Preconditioning and Conditioning of Systems Arising from Boundary Value Methods*

F. Iavernaro[1] and D. Trigiante[2]

[1] *Dipartimento di Matematica, Università di Bari, Via Orabona 4, I-70125 Bari, Italy*
[2] *Dipartimento di Energetica, Università di Firenze, via C. Lombroso 6/17, I-50134 Firenze, Italy*

Abstract: The application of Boundary Value Methods to several classes of Differential Equations requires the solution of large dimension and sparse linear systems having (block) quasi-Toeplitz coefficient matrices. This has naturally suggested the use of Krylov subspace methods in combination with well known preconditioners suitable for Toeplitz matrices. However, the behaviour of such methods is closely related to the continuous problem (in the simplest case the system to be solved depends on a complex parameter) and some aspects need to be carefully studied in order to determine the effectiveness of these preconditioners and even their compatibility with some basic concepts in this area. Considerations about the choice of an optimal preconditioner are also presented.