1023-05-790 **Sherry Xiaohua Wu*** (sxw2@cornell.edu), 0202 Founders, ITHACA, NY 14853-5106. *Cycles in the Cartesian Product of Two Directed Cycles.*

The Cayley graph $Cay(\mathbb{Z}_a \times \mathbb{Z}_b : \{(1,0),(0,1)\})$ is the digraph with vertices the elements of $\mathbb{Z}_a \times \mathbb{Z}_b$ and with a directed edge from vertices α to β if $\alpha = \beta + x$ for $x \in \{(1,0),(0,1)\}$. Given a subgroup G of $\mathbb{Z}_a \times \mathbb{Z}_b$, we provide necessary and sufficient conditions for $Cay(\mathbb{Z}_a \times \mathbb{Z}_b - G : \{(1,0),(0,1)\})$ to have a Hamiltonian cycle, where the vertices of G and their associated edges are deleted from $Cay(\mathbb{Z}_a \times \mathbb{Z}_b : \{(1,0),(0,1)\})$. In addition, for a subgroup $\mathbb{Z}_c$ of $\mathbb{Z}_a$ and a subgroup $\mathbb{Z}_d$ of $\mathbb{Z}_b$, we give necessary and sufficient conditions for $Cay(\mathbb{Z}_a \times \mathbb{Z}_b : \{(1,0),(0,1)\})$ to have a spanning closed walk passing through every vertex in $\mathbb{Z}_c \times \mathbb{Z}_d$ exactly twice and all other vertices exactly once. We also determine precisely when $Cay(\mathbb{Z}_a \times \mathbb{Z}_b - R_{k_1 \times k_2} : \{(1,0),(0,1)\})$ has a Hamiltonian cycle, where $R_{k_1 \times k_2}$ is the set of vertices in an $k_1 \times k_2$ rectangle. (Received September 21, 2006)