1106-VN-1992 **Aras Erzurumluoglu*** (aze0009@auburn.edu) and **Chris Rodger** (rodgec1@auburn.edu).
Fair 1-factorizations, fair holey 1-factorizations and fair holey hamiltonian decompositions of complete multipartite graphs.

A k-factor of G is a k-regular spanning subgraph of G. A k-factorization is a partition of $E(G)$ into k-factors. Let $K(n,p)$ be the complete multipartite graph with p parts, each of size n. If $V_1,...,V_p$ are the p parts of $V(K(n,p))$, then a holey k-factor of deficiency V_i of $K(n,p)$ is a k-factor of $K(n,p)-V_i$ for some i. Hence a holey k-factorization is a set of holey k-factors whose edges partition $E(K(n,p))$. In particular a holey hamiltonian decomposition is a holey 2-factorization of $K(n,p)$ where each holey 2-factor is a connected subgraph of $K(n,p)-V_i$ for some i. A (holey) k-factorization of $K(n,p)$ is said to be fair if between each pair of parts the color classes have size within one of each other. In this work the existence of fair 1-factorizations, fair holey 1-factorizations and fair holey hamiltonian decompositions of $K(n,p)$ are completely settled. The second result can be used to construct symmetric quasigroups of order np with holes of size n with the additional property that the permitted symbols are shared as evenly as possible among the cells in each $n \times n$ "box". The third result simultaneously settles the existence of cycle frames of type n^p for cycles of the longest length. (Received September 15, 2014)