

# NAG C Library Function Document

## zgbmv (f06sdc)

### 1 Purpose

zgbmv (f06sdc) performs the matrix-vector operation

$$y \leftarrow \alpha Ax + \beta y$$

where  $A$  is an  $n$  by  $n$  complex Hermitian band matrix with  $k$  sub-diagonals and  $k$  super-diagonals,  $x$  and  $y$  are  $n$  element complex vectors, and  $\alpha$  and  $\beta$  are complex scalars.

### 2 Specification

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

```
void zgbmv (MatrixTriangle uplo, Integer n, Integer k, Complex alpha,
           const Complex a[], Integer tda, const Complex x[], Integer incx, Complex beta,
           Complex y[], Integer incy)
```

### 3 Arguments

- 1: **uplo** – MatrixTriangle *Input*  
*On entry:* specifies whether the upper or lower triangular part of  $A$  is stored as follows:  
     if **uplo** = **UpperTriangle**, the upper triangular part of  $A$  is stored;  
     if **uplo** = **LowerTriangle**, the lower triangular part of  $A$  is stored.  
*Constraint:* **uplo** = **UpperTriangle** or **LowerTriangle**.
- 2: **n** – Integer *Input*  
*On entry:*  $n$ , the order of the matrix  $A$ .  
*Constraint:*  $n \geq 0$ .
- 3: **k** – Integer *Input*  
*On entry:*  $k$ , the number of sub-diagonals or super-diagonals of the matrix  $A$ .  
*Constraint:*  $k \geq 0$ .
- 4: **alpha** – Complex *Input*  
*On entry:* the scalar  $\alpha$ .
- 5: **a**[ $n \times tda$ ] – const Complex *Input*  
*On entry:* the  $n$  by  $n$  Hermitian 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  $\max(1, i - k) \leq j \leq i$ .
- 6: **tda** – Integer *Input*  
*On entry:* the second dimension of the array **a** as declared in the function from which zgbmv (f06sdc) is called.  
*Constraint:* **tda**  $\geq k + 1$ .

- 7: **x[n]** – const Complex *Input*  
*On entry:* the incremented array **x** must contain the  $n$  element vector  $x$ .
- 8: **incx** – Integer *Input*  
*On entry:* the increment in the subscripts of **x** between successive elements of  $x$ .  
*Constraint:* **incx**  $\neq 0$ .
- 9: **beta** – Complex *Input*  
*On entry:* the scalar  $\beta$ .
- 10: **y[n]** – Complex *Input/Output*  
*On entry:* the incremented array **y** must contain the  $n$  element vector  $y$ .  
*On exit:* the updated vector  $y$ .
- 11: **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.

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