

# NAG Library Routine Document

## F06CBF

**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

F06CBF generates a complex Givens plane rotation having real sine.

### 2 Specification

```
SUBROUTINE F06CBF (A, B, C, S)
REAL (KIND=nag_wp) S
COMPLEX (KIND=nag_wp) A, B, C
```

### 3 Description

F06CBF generates a complex Givens plane rotation with parameters  $c$  (complex) and  $s$  (real), such that, given complex  $a$  and  $b$ :

$$\begin{pmatrix} \bar{c} & s \\ -s & c \end{pmatrix} \begin{pmatrix} a \\ b \end{pmatrix} = \begin{pmatrix} d \\ 0 \end{pmatrix},$$

If  $b$  is real, then  $d$  is also real. On exit,  $b$  is overwritten by  $t$ , the tangent of the rotation;  $c$  and  $s$  can be reconstructed from the single stored value  $t$ , by a subsequent call to F06CDF.

If  $|b| < \epsilon|a|$  and  $\text{Im}(a) = 0$ , where  $\epsilon$  is the *machine precision*, the routine sets  $c = 1$  and  $s = |t|$ .

If  $|b| < \epsilon|a|$  and  $\text{Im}(a) \neq 0$ , the routine sets

$$c = \frac{\text{sign}(\text{Re}(a))a}{|a|} \quad \text{and} \quad s = |t|$$

Note that  $t$  is always set to  $b/a$ , unless overflow would occur, in which case the routine returns the value of the expression

$$\text{CMPLX}(flmax \times \text{sign}(\text{Re}(b)/a), flmax \times \text{sign}(\text{Im}(b)/a));$$

$flmax$  is the real value given by  $1/(\text{X02AMF})$ .

### 4 References

None.

### 5 Parameters

- 1: A – COMPLEX (KIND=nag\_wp) *Input/Output*  
*On entry:* the value  $a$ , the first element of the vector which determines the rotation.  
*On exit:* the value  $d$ .
- 2: B – COMPLEX (KIND=nag\_wp) *Input/Output*  
*On entry:* the value  $b$ , the second element of the vector which determines the rotation.  
*On exit:* the value  $t$ , the tangent of the rotation.

- 3: C – COMPLEX (KIND=nag\_wp) *Output*  
*On exit:* the value  $c$ , the cosine of the rotation.
- 4: S – REAL (KIND=nag\_wp) *Output*  
*On exit:* the value  $s$ , the sine of the rotation.

## 6 Error Indicators and Warnings

None.

## 7 Accuracy

Not applicable.

## 8 Parallelism and Performance

Not applicable.

## 9 Further Comments

None.

## 10 Example

None.

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