Some bounds on the energy of signed complete bipartite graphs

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A *signed graph* G^σ is a pair (G, σ), where G is a graph, and $\sigma : E(G) \longrightarrow \{-1, +1\}$ is a function. Assume that $m \leq n$ are two positive integers. Let

$$A = \left[\begin{array}{c|c} 0 & B \\ \hline B^t & 0 \end{array}\right]$$

is the adjacency matrix of $K^\sigma_{m,n}$. In this talk we show that for every sign function σ, $2\sqrt{mn} \leq E(K^\sigma_{m,n}) \leq 2m\sqrt{n}$, where $E(K^\sigma_{m,n})$ is the energy of $K^\sigma_{m,n}$. Also it is proved that the equality holds for the upper bound if there exists a Hadamard matrix of order n for which B is an m by n submatrix of H. Also if the equality holds, then every two distinct rows of B are orthogonal. We prove that for the lower bound the equality holds if and only if $K^\sigma_{m,n}$ is switching equivalent to $K_{m,n}$.

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