NAG Library Routine Document

F06SJF (ZTRSV)

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

F06SJF (ZTRSV) solves a complex triangular system of equations with a single right hand side.

2 Specification

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SUBROUTINE F06SJF (UPLO, TRANS, DIAG, N, A, LDA, X, INCX)

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

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

3 Description

F06SJF (ZTRSV) performs one of the matrix-vector operations

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

where A is an n by n complex triangular matrix, and x is an n-element complex vector. A^{-T} denotes $(A^{T})^{-1}$ or equivalently $(A^{-1})^{T}$; A^{-H} denotes $(A^{H})^{-1}$ or equivalently $(A^{-1})^{H}$.

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'
    $x \leftarrow A^{-T}x$.

TRANS = 'C'
$$x \leftarrow A^{-\mathrm{H}}x.$$

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: $N \geq 0$.

5:     A(LDA, $*$) – COMPLEX (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 matrix A.

   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.

6:     LDA – INTEGER   *Input*

On entry: the first dimension of the array A as declared in the (sub)program from which F06SJF
(ZTRSV) is called.

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

7:     X($*$) – COMPLEX (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 vector x.

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

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

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

8:     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   Parallelism and Performance

Not applicable.

9   Further Comments

None.

10   Example

None.