NAG Fortran Library Routine Document

F06PKF (DTBSV)

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

F06PKF (DTBSV) performs one of the matrix-vector operations

$$x \leftarrow A^{-1}x \quad \text{or} \quad x \leftarrow A^{-T}x,$$

where A is an n by n real triangular band matrix with k sub-diagonals or super-diagonals, and x is an n element real vector. A^{-T} denotes $\left(A^T\right)^{-1}$ or equivalently $\left(A^{-1}\right)^T$.

No test for singularity or near-singularity of A is included in this routine. Such tests must be performed before calling this routine.

2 Specification

```
SUBROUTINE F06PKF (UPLO, TRANS, DIAG, N, K, A, LDA, X, INCX)
INTEGER            N, K, LDA, INCX
double precision   A(LDA,*), X(*)
CHARACTER*1        UPLO, TRANS, DIAG
```

The routine may be called by its BLAS name ***dtbsv***.

3 Description

None.

4 References

None.

5 Parameters

1: UPLO – CHARACTER*1 *Input*

On entry: specifies whether A is upper or lower triangular as follows:

if UPLO = 'U', A is upper triangular;
if UPLO = 'L', A is lower triangular.

Constraint: UPLO = 'U' or 'L'.

2: TRANS – CHARACTER*1 *Input*

On entry: specifies the operation to be performed as follows:

if TRANS = 'N', $x \leftarrow A^{-1}x$;
if TRANS = 'T' or 'C', $x \leftarrow A^{-T}x$.

Constraint: TRANS = 'N', 'T' or 'C'.

3: DIAG – CHARACTER*1 *Input*

On entry: specifies whether A has non-unit or unit diagonal elements, as follows:

if DIAG = 'N', the diagonal elements are stored explicitly;
if DIAG = 'U', the diagonal elements are assumed to be 1, and are not referenced.

Constraint: DIAG = 'N' or 'U'.

4: N – INTEGER *Input*

On entry: n, the order of the matrix A.

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

5: K – INTEGER *Input*

On entry: k, the number of sub-diagonals or super-diagonals of the matrix A.

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

6: A(LDA,$*$) – ***double precision*** array *Input*

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

On entry: the n by n triangular band matrix A, stored in rows 1 to $k+1$. More precisely, if UPLO = 'U', the elements of the upper triangle of A within the band must be stored with element a_{ij} in $\mathrm{A}(k+1+i-j, j)$ for $\max(1, j-k) \leq i \leq j$; if UPLO = 'L', the elements of the lower triangle of A within the band must be stored with element a_{ij} in $\mathrm{A}(1+i-j, j)$ for $j \leq i \leq \min(n, j+k)$. If DIAG = 'U', the diagonal elements of A are not referenced, but are assumed to be 1.

7: LDA – INTEGER *Input*

On entry: the first dimension of the array A as declared in the (sub)program from which F06PKF (DTBSV) is called.

Constraint: $\mathrm{LDA} \geq \mathrm{K}+1$.

8: X($*$) – ***double precision*** array *Input/Output*

On entry: the vector x.

On exit: the updated vector x.

9: INCX – INTEGER *Input*

On entry: the increment in the subscripts of X between successive elements of x.

Constraint: $\mathrm{INCX} \neq 0$.

6 Error Indicators and Warnings

None.