NAG Library Routine Document

F06VKF

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

F06VKF permutes the rows or columns of a complex rectangular matrix using a real array of permutations.

2 Specification

```
SUBROUTINE F06VKF (SIDE, TRANS, N, PERM, K, B, LDB)
INTEGER                 N, K, LDB
REAL (KIND=nag_wp)      PERM(*)
COMPLEX (KIND=nag_wp) B(LDB,*)
CHARACTER(1)            SIDE, TRANS
```

3 Description

F06VKF performs one of the permutation operations

$$\begin{array}{lll} B \leftarrow P^{\mathrm{T}}B, & & B \leftarrow PB, \\ B \leftarrow BP^{\mathrm{T}} & \text{or} & B \leftarrow BP, \end{array}$$

where B is a complex matrix, and P is a permutation matrix.

P is represented in the form

$$P = P_{1,p_1}P_{2,p_2}\cdots P_{n,p_n},$$

where $P_{i,j}$ is the permutation matrix that interchanges items i and j; that is, $P_{i,j}$ is the unit matrix with rows and columns i and j interchanged. If $i = j$, $P_{i,j} = I$.

Let m denote the number of rows of B if SIDE = 'L', or the number of columns of B if SIDE = 'R': the routine does not require m to be passed as an argument, but assumes that $m \geq p_i$, for $i = 1, 2, \ldots, n$.

This routine requires the indices p_i to be supplied in a real array (the routine takes the integer part of the array elements); F06VJF performs the same operation with the indices supplied in an integer array.

4 References

None.

5 Arguments

1: SIDE – CHARACTER(1) *Input*

2: TRANS – CHARACTER(1) *Input*

On entry: specifies the operation to be performed.

SIDE = 'L' and TRANS = 'T'
$B \leftarrow P^{\mathrm{T}}B$.

SIDE = 'L' and TRANS = 'N'
$B \leftarrow PB$.

SIDE = 'R' and TRANS = 'T'
$B \leftarrow BP^{\mathrm{T}}$.

SIDE = 'R' and TRANS = 'N'
$B \leftarrow BP$.

Constraints:

SIDE = 'L' or 'R';
TRANS = 'N' or 'T'.

3: N – INTEGER *Input*

On entry: n, the number of interchanges in the representation of P.

Constraint: N ≥ 0.

4: PERM$(*)$ – REAL (KIND=nag_wp) array *Input*

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

On entry: the n indices p_i which define the interchanges in the representation of P. It is usual to have $p_i \geq i$, but this is not necessary.

Constraint: $1 \leq \mathrm{PERM}(i) \leq m$.

5: K – INTEGER *Input*

On entry: k, the number of columns of B if SIDE = 'L', or the number of rows of B if SIDE = 'R'.

Constraint: K ≥ 0.

6: B(LDB, $*$) – COMPLEX (KIND=nag_wp) array *Input/Output*

Note: the second dimension of the array B must be at least $\max(1, \mathrm{K})$ if SIDE = 'L' and at least $\max\left(1, \max\limits_{k}\{\mathrm{int}\,\mathrm{PERM}(k)\}\right)$ if SIDE = 'R'.

On entry: the original matrix B; B is m by k if SIDE = 'L', or k by m if SIDE = 'R'.

On exit: the permuted matrix B.

7: LDB – INTEGER *Input*

On entry: the first dimension of the array B as declared in the (sub)program from which F06VKF is called.

Constraints:

if SIDE = 'L', LDB $\geq \max(1, m)$;
if SIDE = 'R', LDB $\geq \max(1, \mathrm{K})$.

6 Error Indicators and Warnings

None.

7 Accuracy

Not applicable.

8 Parallelism and Performance

F06VKF is not threaded in any implementation.

9 Further Comments

None.

10 Example

None.