Prime Ideals In The Kumjian-Pask Algebras

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Abstract

Let Λ be a row-finite k-graph with no sources and R be a unital commutative ring. In this note, we investigate conditions for Λ and R, which under these, $KP_R(\Lambda)$ is a prime ring. Then by applying this result, we characterize basic graded prime ideals of $KP_R(\Lambda)$.

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1 Introduction

Higher rank graphs and their associated C^*-algebras were introduced by Kumjian and Pask in 2000. These C^*-algebras are natural generalizations of directed graph C^*-algebras. The motivation of these definitions was to provide graphical forms for higher rank Cuntz-Krieger algebras.

For a unital commutative ring R and k-graph Λ, Kumjian-Pask algebra $KP_R(\Lambda)$ is the algebraic analogue of the C^*-algebra $C^*(\Lambda)$, that introduced in [5] as higher rank analogues of the Leavitt path algebras. Some important results such as Graded and Cuntz-Krieger uniqueness theorems were proved for these algebras and also analysed their ideal structure. Studing of k-graph algebras has been interested for many authors. One of the reasons, is that they give examples for complicated mathematical concepts (See [1],[2]).

In this note, first, we explain some definitions and preliminaries which we need to prove the main result. Then, in Section 2, we characterize prime Kumjian-Pask algebras $KP_R(\Lambda)$ by giving some equivalent conditions for R and the underlting higher rank graphs Λ. Also, in Corollary 2.2, we determine basic graded prime ideals in $KP_R(\Lambda)$.

Definition 1.1. For a positive integer k, we view the additive semi group $\mathbb{N}^k$ ($\mathbb{N}$ is the set of natural numbers including zero) as a category with one object. A k-graph (or higher rank graph), is a countable category $\Lambda = (\Lambda^\circ, \Lambda, r, s)$ eqquiped with a functor $d : \Lambda \to \mathbb{N}^k$,called the degree map, satisfying the factorization property: for every $\lambda \in \Lambda$ and $m, n \in \mathbb{N}^k$, if $d(\lambda) = m + n$, there exist unique elements $\mu, \nu \in \Lambda$ such that $\lambda = \mu\nu$

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