NAG C Library Function Document

dgbmv (f06pbc)

1 Purpose

dgbmv (f06pbc) performs one of the matrix-vector operations

$$y \leftarrow \alpha Ax + \beta y, \text{ or } y \leftarrow \alpha A^{\mathrm{T}}x + \beta y,$$

where A is an m by n real band matrix with k_l sub-diagonals and k_u super-diagonals, x and y are real vectors, and α and β are real scalars.

If $m = 0$ or $n = 0$, no operation is performed.

2 Specification

```
#include <nag.h>
#include <nagf06.h>
void dgbmv (MatrixTranspose trans, Integer m, Integer n, Integer kl, Integer ku,
      double alpha, const double a[], Integer tda, const double x[], Integer incx,
      double beta, double y[], Integer incy)
```

3 Arguments

1: **trans** – MatrixTranspose *Input*

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

if **trans** = **NoTranspose**, $y \leftarrow \alpha Ax + \beta y$;
if **trans** = **Transpose** or **ConjugateTranspose**, $y \leftarrow \alpha A^{\mathrm{T}}x + \beta y$.

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

2: **m** – Integer *Input*

On entry: m, the number of rows of the matrix A.

Constraint: **m** ≥ 0.

3: **n** – Integer *Input*

On entry: n, the number of columns of the matrix A.

Constraint: **n** ≥ 0.

4: **kl** – Integer *Input*

On entry: k_l, the number of sub-diagonals within the band of A.

Constraint: **kl** ≥ 0.

5: **ku** – Integer *Input*

On entry: k_u, the number of super-diagonals within the band of A.

Constraint: **ku** ≥ 0.

6: **alpha** – double *Input*

On entry: the scalar α.

7: **a**[**m** × **tda**] – const double *Input*

On entry: the m by n band matrix A, stored in m rows and $k_l + k_u + 1$ columns. More precisely, a_{ij} must be stored in $\mathbf{a}[i-1][k_l - i + j]$ for $1 \leq i \leq m$ and $\max(1, i - k_l) \leq j \leq \min(n, i + k_u)$.

8: **tda** – Integer *Input*

On entry: the second dimension of the array **a** as declared in the function from which dgbmv (f06pbc) is called.

Constraint: **tda** $\geq$ **kl** + **ku** + 1.

9: **x**[**n**] – const double *Input*

On entry: the vector x, of length n if **trans** = **NoTranspose**, or of length m if **trans** = **Transpose** or **ConjugateTranspose**.

10: **incx** – Integer *Input*

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

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

11: **beta** – double *Input*

On entry: the scalar β.

12: **y**[**m**] – double *Input/Output*

On entry: the vector y, of length m if **trans** = **NoTranspose**, or of length n if **trans** = **Transpose** or **ConjugateTranspose**.

On exit: the updated vector y.

13: **incy** – Integer *Input*

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

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

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.