ON PERMANENTAL IDENTITIES
OF SYMMETRIC AND SKEW-SYMMETRIC MATRICES
IN CHARACTERISTIC \( p \)

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ABSTRACT. Let \( M_n(F) \) be the algebra of \( n \times n \) matrices over a field \( F \) of characteristic \( p > 2 \) and let \( * \) be an involution on \( M_n(F) \). If \( s_1, \ldots, s_r \) are symmetric variables we determine the smallest \( r \) such that the polynomial

\[
P_r(s_1, \ldots, s_r) = \sum_{\sigma \in \mathcal{S}_r} s_{\sigma(1)} \cdots s_{\sigma(r)}
\]

is a \(*\)-polynomial identity of \( M_n(F) \) under either the symplectic or the transpose involution. We also prove an analogous result for the polynomial

\[
C_r(k_1, \ldots, k_r; k'_1, \ldots, k'_r) = \sum_{\sigma \in \mathcal{S}_r} k_{\sigma(1)} k'_{\sigma(1)} \cdots k_{\sigma(r)} k'_{\sigma(r)}
\]

where \( k_1, \ldots, k_r, k'_1, \ldots, k'_r \) are skew variables under the transpose involution.