G05DBF – 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

G05DBF returns a pseudo-random real number taken from a (negative) exponential distribution with mean a.

2 Specification

```
real FUNCTION G05DBF(A)
real                 A
```

3 Description

The distribution has PDF (probability density function)

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

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

The routine returns the value $-a \ln y$, where y is a pseudo-random number from a uniform distribution over (0,1), generated by G05CAF.

G05FBF may be used to generate a vector of n pseudo-random numbers which, if computed sequentially, are exactly the same as n successive values of G05DBF. On many machines G05FBF is likely to be much faster.

4 References

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

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

5 Parameters

1: A — ***real*** *Input*

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

6 Error Indicators and Warnings

None.

7 Accuracy

Not applicable.

8 Further Comments

None.

9 Example

The example program prints the first five pseudo-random real numbers from a negative exponential distribution with mean 2.0, generated by G05DBF 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.

```
*     G05DBF Example Program Text
*     NAG Fortran SMP Library, Release 2.  NAG Copyright 2000.
*     .. Parameters ..
      INTEGER          NOUT
      PARAMETER        (NOUT=6)
*     .. Local Scalars ..
      DOUBLE PRECISION X
      INTEGER          I
*     .. External Functions ..
      DOUBLE PRECISION G05DBF
      EXTERNAL         G05DBF
*     .. External Subroutines ..
      EXTERNAL         G05CBF, G05ZAF
*     .. Executable Statements ..
      CALL G05ZAF('O')
      WRITE (NOUT,*) 'G05DBF Example Program Results'
      WRITE (NOUT,*)
      CALL G05CBF(0)
      DO 20 I = 1, 5
*
         X = G05DBF(2.0D0)
*
         WRITE (NOUT,99999) X
   20 CONTINUE
      STOP
*
99999 FORMAT (1X,F10.4)
      END
```

9.2 Program Data

None.

9.3 Program Results

```
 G05DBF Example Program Results

     0.4585
     2.9769
     1.9816
     2.9830
     0.2585
```