

**THE DRAZIN INVERSE THROUGH THE MATRIX PENCIL
APPROACH AND ITS APPLICATION TO THE STUDY OF
GENERALIZED LINEAR SYSTEMS WITH RECTANGULAR OR
SQUARE COEFFICIENT MATRICES***

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Abstract. In several applications, e.g., in control and systems modeling theory, Drazin inverses and matrix pencil methods for the study of generalized (descriptor) linear systems are used extensively. In this paper, a relation between the Drazin inverse and the Kronecker canonical form of rectangular pencils is derived and fully investigated. Moreover, the relation between the Drazin inverse and the Weierstrass canonical form is revisited by providing a more algorithmic approach. Finally, the Weierstrass canonical form for a pencil through the core-nilpotent decomposition method is defined.

Key words. Drazin Inverse, Matrix pencil theory, Generalized linear systems.

AMS subject classifications. 15A09, 15A22.

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