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Place: Kopargaon

(Sukhdev Shreemant Naik)
In 1930 Schouten and Van-Dantzing tried to transfer the results of Differential Geometry of spaces with Riemannian metric and affine connection to the case of spaces with complex structure. These spaces were also found independently by Kaehler in 1933 and are now called Kaahler spaces which are even dimensional. Also using the complex structure and differential 1-form on a manifold, a great deal of work is carried out on these manifolds from 1960 onwards. These are known as contact manifolds and are odd dimensional. One can obtain different structures like, Almost-Contact, K-Contact, Sasakian, Kenmotsu, Trans-Sasakian, etc. and the generalized versions of these manifolds by providing additional conditions to the contact structure.

The geometry of these manifolds were studied by many geometers like D.E.Blair, K.Yano, M.Kon, S.Sasaki, Kobayashi, Nomizy, J.Gray, M.H arada, Hatakeyama, M.Okumara, Tachibana, Goldberg, Ldden, H, Endo, B. Y.Chen, K. Arslan, K.S. Amur, S.S. Pujar, Y.B. Maralbhavi, U.C. De and his colleagues, Roy Sengupta, Ghosh and A.A. Shaikh, C.S. Bagewadi and his research colleagues M.M Tripathi, A. Bhattacharya, N. Guha, C. Ozgur S. Tanno, Hasanshahid, R.H. Oza, S.N. Pandey, Bhagawat Prasad H. Singh etc.

Contact geometry has been seen to underlay many physical phenomena and be related to many other mathematical structures. Contact structures first appeared in the work of Sophus Lie on partial differential equations. They reappeared in Gibbs’ work on
thermodynamics, Huygens’ work on geometric optics and in Hamiltonian dynamics. More recently contact structures have been seen to have relations with fluid mechanics, Riemannian geometry, low dimensional topology and provide an interesting class of sub elliptic operators.

The thesis consists of Eight Chapters. We recall in the First chapter the fundamental concepts, formulas and basic theorems which are needed in the rest of the chapters.

The body of the thesis begins from Chapter II; the title of the Chapter II is “On Weakly Ricci –Symmetric $\varepsilon$-Trans-Sasakian manifolds”. Chapter II deals with the continuation of the work of S.S Shukla and D.D Singh (S.S Shukla and D.D.Singh ( On ($\varepsilon$)-Trans-Sasakian manifolds. Int. journal of Math.Analysis, vol.4, 2010, no, 49, 2401-2414.) On $\varepsilon$-Trans-Sasakian Manifold .In fact we studied some of the properties of weakly Ricci symmetric $\varepsilon$-trans-Sasakian manifold, examples for the existence of Weakly Ricci symmetric $\varepsilon$-trans-Sasakian manifold are discussed and these examples generalize the result of A.A.Shaikh and S.K Hui Absos Ali Shaikh and Shyamal Kumar Hui (On weak Symmetries of Trans-Sasakian Manifolds. Proceedings of the Estonian Academy of sciences 2009, 58, (4), 213-223).

The title of the chapter III is on weakly symmetric $\varepsilon$-Trans-Sasakian manifolds. Chapter III is again a continuation of the work of S.S.Shukla and D.D.Singh on $\varepsilon$-trans-Sasakian manifold, a new creation which is introduced by K.L Duggal ( Space time Manifolds

The title of Chapter IV is “On generalized Recurrent and Ricci recurrent Trans-Sasakian manifolds”. In this chapter a general expression for the associated 1-forms \( \omega \) and \( \mu \) is obtained for any smooth functions \( \alpha \) and \( \beta \) in a generalized recurrent trans-Sasakian structure of a Riemannian manifold \( M^{2n+1} \). A series of theorems and lemma’s are obtained for it’s subsidiaries of Trans –Sasakian manifolds.

The title of Chapter V is “On generalized \( \phi \)-Recurrent, Concircular \( \phi \)-Recurrent, and Projective \( \phi \)-Recurrent Trans –Sasakian Manifolds.” This chapter is devoted to the study some of the properties of generalized \( \phi \)-recurrent and generalized Concircular \( \phi \) -recurrent Trans Sasakian manifolds and generalize the some of the results of Asli Basari, Cengizhan Murathan(On generalized\( \phi \)-recurrent Kenmotsu manifolds ,FEN DERGISI(E-

The title of Chapter VI is “On Weakly $\varphi$-Symmetric Trans- Sasakian Manifolds”. In this chapter we mainly introduce a notion of Weakly $\varphi$- Symmetric Trans- Sasakian Manifold, and discussed its properties. A series of corollaries from the main theorems are also obtained as a special case and a concrete example for the existence of such manifolds is provided.

The Title of Chapter VII is “on Weakly $\varphi$-Ricci Symmetric Trans-Sasakian Manifolds” In this chapter we introduced the notion of weakly $\varphi$- Ricci-symmetric trans -Sasakian manifolds of dimension $(M^{2n+1}, g)$ (n>1) and studied the various properties. Finally the existence of weakly $\varphi$- Ricci-symmetric Trans -Sasakian manifold is ensured by an example.

The title of the last Chapter VIII is “Some Properties of Kenmotsu Manifolds” The purpose of this chapter is to study some properties of $W_2$-Semisymmetric, Kenmotsu manifolds, Projectively flat Einstein Kenmotsu manifolds and Conharmonically flat Einstein Kenmotsu manifolds.

S. S. Naik