Abstracts

Self-Adjoint Variational Formulation of Problems Having Non-Self-Adjoint Operators

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A systematic approach is given for deriving a variational formulation, previously stated by Stakgold, of non-self-adjoint operators from the standard quadratic functional for self-adjoint operators given by Mikhlin. If the same set of basis functions is used to approximate the solution of the operator equation and its adjoint equation, the resulting system of equations is identical to that derived from the Galerkin method. By using two differing sets of basis functions, one obtains a system of equations which corresponds to that derived from the moment method in general. As a particular and important example, the integral equation for the interface problem between differing media is considered. Compared to the method used by McDonald, Friedman, and Wexler, the present formulation involves no danger of finding a false solution, results in a simpler set of equations, requires fewer integrations, and is seen--in the case of integral equations--to correspond to the Galerkin method. It is also shown that for wave propagation through a lossy medium, which involves the solution of the non-self-adjoint complex Helmholtz equation, the resulting system of linear equations takes the same form as those for the real self-adjoint case but for the addition of complex arithmetic.

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