NAG C Library Function Document

ztrsv (f06sjc)

1 Purpose

ztrsv (f06sjc) performs one of the matrix-vector operations

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

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

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

2 Specification

```
#include <nag.h>
#include <nagf06.h>

void ztrsv (MatrixTriangle uplo, MatrixTranspose trans, MatrixUnitTriangular diag,
     Integer n, const Complex a[], Integer tda, Complex x[], Integer incx)
```

3 Arguments

1: **uplo** – MatrixTriangle *Input*

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

if **uplo** = **UpperTriangle**, A is upper triangular;
if **uplo** = **LowerTriangle**, A is lower triangular.

Constraint: **uplo** = **UpperTriangle** or **LowerTriangle**.

2: **trans** – MatrixTranspose *Input*

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

if **trans** = **NoTranspose**, $x \leftarrow A^{-1}x$;
if **trans** = **Transpose**, $x \leftarrow A^{-T}x$;
if **trans** = **ConjugateTranspose**, $x \leftarrow A^{-H}x$.

Constraint: **trans** = **NoTranspose**, **Transpose** or **ConjugateTranspose**.

3: **diag** – MatrixUnitTriangular *Input*

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

if **diag** = **NotUnitTriangular**, the diagonal elements are stored explicitly;
if **diag** = **UnitTriangular**, the diagonal elements are assumed to be 1, and are not referenced.

Constraint: **diag** = **NotUnitTriangular** or **UnitTriangular**.

4: **n** – Integer *Input*

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

Constraint: **n** ≥ 0.

5: **a**[**n** × **tda**] – const Complex *Input*

On entry: the n by n triangular matrix A.

uplo = **UpperTriangle**

A is upper triangular and the elements of the array below the diagonal are not referenced.

uplo = **LowerTriangle**

A is lower triangular and the elements of the array above the diagonal are not referenced.

diag = **UnitTriangular**

The diagonal elements of *A* are not referenced, but are assumed to be 1.

6: **tda** – Integer *Input*

On entry: the second dimension of the array **a** as declared in the function from which ztrsv (f06sjc) is called.

Constraint: **tda** $\geq \max(1, \mathbf{n})$.

7: **x**[**n**] – Complex *Input/Output*

On entry: the incremented array **x** must contain the *n* element right-hand side vector *x*.

On exit: the solution vector *x*.

8: **incx** – Integer *Input*

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

Constraint: **incx** $\neq 0$.

4 Error Indicators and Warnings

If a function is called with an invalid argument then an error message is output on stderr, giving the name of the function and the number of the first invalid argument, and execution is terminated.