NAG Fortran Library Routine Document

G05FBF

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

G05FBF generates a vector of pseudo-random numbers taken from a (negative) exponential distribution with mean a.

2 Specification

```
SUBROUTINE G05FBF(A, N, X)
INTEGER           N
real              A, X(N)
```

3 Description

The distribution has PDF (probability density function)

$$f(x) = \tfrac{1}{a}e^{-x/a} \quad \text{if } x > 0,$$

$$f(x) = 0 \qquad \text{otherwise.}$$

The routine returns the values

$$x_i = -a \ln y_i$$

where y_i are the next n numbers generated by a uniform (0,1) generator.

If computing sequentially and using the same generator, G05FBF always generates exactly the same pseudo-random numbers as would n consecutive calls of G05DBF, but on many machines is likely to be much faster.

4 References

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

Kendall M G and Stuart A (1969) *The Advanced Theory of Statistics (Volume 1)* (3rd Edition) Griffin

5 Parameters

1: A – ***real*** *Input*

On entry: the parameter a of the distribution. If A is negative, its absolute value is used.

2: N – INTEGER *Input*

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

3: X(N) – ***real*** array *Output*

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

6 Error Indicators and Warnings

None.

7 Accuracy

Not applicable.

8 Further Comments

None.

9 Example

The example program prints five pseudo-random numbers from an exponential distribution with mean 2.0, generated by a single call to G05FBF, after initialisation 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.

```
*     G05FBF Example Program Text
*     Mark 20 Revised. NAG Copyright 2001.
*     .. Parameters ..
      INTEGER          NOUT
      PARAMETER        (NOUT=6)
      INTEGER          N
      PARAMETER        (N=5)
*     .. Local Scalars ..
      INTEGER          I
*     .. Local Arrays ..
      real             X(N)
*     .. External Subroutines ..
      EXTERNAL         G05CBF, G05FBF, G05ZAF
*     .. Executable Statements ..
      CALL G05ZAF('O')
      WRITE (NOUT,*) 'G05FBF Example Program Results'
      CALL G05CBF(0)
*
      CALL G05FBF(2.0e0,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

```
 G05FBF Example Program Results
     0.4585
     2.9769
     1.9816
     2.9830
     0.2585
```