

NAG 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, &
C, LDC)

INTEGER M, N, K, LDA, LDB, LDC
COMPLEX (KIND=nag_wp) 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 .

TRANSA = 'N'

The operation involves A .

TRANSA = 'T'

The operation involves A^T .

TRANSA = 'C'

The operation 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 .

TRANSB = 'N'

The operation involves B .

TRANSB = 'T'

The operation involves B^T .

TRANSB = 'C'

The operation 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: $M \geq 0$.

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: $N \geq 0$.

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: $K \geq 0$.

6: ALPHA – COMPLEX (KIND=nag_wp) *Input*

On entry: the scalar α .

7: A(LDA,*) – COMPLEX (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 F06ZAF (ZGEMM) is called.

Constraints:

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

9: B(LDB,*) – COMPLEX (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 F06ZAF (ZGEMM) is called.

Constraints:

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

- 11: BETA – COMPLEX (KIND=nag_wp) *Input*
On entry: the scalar β .
- 12: C(LDC,*) – COMPLEX (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 F06ZAF (ZGEMM) is called.
Constraint: $LDC \geq \max(1, M)$.

6 Error Indicators and Warnings

None.

7 Accuracy

Not applicable.

8 Parallelism and Performance

Not applicable.

9 Further Comments

None.

10 Example

None.
