

SUMMARY OF PHD DISSERTATION

Thesis title: Some invariants of modules associated with almost p-standard systems of parameters

Speciality: Algebra and Number theory

Speciality code: 9 46 01 04

PhD. student: Pham Hong Nam

Supervisors:

1. Assoc.Prof. Doan Trung Cuong, Institute of Mathematics;
2. Prof. Le Thi Thanh Nhan, Ministry of Education and Training

Education institution: Institute of Mathematics, Vietnam Academy of Science and Technology

The aim of the thesis is to study some invariants of a finitely generated module over a local ring associated to an almost p-standard of systems of parameters. The content of the thesis consists of three main parts:

Part 1: Study the length function $l\left(\frac{M}{(x_1^{n_1}, \dots, x_d^{n_d})M}\right)$ modulo an almost p-standard of system of parameters, the partial Euler-Poincaré characteristics of the Koszul complex and the Hilbert coefficients of the module with respect to an almost p-standard system of parameters.

Part 2: Study the polynomial behavior of the function $l(H_m^0(\mathbf{R}/I^{n+1}))$ in n in two cases: either I is a principle ideal or I is generated by part of an almost p-standard system of parameters.

Part 3: Using almost p-standard systems of parameters to construct new cohomological degrees of a Noetherian local ring.

The main results of the thesis include:

The thesis obtains the following results:

1. Let M be a finitely generated R -module. Let x_1, \dots, x_d be an almost p-standard system of parameters of M , we show that $U_M^{i,\Lambda} = \left(0 : x_{i+1}^{n_{i+1}}\right)_{M/(x_j^{n_j}; j \in \Lambda)M}$ does not depend on $n_1, \dots, n_d \geq 2$ and the choice of x_1, \dots, x_d . By using this subquotient modules we show that the degrees corresponding to the non-zero coefficients of

the polynomial $l\left(\frac{M}{(x_1^{n_1}, \dots, x_d^{n_d})M}\right)$ does not depend on the choice of parameters, where x_1, \dots, x_d is an almost p-standard of M .

2. Give precisely formulas to compute all the partial Euler-Poincaré characteristics of the Koszul complex and the Hilbert coefficients of the module with respect to an almost p-standard system of parameters. The formulas enable us to establish some comparison between the length $l\left(\frac{M}{(x_1^{n_1}, \dots, x_d^{n_d})M}\right)$ and the partial Euler-Poincaré characteristics and the Hilbert coefficients.
3. Show that the function $l(H_m^0(\mathbb{R}/I^{n+1}))$ is a polynomial for n big enough if either I is a principle ideal or I is generated by part of an almost p-standard system of parameters. Furthermore, we are able to compute the coefficients of this polynomial in terms of length of certain local cohomology modules and usual multiplicity if either I is principal or I is generated by part of a standard system of parameters in a generalized Cohen-Macaulay ring.
4. Using the invariant subquotients $U_M^{i,\Delta}$, we construct an infinite family of cohomological degrees of Noetherian local ring.

Hanoi, June 10, 2020

Supervisors

PhD. Student

Assoc.Prof. Doan Trung Cuong Prof. Le Thi Thanh Nhan

Pham Hong Nam