G05EBF – 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

G05EBF sets up the reference vector, R, for a discrete uniform distribution over the interval $[m, n]$.

2 Specification

```
SUBROUTINE G05EBF(M, N, R, NR, IFAIL)
INTEGER           M, N, NR, IFAIL
real              R(NR)
```

3 Description

This sets up a reference vector for use in G05EYF. Together these routines produce random numbers from the distribution defined by:

$$P(I = i) = \frac{1}{n - m + 1} \quad \text{if } m \leq i \leq n,$$

$$P(I = i) = 0 \quad \text{otherwise,}$$

assuming $m \leq n$. If $m > n$, the roles of m and n are reversed.

The reference array is formed in the natural manner (described in more detail in G05EXF).

4 References

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

5 Parameters

1: M — INTEGER *Input*

2: N — INTEGER *Input*

On entry: the end-points m and n of the distribution. It is not necessary that $m < n$.

3: R(NR) — ***real*** array *Output*

On exit: the reference vector R.

4: NR — INTEGER *Input*

On entry: the dimension of the array R as declared in the (sub)program from which G05EBF is called.

Suggested value: approximately $5 + 1.4 \times |\mathrm{M} - \mathrm{N}|$ (for optimum efficiency in G05EYF).

Constraint: $\mathrm{NR} > |\mathrm{M} - \mathrm{N}| + 3$.

5: IFAIL — INTEGER *Input/Output*

On entry: IFAIL must be set to 0, -1 or 1. For users not familiar with this parameter (described in Chapter P01) the recommended value is 0.

On exit: IFAIL $= 0$ unless the routine detects an error (see Section 6).

6 Error Indicators and Warnings

Errors detected by the routine:

IFAIL = 1

On entry, NR $\leq |M - N| + 3$.

7 Accuracy

Not applicable.

8 Further Comments

The time taken by the routine increases with NR.

9 Example

The example program sets up a reference vector for a uniform distribution between −5 and 5, and then prints the first five pseudo-random numbers generated by G05EYF, after initialisation by G05CBF.

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.

```
*     G05EBF Example Program Text
*     Mark 14 Revised.  NAG Copyright 1989.
*     .. Parameters ..
      INTEGER          M, N, NR
      PARAMETER        (M=-5,N=5,NR=19)
      INTEGER          NOUT
      PARAMETER        (NOUT=6)
*     .. Local Scalars ..
      INTEGER          I, IFAIL, IX
*     .. Local Arrays ..
      real             R(NR)
*     .. External Functions ..
      INTEGER          G05EYF
      EXTERNAL         G05EYF
*     .. External Subroutines ..
      EXTERNAL         G05CBF, G05EBF
*     .. Executable Statements ..
      WRITE (NOUT,*) 'G05EBF Example Program Results'
      WRITE (NOUT,*)
      CALL G05CBF(0)
      IFAIL = 0
*
      CALL G05EBF(M,N,R,NR,IFAIL)
*
      DO 20 I = 1, 5
         IX = G05EYF(R,NR)
         WRITE (NOUT,99999) IX
   20 CONTINUE
      STOP
*
99999 FORMAT (1X,I5)
      END
```

9.2 Program Data

None.

9.3 Program Results

```
G05EBF Example Program Results

     3
    -3
    -1
    -3
     4
```