NAG Fortran Library Routine Document

F06QTF

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

F06QTF performs one of the transformations

$$R \leftarrow PUQ^T \quad \text{or} \quad R \leftarrow QUP^T,$$

where U is a given n by n real upper triangular matrix, P is a given real orthogonal matrix, and Q is a real orthogonal matrix chosen to make R upper triangular. Both P and Q are represented as sequences of plane rotations in planes k_1 to k_2.

If SIDE $=$ 'L', then

$$R \leftarrow PUQ^T, \quad \text{where} \quad \begin{array}{l} P = P_{k_2-1} \ldots P_{k_1+1} P_{k_1}, \\ Q = Q_{k_2-1} \ldots Q_{k_1+1} Q_{k_1}. \end{array}$$

If SIDE $=$ 'R', then

$$R \leftarrow QUP^T, \quad \text{where} \quad \begin{array}{l} P = P_{k_1} P_{k_1+1} \ldots P_{k_2-1}, \\ Q = Q_{k_1} Q_{k_1+1} \ldots Q_{k_2-1}. \end{array}$$

In either case P_k and Q_k are rotations in the $(k, k+1)$ plane.

The 2 by 2 rotation part of P_k or Q_k has the form

$$\begin{pmatrix} c_k & s_k \\ -s_k & c_k \end{pmatrix}.$$

2 Specification

```
SUBROUTINE F06QTF (SIDE, N, K1, K2, C, S, A, LDA)
INTEGER            N, K1, K2, LDA
double precision   C(*), S(*), A(LDA,*)
CHARACTER*1        SIDE
```

3 Description

None.

4 References

None.

5 Parameters

1: SIDE – CHARACTER*1 *Input*

On entry: specifies whether P is applied from the left or the right in the transformation, as follows:

if SIDE $=$ 'L', from the left;
if SIDE $=$ 'R', from the right.

Constraint: SIDE $=$ 'L' or 'R'.

2: N – INTEGER *Input*

On entry: n, the order of the matrices U and R.

Constraint: $\mathrm{N} \geq 0$.

3: K1 – INTEGER *Input*

4: K2 – INTEGER *Input*

On entry: the values k_1 and k_2.

5: C($*$) – ***double precision*** array *Input/Output*

On entry: $\mathrm{C}(k)$ must hold the cosine of the rotation P_k, for $k = k_1, \ldots, k_2 - 1$.

On exit: $\mathrm{C}(k)$ holds the cosine of the rotation Q_k, for $k = k_1, \ldots, k_2 - 1$.

6: S($*$) – ***double precision*** array *Input/Output*

On entry: $\mathrm{S}(k)$ must hold the sine of the rotation P_k, for $k = k_1, \ldots, k_2 - 1$.

On exit: $\mathrm{S}(k)$ holds the sine of the rotation Q_k, for $k = k_1, \ldots, k_2 - 1$.

7: A(LDA,$*$) – ***double precision*** array *Input/Output*

Note: the second dimension of the array A must be at least $\max(1, \mathrm{N})$.

On entry: the n by n upper triangular matrix U.

On exit: the upper triangular matrix R.

8: LDA – INTEGER *Input*

On entry: the first dimension of the array A as declared in the (sub)program from which F06QTF is called.

Constraint: $\mathrm{LDA} \geq \max(1, \mathrm{N})$.

6 Error Indicators and Warnings

None.