G05FAF – NAG Fortran Library Routine Document

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

G05FAF generates a vector of pseudo-random numbers uniformly distributed over the interval $[a, b]$.

2 Specification

```
SUBROUTINE G05FAF(A, B, N, X)
INTEGER           N
real              A, B, X(N)
```

3 Description

If $a = 0$ and $b = 1$, G05FAF returns the next n values y_i from a uniform (0,1) generator (see the Chapter Introduction for details).

For other values of a and b, G05FAF applies the transformation

$$x_i = a + (b - a)y_i$$

The routine ensures that the values x_i lie in the closed interval $[a, b]$.

If computing sequentially and using the same generator, G05FAF always generates exactly the same pseudo-random numbers as would n consecutive calls of G05CAF or G05DAF, and on many machines is likely to be much faster.

4 References

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

5 Parameters

1: A — ***real*** *Input*

2: B — ***real*** *Input*

On entry: the end-points a and b of the uniform distribution. It is not necessary that $a < b$.

3: N — INTEGER *Input*

On entry: the number n of pseudo-random numbers to be generated.

4: X(N) — ***real*** array *Output*

On exit: the n pseudo-random numbers from the specified uniform distribution.

6 Error Indicators and Warnings

None.

7 Accuracy

Not applicable.

8 Further Comments

None.

9 Example

The example program prints 5 pseudo-random numbers from a uniform distribution between 1.0 and 1.5, generated by a single call to G05FAF, after initialization by G05CBF.

The generator mechanism used is selected by an initial call to G05ZAF.

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.

```
*     G05FAF Example Program Text
*     NAG Fortran SMP Library, Release 2.  NAG Copyright 2000.
*     .. Parameters ..
      INTEGER          NOUT
      PARAMETER        (NOUT=6)
      INTEGER          N
      PARAMETER        (N=5)
*     .. Local Scalars ..
      INTEGER          I
*     .. Local Arrays ..
      DOUBLE PRECISION X(N)
*     .. External Subroutines ..
      EXTERNAL         G05CBF, G05FAF, G05ZAF
*     .. Executable Statements ..
      CALL G05ZAF('O')
      WRITE (NOUT,*) 'G05FAF Example Program Results'
      CALL G05CBF(0)
*
      CALL G05FAF(1.0D0,1.5D0,N,X)
*
      WRITE (NOUT,99999) (X(I),I=1,N)
      STOP
*
99999 FORMAT (1X,F10.4)
      END
```

9.2 Program Data

None.

9.3 Program Results

```
 G05FAF Example Program Results
     1.3976
     1.1129
     1.1856
     1.1125
     1.4394
```