NAG C Library Function Document

dgemm (f06yac)

1 Purpose

dgemm (f06yac) performs one of the matrix-matrix operations

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

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

2 Specification

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

void dgemm (MatrixTranspose transa, MatrixTranspose transb, Integer m, Integer n,
     Integer k, double alpha, const double a[], Integer tda, const double b[],
     Integer tdb, double beta, double c[], Integer tdc)
```

3 Arguments

1: **transa** – MatrixTranspose *Input*

On entry: specifies whether the operation involves A or A^{T}, as follows:

if **transa** = **NoTranspose**, it involves A;
if **transa** = **Transpose** or **ConjugateTranspose**, it involves A^{T}.

Constraint: **transa** = **NoTranspose**, **Transpose** or **ConjugateTranspose**.

2: **transb** – MatrixTranspose *Input*

On entry: specifies whether the operation involves B or B^{T}, as follows:

if **transb** = **NoTranspose**, it involves B;
if **transb** = **Transpose** or **ConjugateTranspose**, it involves B^{T}.

Constraint: **transb** = **NoTranspose**, **Transpose** or **ConjugateTranspose**.

3: **m** – Integer *Input*

On entry: m, the number of rows of the matrix C; the number of rows of A if **transa** = **NoTranspose**, or the number of columns of A if **transa** = **Transpose** or **ConjugateTranspose**.

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** = **NoTranspose**, or the number of rows of B if **transb** = **Transpose** or **ConjugateTranspose**.

Constraint: **n** ≥ 0.

5: **k** – Integer *Input*

On entry: k, the number of columns of A, if **transa** = **NoTranspose**, or the number of rows of A if **transa** = **Transpose** or **ConjugateTranspose**; the number of rows of B if **transb** = **NoTranspose**, or the number of columns of B if **transb** = **Transpose** or **ConjugateTranspose**.

Constraint: $\mathbf{k} \geq 0$.

6: **alpha** – double *Input*

On entry: the scalar α.

7: **a**[× **tda**] – const double *Input*

On entry: the matrix A; A is m by k if **transa** = **NoTranspose**, or k by m if **transa** = **Transpose** or **ConjugateTranspose**.

8: **tda** – Integer *Input*

On entry: the second dimension of the array **a** as declared in the function from which dgemm (f06yac) is called.

Constraint: **tda** $\geq max(1,$**k**$)$ if **transa** = **NoTranspose**; **tda** $\geq max(1,$**m**$)$ if **transa** = **Transpose** or **ConjugateTranspose**.

9: **b**[× **tdb**] – const double *Input*

On entry: the matrix B; B is k by n if **transb** = **NoTranspose**, or n by k if **transb** = **Transpose** or **ConjugateTranspose**.

10: **tdb** – Integer *Input*

On entry: the second dimension of the array **b** as declared in the function from which dgemm (f06yac) is called.

Constraint: **tdb** $\geq max(1,$**n**$)$ if **transb** = **NoTranspose**; **tdb** $\geq max(1,$**k**$)$ if **transb** = **Transpose** or **ConjugateTranspose**.

11: **beta** – double *Input*

On entry: the scalar β.

12: **c**[**m** × **tdc**] – double *Input/Output*

On entry: the m by n matrix C. If **beta** = 0, **c** need not be set.

On exit: the updated matrix C.

13: **tdc** – Integer *Input*

On entry: the second dimension of the array **c** as declared in the function from which dgemm (f06yac) is called.

Constraint: **tdc** $\geq \max(1, \mathbf{n})$.

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.