ABSTRACT

A module is an action of a ring on a commutative group and a vector space is a special case of a module. This is indeed a source of motivation to study the action of certain algebraic structures on groups. A BCK-module is an action of BCK-algebra on a commutative group. The notion of BCK-modules was introduced in 1994 by H. A. S. Abujabal , M. Aslam, and A. B. Thaheem [2]. They showed that every bounded implicative BCK-algebra forms a BCK-module over itself. They established the isomorphism theorems and studied the homological aspects of BCK-modules. Z. Perveen, M. Aslam introduced the notions of chains, injective and projective on BCK-modules in [20]. The theory of BCK-modules was further developed by I. Baig and M. Aslam [4]. They introduced the notion of matrices of endomorphisms, topology over decreasing sequence of submodules of a BCK-module M, BCK-module over polynomials, Artinian and Noetherian modules and discuss their properties and relationship.

In this thesis, we introduce the notion of complexes of BCK-modules, homology of BCK-modules, complex homomorphism, complex exact sequence and established that every short exact sequence of complexes admits an exact homology sequence of X-modules. Further, we explore different aspects of topology on BCK-modules introduced in [4], we refer it as the Baig topology. We introduce the notion of a BCK-topological module in a natural way and establish that every decreasing sequence of submodules on a BCK-module M over bounded commutative BCK-algebra X is indeed a BCK-topological module. We also define the notion of compatible and strict BCK-module homomorphisms and establish the necessary and sufficient condition for a compatible mapping to be strict. Moreover, the notion of a complete BCK-module is introduced and explored along with Cantor's type intersection theorems.