NAG C Library Function Document

ztbmv (f06sgc)

1 Purpose

ztbmv (f06sgc) performs one of the matrix-vector operations

$$x \leftarrow Ax, x \leftarrow A^{\mathrm{T}}x \text{ or } x \leftarrow A^{H}x,$$

where A is an n by n complex triangular band matrix with k sub-diagonals or super-diagonals, and x is an n element complex vector.

2 Specification

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

void ztbmv (MatrixTriangle uplo, MatrixTranspose trans, MatrixUnitTriangular diag,
     Integer n, Integer k, 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**, $x \leftarrow Ax$;
if **trans** = **Transpose**, $x \leftarrow A^{\mathrm{T}}x$;
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: **k** – Integer *Input*

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

Constraint: **k** ≥ 0.

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

On entry: the n by n triangular band matrix A, stored in n rows and $k+1$ columns. More precisely,

if **uplo** = **UpperTriangle**, the elements of the upper triangle of A within the band must be stored with element a_{ij} in **a**$[i-1][j-i]$ for $1 \leq i \leq n$ and $i \leq j \leq \min(n, i+k)$;
if **uplo** = **LowerTriangle**, the elements of the lower triangle of A within the band must be stored with element a_{ij} in **a**$[i-1][k+j-i]$ for $1 \leq i \leq n$ and $\max(1, i-k) \leq j \leq i$.

7: **tda** – Integer *Input*

On entry: the second dimension of the array **a** as declared in the function from which ztbmv (f06sgc) is called.

Constraint: **tda** $\geq$ **k** + 1.

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

On entry: the incremented array **x** must contain the n element 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: **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.