$ and $Q(g, R)$ are linearly dependent at every point of M, i.e. $R.R = L_R Q(g, R)$. This is equivalent to

$$(R(X, Y).R)(U, V, W) = L_R[((X \wedge Y).R)(U, V, W)] \tag{4}$$

holding on the set $U_R = \{x \in M : Q(g, R) \neq 0 \ at \ x\}$, where L_R is some function on U_R [4]. The manifold M is called a pseudosymmetric of constant type if L is constant. Particularly if $L_R = 0$ then M is a semisymmetric manifold. Papantoniou classified semisymmetric (κ, μ)-contact metric manifolds [5]. As a generalization, in this paper, we study pseudosymmetric (κ, μ)-contact metric manifolds.

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