NAG 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) solves a real triangular banded system of equations with a single right hand side.

2 Specification

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SUBROUTINE F06PKF (UPLO, TRANS, DIAG, N, K, A, LDA, X, INCX)

INTEGER            N, K, LDA, INCX
REAL (KIND=nag_wp) A(LDA,*), X(*)
CHARACTER(1)       UPLO, TRANS, DIAG
```

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

3 Description

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

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

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

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

4 References

None.

5 Parameters

1: UPLO – CHARACTER(1) *Input*

On entry: specifies whether A is upper or lower triangular.

UPLO = 'U'
A is upper triangular.

UPLO = 'L'
A is lower triangular.

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

2: TRANS – CHARACTER(1) *Input*

On entry: specifies the operation to be performed.

TRANS = 'N'
$x \leftarrow A^{-1}x$.

TRANS = 'T' or 'C'
$x \leftarrow A^{-\mathrm{T}}x$.

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

3: DIAG – CHARACTER(1) *Input*

On entry: specifies whether A has nonunit or unit diagonal elements.

DIAG = 'N'
The diagonal elements are stored explicitly.

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: N ≥ 0.

5: K – INTEGER *Input*

On entry: k, the number of subdiagonals or superdiagonals of the matrix A.

Constraint: K ≥ 0.

6: A(LDA,$*$) – REAL (KIND=nag_wp) array *Input*

Note: the second dimension of the array A must be at least N.

On entry: the n by n triangular band matrix A

The matrix is 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 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 A$(1+i-j,j)$ for $j \leq i \leq \min(n,j+k)$.

If DIAG = 'U', the diagonal elements of A are assumed to be 1, and are not referenced.

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: LDA $\geq$ K + 1.

8: X($*$) – REAL (KIND=nag_wp) array *Input/Output*

Note: the dimension of the array X must be at least $\max(1, 1 + (\mathrm{N}-1) \times |\mathrm{INCX}|)$.

On entry: the n-element vector x.

If INCX > 0, x_i must be stored in X$(1 + (i-1) \times$ INCX), for $i = 1, 2, \ldots,$ N.

If INCX < 0, x_i must be stored in X$(1 - (\mathrm{N}-i) \times$ INCX), for $i = 1, 2, \ldots,$ N.

On exit: the updated vector x stored in the array elements used to supply the original vector x.

9: INCX – INTEGER *Input*

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

Constraint: INCX $\neq 0$.

6 Error Indicators and Warnings

None.

7 Accuracy

Not applicable.

8 Further Comments

None.

9 Example

None.