Independence and domination play an important role in graph theory. Many papers have been published on these topics. Maximal independent sets lead to the concept of domination. There are graphs which have unique maximum independent set and in some graphs every independent set is maximum. Maximal independent sets which are not maximum play an important part. The minimum cardinality of a maximal independent set is called the independence domination number of $G$ and is denoted by $i(G)$. Clearly $\gamma(G) \leq i(G) \leq \beta_0(G)$, where $\gamma(G)$ is the domination number of $G$ and $\beta_0(G)$ is the independence number of $G$. There may be maximal independent sets of cardinality between $i(G)$ and $\beta_0(G)$.

If $i(G) = \beta_0(G)$, then every maximal independent set is a maximum independent set. Such graphs are called well covered graphs. The question of extending an independent set of cardinality $k$ to a maximum independent set was considered by Claude Berge in 1980. $k$-extendable graphs were introduced by him. Many research papers have been published on this. This thesis is a study of $k$-extensibility, weak $k$-extensibility, trivial $k$-extensibility
and weakly well covered graphs.

The thesis consists of five chapters. In the first chapter, definitions and results required in the subsequent chapters are given. The second chapter is devoted to the study of \( k \)-extensibility in graphs. In the third chapter trivially extendable graphs are defined and studied. Study of Weakly \( k \)-extendable graphs forms the fourth chapter. The fifth chapter is devoted to the study of weakly well covered graphs. An interesting application is given at the end of the fifth chapter. The thesis ends with a comprehensive bibliography.

Some of the contents of the first chapter has been published as *k*-extensibility in graphs with unique maximum independent set in the Global journal of Pure and Applied Mathematics, Volume 9, 2013, 567-574. Another paper titled *k*-extensibility in graphs-II was published in the proceedings of the International Conference on Mathematical Computational and Modeling, 2014. A paper titled *k*-extensibility in graphs was published in the proceedings of the International Conference on Mathematical Computer Engineering, 2013. Two more papers on *k*-extendable graphs and weakly *k*-extendable graphs are communicated.