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An identity of divisor functions defined on quaternion algebras

In order to prove an average version of fourth moment problem for newforms of level 2, Duke, in his paper in 1988, investigated a maximal order of the Hamiltonian quaternion algebra and defined the divisor function for this order. In 2009, Kim and the author generalized his definition of divisor function to those for maximal orders in the rational quaternion algebra that ramifies only at one finite arbitrary prime. As a corollary, we generalized his result to arbitrary prime level.

In this talk, we will further explore the divisor functions for orders not necessarily maximal, for example, orders of square-free level, and prove a similar identity which plays an important role in both of Duke's and our works. Applying this to fourth moment problem, we have the case of square-free level as a corollary. Finally, we will see the same identity over general ground field.