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Modified Bessel Functions K of Certain Order

Subroutine subprograms BSKA and DBSKA calculate the sequence of modified Bessel functions

$$K_{a+n}(x)$$

for real argument $x > 0$ and a chosen $a \in \left\{0, \frac{1}{2}, \frac{1}{3}, \frac{1}{4}, \frac{2}{3}, \frac{3}{4}\right\}$.
On CDC and Cray computers, the double-precision versions DBSKA and DEBKA are not available.

Structure:

SUBROUTINE subprograms
User Entry Names: BSKA, EBSKA, DBSKA,DEBKA
Files Referenced: Unit 6
External References: BESK0 (C313), BESK1 (C313), EBESK0 (C313), EBESK1 (C313),
DBESK0 (C313), DBESK1 (C313), DEBSK0 (C313), DEBSK1 (C313),
BSKR4 (C327), EBSKR4 (C327), DBSKR4 (C327), DEBKR4 (C327),
BSKR3 (C340), EBSKR3 (C340), DBSKR3 (C340), DEBKR3 (C340),
MTLMTR (N002), ABEND (Z035)

Usage:

Single-precision version:

```
CALL BSKA(X,IA,JA,NL,B)      or      CALL EBSKA(X,IA,JA,NL,B)
```

X (REAL) Argument x.

IA,JA (INTEGER) Numerator i and denominator j of $a = i/j$. Only the pairs

```
(IA,JA) = (0,1), (1,2), (1,3), (1,4), (2,3), (3,4)
```

are permitted. For example, IA $= 2$ and JA $= 3$ corresponds to $a = 2/3$.

NL (INTEGER) Specifies the order $a +$ NL of the last Bessel function in the computed sequence.

B (REAL) One-dimensional array with dimension (0:d) where d $\geq$ NL.
On exit, B(n), (n $= 0, 1, 2, \ldots,$ NL), contains $K_{a+\mathtt{n}}(\mathtt{X})$ for BSKA, $\exp(\mathtt{X}) * K_{a+\mathtt{n}}(\mathtt{X})$ for EBSKA, respectively.

Double-precision version:

```
CALL DBSKA(X,IA,JA,NL,B)      or      CALL DEBKA(X,IA,JA,NL,B)
```

where X and B are of type DOUBLE PRECISION.

Method:

The well-known recurrence relation for modified Bessel functions is used.

Restrictions:

X > 0, NL ≤ 100. Only the pairs (IA,JA) given above are permitted.

Error handling:

Error C341.1: $X \leq 0$.
Error C341.2: Pair (IA,JA) not permitted.
Error C341.3: $NL > 100$.
In all cases, a message is written on Unit 6, unless subroutine MTLSET (N002) has been called. The initial contents of array B is left unchanged.

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