NAG Library Routine Document

F06YAF (DGEMM)

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

F06YAF (DGEMM) performs one of the matrix-matrix operations

$$\begin{array}{ll} C \leftarrow \alpha AB + \beta C, & C \leftarrow \alpha A^{\mathrm{T}} B + \beta C, \\ C \leftarrow \alpha AB^{\mathrm{T}} + \beta C \quad \text{or} & C \leftarrow \alpha A^{\mathrm{T}} B^{\mathrm{T}} + \beta C, \end{array}$$

where A, B and C are real matrices, and α and β are real scalars; C is always m by n.

2 Specification

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SUBROUTINE F06YAF (TRANSA, TRANSB, M, N, K, ALPHA, A, LDA, B, LDB, BETA,    &
                   C, LDC)
INTEGER            M, N, K, LDA, LDB, LDC
REAL (KIND=nag_wp) ALPHA, A(LDA,*), B(LDB,*), BETA, C(LDC,*)
CHARACTER(1)       TRANSA, TRANSB
```

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

3 Description

None.

4 References

None.

5 Arguments

1: TRANSA – CHARACTER(1) *Input*

On entry: specifies whether the operation involves A or A^{T}.

TRANSA = 'N'
The operation involves A.

TRANSA = 'T' or 'C'
The operation involves A^{T}.

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

2: TRANSB – CHARACTER(1) *Input*

On entry: specifies whether the operation involves B or B^{T}.

TRANSB = 'N'
The operation involves B.

TRANSB = 'T' or 'C'
The operation involves B^{T}.

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

3: M – INTEGER *Input*

On entry: m, the number of rows of the matrix C; the number of rows of A if TRANSA = 'N', or the number of columns of A if TRANSA = 'T' or 'C'.

Constraint: M ≥ 0.

4: N – INTEGER *Input*

On entry: n, the number of columns of the matrix C; the number of columns of B if TRANSB = 'N', or the number of rows of B if TRANSB = 'T' or 'C'.

Constraint: N ≥ 0.

5: K – INTEGER *Input*

On entry: k, the number of columns of A if TRANSA = 'N', or the number of rows of A if TRANSA = 'T' or 'C'; the number of rows of B if TRANSB = 'N', or the number of columns of B if TRANSB = 'T' or 'C'.

Constraint: K ≥ 0.

6: ALPHA – REAL (KIND=nag_wp) *Input*

On entry: the scalar α.

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

Note: the second dimension of the array A must be at least max(1, K) if TRANSA = 'N' and at least max(1, M) if TRANSA = 'T' or 'C'.

On entry: the matrix A; A is m by k if TRANSA = 'N', or k by m if TRANSA = 'T' or 'C'.

8: LDA – INTEGER *Input*

On entry: the first dimension of the array A as declared in the (sub)program from which F06YAF (DGEMM) is called.

Constraints:

if TRANSA = 'N', LDA $\geq$ max(1, M);
if TRANSA = 'T' or 'C', LDA $\geq$ max(1, K).

9: B(LDB, $*$) – REAL (KIND=nag_wp) array *Input*

Note: the second dimension of the array B must be at least max(1, N) if TRANSB = 'N' and at least max(1, K) if TRANSB = 'T' or 'C'.

On entry: the matrix B; B is k by n if TRANSB = 'N', or n by k if TRANSB = 'T' or 'C'.

10: LDB – INTEGER *Input*

On entry: the first dimension of the array B as declared in the (sub)program from which F06YAF (DGEMM) is called.

Constraints:

if TRANSB = 'N', LDB $\geq$ max(1, K);
if TRANSB = 'T' or 'C', LDB $\geq$ max(1, N).

11: BETA – REAL (KIND=nag_wp) *Input*

On entry: the scalar β.

12: 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 m by n matrix C.

If BETA $= 0$, C need not be set.

On exit: the updated matrix C.

13: LDC – INTEGER *Input*

On entry: the first dimension of the array C as declared in the (sub)program from which F06YAF (DGEMM) is called.

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

6 Error Indicators and Warnings

None.

7 Accuracy

Not applicable.

8 Parallelism and Performance

F06YAF (DGEMM) is threaded by NAG for parallel execution in multithreaded implementations of the NAG Library.

Please consult the X06 Chapter Introduction for information on how to control and interrogate the OpenMP environment used within this routine. Please also consult the Users' Note for your implementation for any additional implementation-specific information.

9 Further Comments

None.

10 Example

None.