Graduate Seminar

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Cyclic $\text{BIBD}(v, 3, \lambda)$ from Skolem-Type Sequences-Constructsions and Properties

Abstract:

A *Skolem-type sequence* is a sequence $(s_1, \ldots, s_t)$ of positive integers $i \in D$ such that for each $i \in D$ there is exactly one $j \in \{1, \ldots, t - i\}$ such that $s_j = s_{j+i} = i$. Positions in the sequence not occupied by integers $i \in D$ contain null elements. A *balanced incomplete block design* or a *block design*, denoted by $\text{BIBD}(v, k, \lambda)$ is a pair $(V, B)$ where $V$ is a $v$-set of points and $B$ is a set of $k$-subsets in $B$ called blocks such that any 2-subset of $V$ appears in exactly $\lambda$ of the $k$-subsets.

It is known that Skolem-type sequences may be used to construct cyclic $\text{BIBD}(v, 3, 1)$ as well as cyclic $\text{BIBD}(v, 3, 2)$. The main result of this talk is an extension of former results onto cyclic triple systems with $\lambda > 2$. In addition we introduce a new kind of Skolem-type sequence. Then, we use our construction for $\lambda = 3$ to generate $\text{BIBD}(v, 3, 3)$ having three properties in the same time: cyclic, simple and indecomposable.

This is joint work with my supervisor, Dr N. Shalaby.