Warning: Subroutine EA07 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 **real symmetric matrix A**=$\{a_{ij}\}_{n\times n}$, finds **all its eigenvalues,** i.e. finds the solutions λ_i i=1,2,...,m of $\det(\mathbf{A}-\lambda\mathbf{I})=0$.

The matrix is reduced to tri-diagonal form by applying Householder transformations; then the eigenvalues of the reduced matrix are found by calling EA09C/CD which uses the QR algorithm.

ATTRIBUTES — Version: 1.0.0. **Types:** EA07C; EA07CD. **Calls:** EA09 and MC04. **Original date:** February 1970. **Origin:** J.K.Reid, Harwell.

2 HOW TO USE THE PACKAGE

2.1 Argument list and calling sequence

The single precision version:

```
CALL EA07C(A,VALUE,M,IA,W)
```

The double precision version:

```
CALL EA07CD(A,VALUE,M,IA,W)
```

A is a two dimensional REAL (DOUBLE PRECISION in the D version) array with first dimension IA and 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 $i \geq j$ and I ≥ J.

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 the order m of the matrix.

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

```
DIMENSION A(100,50)
```

then IA would be set to 100.

W is a REAL (DOUBLE PRECISION in the D version) array used by the subroutine as workspace and its dimension must be at least 3m.

3 GENERAL INFORMATION

Use of COMMON: none.

Workspace: in W of length 3*m*.

Other subroutines: MC04B/BD and EA09C/CD are called.

Input/Output: none.

System dependence: none.

4 METHOD

Householder reduction to tri-diagonal form is performed by MC04B and the eigenvalues of this tri-diagonal matrix are found by EA09C using the QR algorithm.