

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

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

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

2 Specification

```
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 $\text{TRANSA} = 'N'$, or the number of columns of A if $\text{TRANSA} = 'T'$ or $'C'$.
Constraint: $M \geq 0$.
- 4: N – INTEGER *Input*
On entry: n , the number of columns of the matrix C ; the number of columns of B if $\text{TRANSB} = 'N'$, or the number of rows of B if $\text{TRANSB} = 'T'$ or $'C'$.
Constraint: $N \geq 0$.
- 5: K – INTEGER *Input*
On entry: k , the number of columns of A , if $\text{TRANSA} = 'N'$, or the number of rows of A if $\text{TRANSA} = 'T'$ or $'C'$; the number of rows of B if $\text{TRANSB} = 'N'$, or the number of columns of B if $\text{TRANSB} = 'T'$ or $'C'$.
Constraint: $K \geq 0$.
- 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 $\max(1, K)$ if $\text{TRANSA} = 'N'$ and at least $\max(1, N)$ if $\text{TRANSA} = 'T'$ or $'C'$.
On entry: the matrix A ; A is m by k if $\text{TRANSA} = 'N'$, or k by m if $\text{TRANSA} = 'T'$ 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: $LDA \geq \max(1, M)$ if $\text{TRANSA} = 'N'$; $LDA \geq \max(1, K)$ if $\text{TRANSA} = 'T'$ or $'C'$.
- 9: B(LDB,*) – **complex*16** array *Input*
Note: the second dimension of the array B must be at least $\max(1, N)$ if $\text{TRANSB} = 'N'$ and at least $\max(1, K)$ if $\text{TRANSB} = 'T'$ or $'C'$.
On entry: the matrix B ; B is k by n if $\text{TRANSB} = 'N'$, or n by k if $\text{TRANSB} = 'T'$ 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: $LDB \geq \max(1, N)$ if $\text{TRANSB} = 'N'$; $LDB \geq \max(1, K)$ if $\text{TRANSB} = 'T'$ 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 $\max(1, N)$.
On entry: the m by n matrix C . If $\text{BETA} = 0$, 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: $LDC \geq \max(1, M)$.

6 Error Indicators and Warnings

None.
