NAG Library Routine Document

F06PDF (DSBMV)

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

F06PDF (DSBMV) computes the matrix-vector product for a real symmetric band matrix.

2 Specification

```
SUBROUTINE F06PDF (UPLO, N, K, ALPHA, A, LDA, X, INCX, BETA, Y, INCY)
INTEGER            N, K, LDA, INCX, INCY
REAL (KIND=nag_wp) ALPHA, A(LDA,*), X(*), BETA, Y(*)
CHARACTER(1)       UPLO
```

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

3 Description

F06PDF (DSBMV) performs the matrix-vector operation

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

where A is an n by n real symmetric band matrix with k subdiagonals and k superdiagonals, x and y are n-element real vectors, and α and β are real scalars.

4 References

None.

5 Arguments

1: UPLO – CHARACTER(1) *Input*

On entry: specifies whether the upper or lower triangular part of A is stored.

UPLO = 'U'
The upper triangular part of A is stored.

UPLO = 'L'
The lower triangular part of A is stored.

Constraint: UPLO = 'U' or 'L'.

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 subdiagonals or superdiagonals of the matrix A.

Constraint: K $\geq$ 0.

4: ALPHA – REAL (KIND=nag_wp) *Input*

On entry: the scalar α.

5: A(LDA, $*$) – REAL (KIND=nag_wp) array *Input*

Note: the second dimension of the array A must be at least N.

On entry: the n by n symmetric band matrix A.

The matrix is stored in rows 1 to $k+1$, more precisely,

if UPLO = 'U', the elements of the upper triangle of A within the band must be stored with element A_{ij} in A$(k+1+i-j,j)$ for $\max(1,j-k) \leq i \leq j$;

if UPLO = 'L', the elements of the lower triangle of A within the band must be stored with element A_{ij} in A$(1+i-j,j)$ for $j \leq i \leq \min(n,j+k)$.

6: LDA – INTEGER *Input*

On entry: the first dimension of the array A as declared in the (sub)program from which F06PDF (DSBMV) is called.

Constraint: LDA $\geq$ K + 1.

7: X($*$) – REAL (KIND=nag_wp) array *Input*

Note: the dimension of the array X must be at least $\max(1, 1 + (\text{N}-1) \times |\text{INCX}|)$.

On entry: the n-element vector x.

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

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

Intermediate elements of X are not referenced.

8: INCX – INTEGER *Input*

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

Constraint: INCX $\neq 0$.

9: BETA – REAL (KIND=nag_wp) *Input*

On entry: the scalar β.

10: Y($*$) – REAL (KIND=nag_wp) array *Input/Output*

Note: the dimension of the array Y must be at least $\max(1, 1 + (\text{N}-1) \times |\text{INCY}|)$.

On entry: the n-element vector y, if BETA $= 0.0$ Y need not be set.

If INCY > 0, y_i must be stored in Y$(1 + (i-1) \times \text{INCY})$, for $i = 1, 2, \ldots, \text{N}$.

If INCY < 0, y_i must be stored in Y$(1-(\text{N}-i) \times \text{INCY})$, for $i = 1, 2, \ldots, \text{N}$.

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

11: INCY – INTEGER *Input*

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

Constraint: INCY $\neq 0$.

6 Error Indicators and Warnings

None.

7 Accuracy

Not applicable.

8 Parallelism and Performance

F06PDF (DSBMV) is not threaded in any implementation.

9 Further Comments

None.

10 Example

None.