

NAG Fortran Library Routine Document

G05KEF

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

G05KEF returns a pseudo-random logical value – *true* with probability p and *false* with probability $(1 - p)$.

2 Specification

```
LOGICAL FUNCTION G05KEF(P, IGEN, ISEED, IFAIL)
INTEGER          IGEN, ISEED(4), IFAIL
real           P
```

3 Description

The routine returns the logical value of the relation

$$y < p$$

where y is a pseudo-random number from a uniform distribution over (0,1), generated by G05KAF using the values of IGEN and ISEED as input to G05KEF.

One of the initialisation routines G05KBF (for a repeatable sequence if computed sequentially) or G05KCF (for a non-repeatable sequence) must be called prior to the first call to G05KEF.

4 References

Knuth D E (1981) *The Art of Computer Programming (Volume 2)* (2nd Edition) Addison-Wesley

5 Parameters

- 1: P – *real* *Input*
On entry: must contain the probability of G05KEF returning a true result.
Constraint: $0 \leq P \leq 1$.
- 2: IGEN – INTEGER *Input*
On entry: must contain the identification number for the generator to be used to return a pseudo-random number and should remain unchanged following initialisation by a prior call to one of the routines G05KBF or G05KCF.
- 3: ISEED(4) – INTEGER array *Input/Output*
On entry: contains values which define the current state of the selected generator.
On exit: contains updated values defining the new state of the selected generator.
- 4: IFAIL – INTEGER *Input/Output*
On entry: IFAIL must be set to 0, -1 or 1. Users who are unfamiliar with this parameter should refer to Chapter P01 for details.
On exit: IFAIL = 0 unless the routine detects an error (see Section 6).

For environments where it might be inappropriate to halt program execution when an error is detected, the value -1 or 1 is recommended. If the output of error messages is undesirable, then the value 1 is recommended. Otherwise, for users not familiar with this parameter the recommended value is 0 . **When the value -1 or 1 is used it is essential to test the value of IFAIL on exit.**

6 Error Indicators and Warnings

If on entry $IFAIL = 0$ or -1 , explanatory error messages are output on the current error message unit (as defined by X04AAF).

Errors or warnings detected by the routine:

$IFAIL = 1$

On entry, $P < 0$,
or $P > 1$.

7 Accuracy

Not applicable.

8 Further Comments

None.

9 Example

The example program prints the first five pseudo-random logical values generated by G05KEF after initialisation by G05KBF, when the probability of a TRUE value is 0.6 .

9.1 Program Text

Note: the listing of the example program presented below uses *bold italicised* terms to denote precision-dependent details. Please read the Users' Note for your implementation to check the interpretation of these terms. As explained in the Essential Introduction to this manual, the results produced may not be identical for all implementations.

```
*      G05KEF Example Program Text
*      Mark 20 Release. NAG Copyright 2001.
*      .. Parameters ..
INTEGER          NOUT
PARAMETER       (NOUT=6)
*      .. Local Scalars ..
INTEGER          I, IFAIL, IGEN
LOGICAL         X
*      .. Local Arrays ..
INTEGER          ISEED(4)
*      .. External Functions ..
LOGICAL         G05KEF
EXTERNAL        G05KEF
*      .. External Subroutines ..
EXTERNAL        G05KBF
*      .. Executable Statements ..
WRITE (NOUT,*) 'G05KEF Example Program Results'
WRITE (NOUT,*)
*      Initialise the seed
ISEED(1) = 1762543
ISEED(2) = 9324783
ISEED(3) = 42344
ISEED(4) = 742355
*      IGEN identifies the stream.
IGEN = 1
CALL G05KBF(IGEN,ISEED)
*
IFAIL = 0
DO 20 I = 1, 5
```

```
*
      X = G05KEF(0.6e0, IGEN, ISEED, IFAIL)
*
      WRITE (NOUT, 99999) X
20  CONTINUE
      STOP
*
99999 FORMAT (1X, L5)
      END
```

9.2 Program Data

None.

9.3 Program Results

G05KEF Example Program Results

```
T
F
T
F
F
```
