> **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** $\mathbf{A} = \{a_{ij}\}_{n \times n}$, $a_{ij} = \bar{a}_{ji}$, finds **all its eigenvalues** λ_i such that $\det(\mathbf{A} - \lambda_i \mathbf{I}) = 0$.

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

ATTRIBUTES — **Version:** 1.0.0. **Types:** `EC07C`; `EC07CD`. **Calls:** `EC09` and `ME08`. **Language:** `EC07CD` uses `COMPLEX*16` **Original date:** September 1971. **Origin:** S.Marlow, Harwell.

2 HOW TO USE THE PACKAGE

2.1 The argument list

The single precision version

```
CALL EC07C(A,VALUE,M,IA,W)
```

The double precision version

```
CALL EC07CD(A,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(i,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.

VALUE   is a `REAL` (`DOUBLE PRECISION` in the D version) array in which the subroutine puts the eigenvalues λ_i $i=1,2,...,m$.

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

```
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.