

## Permanent ranks of matrices and generalized cycles of graphs

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The principal permanent rank characteristic sequence is a binary sequence  $r_0, r_1, \dots, r_n$  where  $r_k = 1$  if there exists a principal square submatrix of size  $k$  with nonzero permanent and  $r_k = 0$  otherwise, and  $r_0 = 1$  if there is a zero diagonal entry.

A complete characterization will be provided for all principal permanent rank sequences obtainable by the family of nonnegative matrices as well as the family of nonnegative symmetric matrices. Constructions for all realizable sequences will be provided.

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