Abstract

Let J_G denote the binomial edge ideal of a connected undirected graph G on n vertices. This is the ideal generated by the binomials $x_i y_j - x_j y_i$, $1 \leq i < j \leq n$, in the polynomial ring $S = K[x_1, \ldots, x_n, y_1, \ldots, y_n]$ where $\{i, j\}$ is an edge of G. Our aim in this thesis is to compute certain algebraic invariants like dimension, depth, system of parameters, regular sequence, Hilbert series and multiplicity of J_G of some particular classes of binomial edge ideals of graphs. A large amount of information of an ideal is carried by its minimal free resolution. So we give information on the minimal free resolution on certain binomial edge ideals. We also give a complete description of the structure of the modules of deficiencies of binomial edge ideals of some classes of graphs.

A generalization of the concept of a Cohen-Macaulay ring was introduced by S. Goto [7] under the name approximately Cohen-Macaulay. In this thesis we collect a few graphs G such that the associated ring S/J_G is approximately Cohen-Macaulay. We also characterize all the trees that are approximately Cohen-Macaulay.

As more generalized notion than approximately Cohen-Macaulay we also study sequentially Cohen-Macaulay property for binomial edge ideals. We give a nice construction principle in this topic.

The complete graph $\tilde{G}$ on n vertices has the property that $S/J_{\tilde{G}}$ is a Cohen-Macaulay domain with a 1-linear resolution. As one of the main results we clarify the structure of $S/J_{K_{m,n}}$, where $K_{m,n}$ denotes the complete bipartite graph.