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CONSTRUCTIONS OF TRACE ZERO SYMMETRIC STOCHASTIC MATRICES FOR THE INVERSE EIGENVALUE PROBLEM*

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Abstract. In the special case of where the spectrum $\sigma = \{\lambda_1, \lambda_2, \lambda_3, 0, 0, \ldots, 0\}$ has at most three nonzero eigenvalues $\lambda_1, \lambda_2, \lambda_3$ with $\lambda_1 \geq 0 \geq \lambda_2 \geq \lambda_3$, and $\lambda_1 + \lambda_2 + \lambda_3 = 0$, the inverse eigenvalue problem for symmetric stochastic $n \times n$ matrices is solved. Constructions are provided for the appropriate matrices where they are readily available. It is shown that when n is odd it is not possible to realize the spectrum σ with an $n \times n$ symmetric stochastic matrix when $\lambda_3 \neq 0$ and $\frac{3}{2n-3} > \frac{\lambda_2}{\lambda_3} \geq 0$, and it is shown that this bound is best possible.

Key words. Inverse eigenvalue problem, Symmetric stochastic matrix, Symmetric nonnegative matrix, Distance matrix.

AMS subject classifications. 15A18, 15A48, 15A51, 15A57

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