NAG Library Routine Document

F06CHF

Note: before using this routine, please read the Users' Note for your implementation to check the interpretation of **bold italicised** terms and other implementation-dependent details.

1   Purpose

F06CHF applies a complex similarity rotation having real cosine and complex sine to a 2 by 2 complex Hermitian matrix.

2   Specification

```
SUBROUTINE F06CHF (X, Y, Z, C, S)
REAL (KIND=nag_wp)    C
COMPLEX (KIND=nag_wp) X, Y, Z, S
```

3   Description

F06CHF applies a complex similarity rotation, with parameters c (real) and s (complex), to a given 2 by 2 complex Hermitian matrix; that is, it performs the operation:

$$\begin{pmatrix} x & y \\ \bar{y} & z \end{pmatrix} \leftarrow \begin{pmatrix} c & \bar{s} \\ -s & c \end{pmatrix} \begin{pmatrix} x & y \\ \bar{y} & z \end{pmatrix} \begin{pmatrix} c & -\bar{s} \\ s & c \end{pmatrix},$$

where x and z are real.

The argument X and Z which hold x and z are declared complex for convenience when using the routine to operate on submatrices of larger Hermitian matrices.

Note that:

$$\begin{pmatrix} z & \bar{y} \\ y & x \end{pmatrix} \leftarrow \begin{pmatrix} c & \bar{w} \\ -w & c \end{pmatrix} \begin{pmatrix} z & \bar{y} \\ y & x \end{pmatrix} \begin{pmatrix} c & -\bar{w} \\ w & c \end{pmatrix},$$

where $w = -\bar{s}$, so to use F06CHF when y is the $(2,1)$ element of the matrix, you can make the call

```
CALL F06CHF(Z, Y, X, C, -CONJG(S))
```

4   References

None.

5   Arguments

1:    X – COMPLEX (KIND=nag_wp)   *Input/Output*

   On entry: the value x, the $(1,1)$ element of the input matrix.

   On exit: the transformed value x.

2:    Y – COMPLEX (KIND=nag_wp)   *Input/Output*

   On entry: the value y, the $(1,2)$ element of the input matrix.

   On exit: the transformed value y.

3:    Z – COMPLEX (KIND=nag_wp)   *Input/Output*

   On entry: the value z, the $(2,2)$ element of the input matrix.

On exit: the transformed value z.

4:     C – REAL (KIND=nag_wp)   *Input*

On entry: the value c, the cosine of the rotation.

5:     S – COMPLEX (KIND=nag_wp)   *Input*

On entry: the value s, the sine of the rotation.

6   Error Indicators and Warnings

None.

7   Accuracy

Not applicable.

8   Parallelism and Performance

F06CHF is not threaded in any implementation.

9   Further Comments

None.

10   Example

None.