Warning: Subroutine EC07 performs functions which are adequately treated by routines in other standard subroutine libraries (for example, LAPACK). The use of this routine is not recommended, and it may be removed from future releases of this library.

1 SUMMARY

Given a complex Hermitian matrix \( A = \{a_{ij}\}_{n \times n} \), \( a_{ij} = \bar{a}_{ji} \), finds all its eigenvalues \( \lambda_i \) such that \( \det(A - \lambda I) = 0 \).

The matrix is reduced to triangular form by applying Householder orthogonal transformations and the eigenvalues of the reduced matrix are found by EA09.


2 HOW TO USE THE PACKAGE

2.1 The argument list

The single precision version

\[
\text{CALL EC07C}(A, \text{VALUE}, M, IA, W)
\]

The double precision version

\[
\text{CALL EC07CD}(A, \text{VALUE}, M, IA, W)
\]

\( A \) is a COMPLEX (COMPLEX*16 in the D version) (see §2.2) two-dimensional array with first dimension \( IA \). The user must store the lower triangle of the matrix \( A \) into the lower triangle of the array \( A \), i.e. put \( a_{ij} \) into \( A(1, j) \) for \( i \geq j \). The space above the diagonal of the array \( A \) is used by the subroutine as work space, the lower triangle set by the user will remain unchanged on return.

\( \text{VALUE} \) is a REAL (DOUBLE PRECISION in the D version) array in which the subroutine puts the eigenvalues \( \lambda_i \), \( i=1,2,\ldots,m \).

\( M \) is an INTEGER variable and should be set by the user to \( m \) the order of the matrix.

\( IA \) is an INTEGER variable set by the user to the first dimension of the array \( A \), i.e. if the allocation for the array \( A \) was specified by

\[
\text{COMPLEX} A(100,50)
\]

then \( IA \) would be set to 100.

\( W \) is a COMPLEX (COMPLEX*16 in the D version) (see §2.2) array used by the subroutine as workspace. It must have dimension at least \( 3m \).

2.2 The COMPLEX argument types

To conform to the Fortran 77 standard the array arguments listed as COMPLEX (COMPLEX*16 in the D version) in §2.1 should strictly be REAL (DOUBLE PRECISION in the D version) arrays with an extra first dimension of 2, e.g.
REAL A(2,10,10),W(2,30)
REAL VALUE(10)
- - -
CALL EC07C(A,VALUE,5,10,W)

Most implementations of Fortran allow such arguments to be passed in the more convenient form of COMPLEX (COMPLEX*16 in the D version).

3 GENERAL INFORMATION

Use of common: None.
Workspace: None.
Other routines called directly: ME08A/AD and EC09C/CD are called.
Input/output: None.
Portability: EC07CD uses COMPLEX*16 facility.

4 METHOD

Householder reduction to tri-diagonal form is performed by ME08A/AD and the eigenvalues of this tri-diagonal matrix are found by EC09C/CD using the QR algorithm.