



Prague, August 19, 2015

**Andrew Kozlik: Designs and their algebraic theory
Advisor's opinion**

The thesis is concentrated around the notion of Latin Directed Triple Systems as discovered by Griggs when he had been investigating algebraic interpretations of the Directed Triple Systems. This was further developed by Drápal who later asked Kozlik to help with enumerations of isomorphism classes. This collaboration led to this thesis. The process transformed Andrew Kozlik from a student with leanings towards programming into a mathematician.

The thesis witnesses this development in many ways. Amongst others It shows how well Andrew mastered, with help of Terry Griggs, techniques and constructions of classical Design Theory. In the thesis he has produced Latin Directed Triple Systems of various sizes and properties, determining thus spectra of non-flexible LDTS, flexible LDTS, pure non-flexible LDTS, cyclic antiflexible LDTS and antiflexible LDTS fully, and the spectrum of pure flexible LDTS nearly completely, with open questions of existence for sizes 24, 30, 42, 78, 114 and 150. Further results are concerned with counting, in which the most struggling achievement is the determination of proper LDTS quasigroups of order 13 up to isomorphism. There are 1 206 697 such isomorphism classes.

Hybrid Triple Systems are those that admit both directed and cyclic (Mendelsohn) triples. These systems may also yield a quasigroup. Then they are called Latin HTS. The thesis involves a paper that determines spectra for cyclic and rotational LDTS and LHTS and gives necessary conditions for the number of cyclic triples in rotational and cyclic LHTS. The final paper of the thesis is short (4 and half of pages). It succinctly determines the spectra for the centres of STS quasigroups. Only recently it turned out that these results are not new. However, the proof technique is new and more efficient. Hence the paper does not lose its value completely. But it will have to be reworked.

I have no doubt about the high quality of the thesis. I recommend that doctoral degree is awarded to Andrew Kozlik on the basis of this thesis.

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