NAG Fortran Library Routine Document

F06ZAF (ZGEMM)

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

F06ZAF (ZGEMM) performs one of the matrix-matrix operations

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

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

2 Specification

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SUBROUTINE F06ZAF (TRANSA, TRANSB, M, N, K, ALPHA, A, LDA, B, LDB, BETA,
1                  C, LDC)
INTEGER            M, N, K, LDA, LDB, LDC
complex*16         ALPHA, A(LDA,*), B(LDB,*), BETA, C(LDC,*)
CHARACTER*1        TRANSA, TRANSB
```

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

3 Description

None.

4 References

None.

5 Parameters

1: TRANSA – CHARACTER*1 *Input*

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

if TRANSA = 'N', it involves A;
if TRANSA = 'T', it involves A^T;
if TRANSA = 'C', it involves A^H.

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

2: TRANSB – CHARACTER*1 *Input*

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

if TRANSB = 'N', it involves B;
if TRANSB = 'T', it involves B^T;
if TRANSB = 'C', it involves B^H.

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: $\mathrm{M} \geq 0$.

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: $\mathrm{N} \geq 0$.

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: $\mathrm{K} \geq 0$.

6: ALPHA – ***complex*16*** *Input*

On entry: the scalar α.

7: A(LDA,$*$) – ***complex*16*** array *Input*

Note: the second dimension of the array A must be at least $\max(1, \mathrm{K})$ if TRANSA = 'N' and at least $\max(1, \mathrm{N})$ 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 F06ZAF (ZGEMM) is called.

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

9: B(LDB,$*$) – ***complex*16*** array *Input*

Note: the second dimension of the array B must be at least $\max(1, \mathrm{N})$ if TRANSB = 'N' and at least $\max(1, \mathrm{K})$ 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 F06ZAF (ZGEMM) is called.

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

11: BETA – ***complex*16*** *Input*

On entry: the scalar β.

12: C(LDC,$*$) – ***complex*16*** array *Input/Output*

Note: the second dimension of the array C must be at least $\max(1, \mathrm{N})$.

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 F06ZAF (ZGEMM) is called.

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

6 Error Indicators and Warnings

None.