NAG Library Routine Document

F06YJF (DTRSM)

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

F06YJF (DTRSM) performs one of the matrix-matrix operations

$$B \leftarrow \alpha A^{-1}B, \qquad B \leftarrow \alpha A^{-\mathrm{T}}B,$$
$$B \leftarrow \alpha BA^{-1} \quad \text{or} \quad B \leftarrow \alpha BA^{-\mathrm{T}},$$

where A is a real triangular matrix, B is an m by n real matrix, and α is a real scalar. $A^{-\mathrm{T}}$ denotes $(A^{\mathrm{T}})^{-1}$ or equivalently $(A^{-1})^{\mathrm{T}}$.

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

2 Specification

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SUBROUTINE F06YJF (SIDE, UPLO, TRANSA, DIAG, M, N, ALPHA, A, LDA, B,       &
                   LDB)
INTEGER             M, N, LDA, LDB
REAL (KIND=nag_wp) ALPHA, A(LDA,*), B(LDB,*)
CHARACTER(1)        SIDE, UPLO, TRANSA, DIAG
```

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

3 Description

None.

4 References

None.

5 Arguments

1: SIDE – CHARACTER(1) *Input*

On entry: specifies whether B is operated on from the left or the right.

SIDE = 'L'
B is pre-multiplied from the left.

SIDE = 'R'
B is post-multiplied from the right.

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

2: 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'.

3: TRANSA – CHARACTER(1) *Input*

On entry: specifies whether the operation involves A^{-1} or $A^{-\mathrm{T}}$.

TRANSA = 'N'
The operation involves A^{-1}.

TRANSA = 'T' or 'C'
The operation involves $A^{-\mathrm{T}}$.

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

4: 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'.

5: M – INTEGER *Input*

On entry: m, the number of rows of the matrix B; the order of A if SIDE = 'L'.

Constraint: M ≥ 0.

6: N – INTEGER *Input*

On entry: n, the number of columns of the matrix B; the order of A if SIDE = 'R'.

Constraint: N ≥ 0.

7: ALPHA – REAL (KIND=nag_wp) *Input*

On entry: the scalar α.

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

Note: the second dimension of the array A must be at least $\max(1, \mathrm{M})$ if SIDE = 'L' and at least $\max(1, \mathrm{N})$ if SIDE = 'R'.

On entry: the triangular matrix A; A is m by m if SIDE = 'L', or n by n if SIDE = 'R'.

If UPLO = 'U', A is upper triangular and the elements of the array below the diagonal are not referenced.

If UPLO = 'L', A is lower triangular and the elements of the array above the diagonal are not referenced.

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

9: LDA – INTEGER *Input*

On entry: the first dimension of the array A as declared in the (sub)program from which F06YJF (DTRSM) is called.

Constraints:

if SIDE = 'L', LDA $\geq \max(1, \mathrm{M})$;
if SIDE = 'R', LDA $\geq \max(1, \mathrm{N})$.

10: B(LDB, $*$) – REAL (KIND=nag_wp) array *Input/Output*

Note: the second dimension of the array B must be at least max(1, N).

On entry: the m by n matrix B.

If ALPHA $= 0$, B need not be set.

On exit: the updated matrix B.

11: LDB – INTEGER *Input*

On entry: the first dimension of the array B as declared in the (sub)program from which F06YJF (DTRSM) is called.

Constraint: LDB $\geq$ max(1, M).

6 Error Indicators and Warnings

None.

7 Accuracy

Not applicable.

8 Parallelism and Performance

F06YJF (DTRSM) is threaded by NAG for parallel execution in multithreaded implementations of the NAG Library.

Please consult the X06 Chapter Introduction for information on how to control and interrogate the OpenMP environment used within this routine. Please also consult the Users' Note for your implementation for any additional implementation-specific information.

9 Further Comments

None.

10 Example

None.