

Abstract

Firstly, Abbasi et al. gave the idea of an f -ideal, in 2012. Naturally, it can be asked that either the classification of all the square-free monomial ideals which are f -ideals is possible. Classification of all those f -ideals which were generated with degree two, was given by Abbasi. Later, Anwar et al. [3] generalized this result which gave the classification of all those f -ideals I which are unmixed also possessing degree $d \geq 2$. Guo and Wu [12] gave an alternative way for the proof of this result. After that, Gu et al. [11] removed the condition of unmixed which was imposed in [3]. Papers [16], [15], [5] and [17] are included into the other work which is related to f -ideals

In this work first, we have studied those graphs whose Stanley-Reisner ideals turn out to be f -ideals. We give a characterization and construction of these graphs and show that, unlike f -graphs, these graphs are always connected. We have also discussed that when these graphs are complete bipartite graphs. Moreover, we classify those graphs for which both, the facet ideal (the edge ideal) and the Stanley-Reisner ideal, are f -ideals. Secondly, we have generalized the idea of f -ideals to quasi f -ideals. This extended class of ideals is much bigger than the class of all f -ideals. Apart from giving various characterizations of quasi f -ideals of degree 2, we have determined all the minimal primes ideals of these ideals. Moreover, construction of quasi f -ideals of degree 2 has been described; the formula for computing Hilbert function and Hilbert series of the polynomial ring modulo quasi f -ideal has been provided. Moreover, we introduce the concept of quasi f -simplicial complex and quasi f -graph. We give a characterization of quasi f -graphs on n vertices. A complete solution of connectedness of quasi f -simplicial complexes is described. We have also given a method of constructing Cohen-Macaulay quasi f -graphs. At the last we give the complete characterization of quasi f -ideals of degree greater or equal to 2. Additionally, we show that the property of being quasi f -ideals remains the same after taking the Newton complementary dual of monomial ideal I which is square-free provided that the minimal generating set of I is perfect. I intend to give the generalization of f -ideals, which can be termed as 'quasi f -ideals'. This generalization will be helpful in reading off the f -vector of the Stanley-Reisner complex through f -vector of facet complex of ideal which was one of the essences of f -ideals. I believe this extended class of ideals would be much bigger than the class of all f -ideals. I want to study these ideals and its related complexes in detail in the thesis. Particularly, I would like to give the characterization of all those quasi f -ideals which possess

degree d also primary decomposition as well as all associated prime ideals of these ideals. Problems related to characterization, construction of Cohen-Macaulay and connectedness of corresponding quasi f -simplicial complexes and quasi f -graphs are also studied here. I would give a formula for computing the Hilbert function and series corresponding to these ideals.