
ELSEVIER Linear Algebra and its Applications 313 (2000) 155–161

LINEAR ALGEBRA AND ITS APPLICATIONS

www.elsevier.com/locate/laa

Reducibility theorems for pairs of matrices as rational criteria

Yurii A. Al'pin [a], Khakim D. Ikramov [b,*]

[a] *Faculty of Mathematics and Mechanics, Kazan State University, 420008 Kazan, Russian Federation*
[b] *Faculty of Computational Mathematics and Cybernetics, Moscow State University, 119899 Moscow, Russian Federation*

Received 2 February 2000; accepted 20 March 2000

Submitted by E. Tyrtyshnikov

Abstract

Theorems giving conditions for a pair of matrices to be reducible to a special form by a simultaneous similarity transformation such as the classical McCoy's theorem or theorems due to Shapiro and Watters are traditionally perceived as nonconstructive ones. We disprove this perception by showing that conditions of each of the theorems above can be verified using a finite number of arithmetic operations. A new extension of McCoy's theorem is stated which, in some respects, is more convenient than Shapiro's theorem. © 2000 Published by Elsevier Science Inc. All rights reserved.

Keywords: Simultaneous (block) triangular form; Matrix algebra; Commutator; Standard polynomial; Quasidiagonalizability

1. Introduction

In linear algebra and representation theory of finite-dimensional algebras, there are a number of results that give necessary and sufficient conditions for a pair of $n \times n$ matrices to be reducible to a special form by a simultaneous similarity transformation. The most known of these results is the classical McCoy's theorem [1].

* Corresponding author.
E-mail address: ikramov@cmc.msk.su (K.D. Ikramov).

PII: S 0 0 2 4 - 3 7 9 5 (0 0) 0 0 1 2 9 - 4