PREFACE

This thesis is devoted to a study on Wiener number of a Graph. The Wiener number, introduced by American chemist Harold Wiener in 1947, is one of the structural descriptors for acyclic organic molecules in chemistry. It is known that the Wiener number of a molecular graph correlates with certain physical and chemical properties of a molecule. It is defined as the sum of distances between distinct pairs of vertices of a connected graph $G$. A number of interesting Mathematical results have been found, particularly, for the case that $G$ is a tree.

This thesis consists of six chapters.

In the second chapter Wiener numbers of some standard graphs, cycle related graphs, cluster graphs and circular graphs are computed.

Chapter III completely deals with trees where we have determined ranges of Wiener numbers of special trees of order $n$ with diameter $k$. We also obtain lower bound for Wiener numbers of trees of order $n$ with diameter $k$.

In the fourth chapter, Wiener numbers of distance – regular graphs such as odd graphs, cube graphs and Johnson graphs are computed.
In the fifth chapter, we made an attempt on the study of Wiener number of four product graphs. General formulas for \( W(G_1 \oplus G_2) \) and \( W(G_1 \vee G_2) \) are obtained. We find Wiener number of `strong’ and `tensor products by considering some standard graphs.

In the sixth chapter, we introduce a new concept, namely, Wiener strength, \( WS(G) \), of a graph \( G \) which is not a tree. We obtain \( WS(G) \) for standard graphs and characterized the graphs for which \( WS(G) = k \), where \( k = 1,2 \). We characterized connected graphs \( G \) for which \( W(G) = W(T) - (m - n + 1) \) for some spanning tree \( T \) of \( G \). We also obtained bounds for \( WS(G) \).