University of Lethbridge
Department of Mathematics
and Computer Science

Number Theory & Combinatorics Seminar

Monday — March 18, 2013
Room: B660
Time: 12:00 to 12:50 p.m.

Ebrahim Ghaderpour
(University of Lethbridge)

The asymptotic existence of orthogonal designs

Abstract: A complex orthogonal design of order $n$ and type $(s_1,\ldots,s_k)$, denoted $COD(n; s_1,\ldots,s_k)$, is a matrix $X$ with entries from $\{0,\epsilon_1x_1,\ldots,\epsilon_kx_k\}$, where the $x_i$'s are commuting variables and $\epsilon_j \in \{\pm 1, \pm i\}$ for each $j$, that satisfies

$$XX^* = \left( \sum_{i=1}^{k} s_ix_i^2 \right) I_n,$$

where $X^*$ denotes the conjugate transpose of $X$ and $I_n$ is the identity matrix of order $n$.

A complex orthogonal design in which $\epsilon_j \in \{\pm 1\}$ for all $j$ is called an orthogonal design, denoted $OD(n; s_1,\ldots,s_k)$. An orthogonal design (=OD) in which there is no zero entry is called a full OD. Equating all variables to 1 in any full OD results in a Hadamard matrix.

In this seminar, we show that for any $n$-tuple $(s_1,\ldots,s_k)$ of positive integers, there exists an integer $N$ such that for each $n \geq N$, there is an $OD\left(2^n(s_1+\cdots+s_k); 2^n s_1,\ldots,2^n s_k\right)$. This is a joint work with professor Hadi Kharaghani.

EVERYONE IS WELCOME!

Visit the seminar web page at
http://www.cs.uleth.ca/~nathanng/ntcoseminar/