

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) | <i>Input</i> |
| | <i>On entry:</i> 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. | |
| | <i>Constraint:</i> UPLO = 'U' or 'L'. | |
| 2: | N – INTEGER | <i>Input</i> |
| | <i>On entry:</i> n , the order of the matrix A . | |
| | <i>Constraint:</i> $N \geq 0$. | |
| 3: | K – INTEGER | <i>Input</i> |
| | <i>On entry:</i> k , the number of subdiagonals or superdiagonals of the matrix A . | |
| | <i>Constraint:</i> $K \geq 0$. | |
| 4: | ALPHA – REAL (KIND=nag_wp) | <i>Input</i> |
| | <i>On entry:</i> 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 $\max(1, 1 + (N - 1) \times |INCX|)$.
On entry: the n -element vector x .
 If $INCX > 0$, x_i must be stored in $X(1 + (i - 1) \times INCX)$, for $i = 1, 2, \dots, N$.
 If $INCX < 0$, x_i must be stored in $X(1 - (N - i) \times INCX)$, for $i = 1, 2, \dots, N$.
 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 $\max(1, 1 + (N - 1) \times |INCY|)$.
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 $Y(1 + (i - 1) \times INCY)$, for $i = 1, 2, \dots, N$.
 If $INCY < 0$, y_i must be stored in $Y(1 - (N - i) \times INCY)$, for $i = 1, 2, \dots, N$.
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.
