

NAG Fortran Library Routine Document

G05YKF

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

G05YKF generates a log Normal quasi-random number sequence of IDIM dimensions. One of the initialization routines G05YCF, G05YEF or G05YGF must be called beforehand to determine whether a Faure, Sobol or Niederreiter sequence should be generated.

2 Specification

```
SUBROUTINE G05YKF (N, XMEAN, STD, QUASI, IREF, IFAIL)
  INTEGER          N, IREF(406), IFAIL
  double precision XMEAN(*), STD(*), QUASI(N,*)
```

3 Description

G05YKF generates a log Normal quasi-random number sequence.

4 References

None.

5 Parameters

- 1: N – INTEGER *Input*
On entry: the number of quasi-random numbers required.
Constraint: $N \geq 1$.
- 2: XMEAN(*) – **double precision** array *Input*
Note: the dimension of the array XMEAN must be at least IDIM or IDIM + 1 if IDIM is odd.
On entry: specifies, for each dimension, the mean of the underlying Normal distribution.
- 3: STD(*) – **double precision** array *Input*
Note: the dimension of the array STD must be at least IDIM or IDIM + 1 if IDIM is odd.
On entry: specifies, for each dimension, the standard deviation of the underlying Normal distribution.
Constraint: $STD(i) \geq 0$.
- 4: QUASI(N,*) – **double precision** array *Output*
Note: the second dimension of the array QUASI must be at least IDIM or IDIM + 1 if IDIM is odd.
On exit: contains N quasi-random numbers of dimension IDIM.
- 5: IREF(406) – INTEGER array *Input/Output*
On entry: contains vital information for the generator.
On exit: updated information for the generation for a further set of quasi-random numbers.

IREF must not be changed between calls of G05YKF.

6: IFAIL – INTEGER

Input/Output

On entry: IFAIL must be set to 0, -1 or 1. Users who are unfamiliar with this parameter should refer to Chapter P01 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, for users 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, incorrect initialization has been detected.

IFAIL = 3

A standard deviation is negative.

IFAIL = 4

There have been too many calls to the generator.

7 Accuracy

Not applicable.

8 Further Comments

None.

9 Example

The example calls G05YCF to initialize the generator and then G05YKF to produce quasi-random numbers.

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.

```
*      G05YKF Example Program Text
*      Mark 21 Release. NAG Copyright 2004.
*      .. Parameters ..
      INTEGER          NOUT, IDIM, JDIM
      PARAMETER        (NOUT=6, IDIM=4, JDIM=2*IDIM)
*      .. Local Scalars ..
      DOUBLE PRECISION SUM
      INTEGER          I, IFAIL, J
*      .. Local Arrays ..
      DOUBLE PRECISION QUASI(5,JDIM), STD(JDIM), XMEAN(JDIM)
      INTEGER          IREF(406)
```

```

*      .. External Subroutines ..
      EXTERNAL          G05YCF, G05YKF
*      .. Intrinsic Functions ..
      INTRINSIC          REAL
*      .. Executable Statements ..
      WRITE (NOUT,99999) 'G05YKF Example Program Results'
      IFAIL = 0
      DO 20 I = 1, JDIM
          XMEAN(I) = REAL(I)
          STD(I) = 1.0D0
20  CONTINUE
*
      CALL G05YCF(IDIM,IREF,IFAIL)
*
      SUM = 0.0D0
*
      CALL G05YKF(XMEAN,STD,5,QUASI,IREF,IFAIL)
      WRITE (NOUT,99998) ((QUASI(I,J),J=1,IDIM),I=1,5)
*
      WRITE (NOUT,99999)
      STOP
*
99999 FORMAT (A,F20.4)
99998 FORMAT (1X,4F10.4)
      END

```

9.2 Program Data

None.

9.3 Program Results

```

G05YKF Example Program Results
  2.6120   7.6919  129.5899   95.5339
  0.1601  126.6900   7.9026  180.2768
  0.5492   3.2828   6.8258   36.8717
  3.3512   1.9409  20.6616   24.1673
  7.3708   6.2979  29.9591   48.6792

```
