

NAG Library Routine Document

F06YRF (DSYR2K)

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

F06YRF (DSYR2K) performs one of the symmetric rank- $2k$ update operations

$$C \leftarrow \alpha AB^T + \alpha BA^T + \beta C \quad \text{or} \quad C \leftarrow \alpha A^T B + \alpha B^T A + \beta C,$$

where A and B are real matrices, C is an n by n real symmetric matrix, and α and β are real scalars.

2 Specification

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SUBROUTINE F06YRF (UPLO, TRANS, N, K, ALPHA, A, LDA, B, LDB, BETA, C, LDC)
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INTEGER          N, K, LDA, LDB, LDC
REAL (KIND=nag_wp) ALPHA, A(LDA,*), B(LDB,*), BETA, C(LDC,*)
CHARACTER(1)    UPLO, TRANS
```

The routine may be called by its BLAS name *dsyr2k*.

3 Description

None.

4 References

None.

5 Parameters

1: UPLO – CHARACTER(1) *Input*

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

UPLO = 'U'

The upper triangular part of C is stored.

UPLO = 'L'

The lower triangular part of C is stored.

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

2: TRANS – CHARACTER(1) *Input*

On entry: specifies the operation to be performed.

TRANS = 'N'

$$C \leftarrow \alpha AB^T + \alpha BA^T + \beta C.$$

TRANS = 'T' or 'C'

$$C \leftarrow \alpha A^T B + \alpha B^T A + \beta C.$$

Constraint: TRANS = 'N', 'T' or 'C'.

- 3: N – INTEGER *Input*
On entry: n , the order of the matrix C ; the number of rows of A and B if TRANS = 'N', or the number of columns of A and B if TRANS = 'T' or 'C'.
Constraint: $N \geq 0$.
- 4: K – INTEGER *Input*
On entry: k , the number of columns of A and B if TRANS = 'N', or the number of rows of A and B if TRANS = 'T' or 'C'.
Constraint: $K \geq 0$.
- 5: ALPHA – REAL (KIND=nag_wp) *Input*
On entry: the scalar α .
- 6: A(LDA,*) – REAL (KIND=nag_wp) array *Input*
Note: the second dimension of the array A must be at least $\max(1, K)$ if TRANS = 'N' and at least $\max(1, N)$ if TRANS = 'T' or 'C'.
On entry: the matrix A ; A is n by k if TRANS = 'N', or k by n if TRANS = 'T' or 'C'.
- 7: LDA – INTEGER *Input*
On entry: the first dimension of the array A as declared in the (sub)program from which F06YRF (DSYR2K) is called.
Constraints:
 if TRANS = 'N', $LDA \geq \max(1, N)$;
 if TRANS = 'T' or 'C', $LDA \geq \max(1, K)$.
- 8: B(LDB,*) – REAL (KIND=nag_wp) array *Input*
Note: the second dimension of the array B must be at least $\max(1, K)$ if TRANS = 'N' and at least $\max(1, N)$ if TRANS = 'T' or 'C'.
On entry: the matrix B ; B is n by k if TRANS = 'N', or k by n if TRANS = 'T' or 'C'.
- 9: LDB – INTEGER *Input*
On entry: the first dimension of the array B as declared in the (sub)program from which F06YRF (DSYR2K) is called.
Constraints:
 if TRANS = 'N', $LDB \geq \max(1, N)$;
 if TRANS = 'T' or 'C', $LDB \geq \max(1, K)$.
- 10: BETA – REAL (KIND=nag_wp) *Input*
On entry: the scalar β .
- 11: C(LDC,*) – REAL (KIND=nag_wp) array *Input/Output*
Note: the second dimension of the array C must be at least $\max(1, N)$.
On entry: the n by n symmetric matrix C .
 If UPLO = 'U', the upper triangular part of C must be stored and the elements of the array below the diagonal are not referenced.
 If UPLO = 'L', the lower triangular part of C must be stored and the elements of the array above the diagonal are not referenced.
On exit: the updated matrix C .

12: LDC – INTEGER

Input

On entry: the first dimension of the array C as declared in the (sub)program from which F06YRF (DSYR2K) is called.

Constraint: $LDC \geq \max(1, N)$.

6 Error Indicators and Warnings

None.

7 Accuracy

Not applicable.

8 Further Comments

None.

9 Example

None.
