Summary: This paper is concerned with properties of permutation matrices and alternating sign matrices (ASMs). An ASM is a square $(0, \pm 1)$-matrix such that, ignoring 0's, the 1's and $-1$'s in each row and column alternate, beginning and ending with a 1. We study extensions of permutation matrices into ASMs by changing some zeros to $+1$ or $-1$. Furthermore, several properties concerning the term rank and line covering of ASMs are shown. An ASM $A$ is determined by a sum-matrix $\Sigma(A)$ whose entries are the sums of the entries of its leading submatrices (so determined by the entries of $A$). We show that those sums corresponding to the nonzero entries of a permutation matrix determine all the entries of the sum-matrix and investigate some of the properties of the resulting sequence of numbers. Finally, we investigate the lattice-properties of the set of ASMs (of order $n$), where the partial order comes from the Bruhat order for permutation matrices.

MSC: 05B20 Combinatorial aspects of matrices (incidence, Hadamard, etc.)

Keywords: permutation matrix; alternating sign matrix; term rank; line covering; Bruhat order

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