

NAG Library Routine Document

G05SAF

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

G05SAF generates a vector of pseudorandom numbers taken from a uniform distribution between 0 and 1.

2 Specification

```
SUBROUTINE G05SAF(N, STATE, X, IFAIL)
  INTEGER          N, STATE(lstate), IFAIL
  double precision X(N)
```

3 Description

G05SAF generates n values from a uniform distribution over the half closed interval $(0, 1]$.

One of the initialization routines G05KFF (for a repeatable sequence if computed sequentially) or G05KGF (for a non-repeatable sequence) must be called prior to the first call to G05SAF.

4 References

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

5 Parameters

- 1: N – INTEGER *Input*
On entry: n , the number of pseudorandom numbers to be generated.
Constraint: $N \geq 0$.
- 2: STATE(lstate) – INTEGER array *Communication Array*
Note: $lstate = LSTATE$, the dimension of STATE as supplied to the initialization routine G05KFF or G05KGF.
On entry: contains information on the selected base generator and its current state.
On exit: contains updated information on the state of the generator.
- 3: X(N) – **double precision** array *Output*
On exit: the n pseudorandom numbers from a uniform distribution over the half closed interval $(0, 1]$.
- 4: IFAIL – INTEGER *Input/Output*
On entry: IFAIL must be set to 0, -1 or 1. If you are unfamiliar with this parameter you should refer to Section 3.3 in the Essential Introduction 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, if you are 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, $N < 0$.

$IFAIL = 2$

On entry, STATE vector was not initialized or has been corrupted.

7 Accuracy

Not applicable.

8 Further Comments

Not applicable.

9 Example

This example prints the first five pseudorandom numbers from a uniform distribution between 0 and 1, generated by G05SAF after initialization by G05KFF.

9.1 Program Text

```
*      G05SAF Example Program Text
*      Mark 22 Release. NAG Copyright 2006.
*      .. Parameters ..
      INTEGER          NOUT
      PARAMETER        (NOUT=6)
      INTEGER          MSTATE, MSED, N
      PARAMETER        (MSTATE=633,MSED=1,N=5)
*      .. Local Scalars ..
      INTEGER          GENID, I, IFAIL, LSED, LSTATE, SUBID
*      .. Local Arrays ..
      DOUBLE PRECISION X(N)
      INTEGER          SED(MSED), STATE(MSTATE)
*      .. External Subroutines ..
      EXTERNAL         G05KFF, G05SAF
*      .. Executable Statements ..
      WRITE (NOUT,*) 'G05SAF Example Program Results'
      WRITE (NOUT,*)
*      Initialize the seed
      SED(1) = 1762543
*      GENID and SUBID identify the base generator
      GENID = 1
      SUBID = 1
*      Initialize the generator to a repeatable sequence
      LSTATE = MSTATE
      LSED = MSED
      IFAIL = 1
      CALL G05KFF(GENID,SUBID,SED,LSED,STATE,LSTATE,IFAIL)
      IF (IFAIL.NE.0) THEN
        WRITE (NOUT,99998) IFAIL
        GO TO 20
      END IF
*      Generate the variates
```

```
      IFAIL = 1
      CALL G05SAF(N,STATE,X,IFAIL)
      IF (IFAIL.NE.0) THEN
        WRITE (NOUT,99997) IFAIL
        GO TO 20
      END IF
*      Display the variates
      WRITE (NOUT,99999) (X(I),I=1,N)
*
      20 CONTINUE
*
99999 FORMAT (1X,F10.4)
99998 FORMAT (1X,' ** G05KFF returned with IFAIL = ',I5)
99997 FORMAT (1X,' ** G05SAF returned with IFAIL = ',I5)
      END
```

9.2 Program Data

None.

9.3 Program Results

G05SAF Example Program Results

```
0.6364
0.1065
0.7460
0.7983
0.1046
```
