NAG Toolbox for MATLAB

g05lj

1 Purpose

g05lj generates a vector of pseudo-random numbers from a (negative) exponential distribution with mean a.

2 Syntax

```
[x, iseed, ifail] = g05lj(a, n, igen, iseed)
```

3 Description

The exponential distribution has PDF (probability density function):

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

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

g05lj returns the values

$$x_i = -a \ln y_i$$

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

One of the initialization functions g05kb (for a repeatable sequence if computed sequentially) or g05kc (for a non-repeatable sequence) must be called prior to the first call to g05lj.

4 References

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

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

5 Parameters

5.1 Compulsory Input Parameters

1: **a – double scalar**

a, the mean of the distribution.

Constraint: **a** > 0.0.

2: **n – int32 scalar**

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

Constraint: **n** ≥ 0.

3: **igen – int32 scalar**

Must contain the identification number for the generator to be used to return a pseudo-random number and should remain unchanged following initialization by a prior call to g05kb or g05kc.

4: **iseed**(4) **– int32 array**

Contains values which define the current state of the selected generator.

5.2 Optional Input Parameters

None.

5.3 Input Parameters Omitted from the MATLAB Interface

None.

5.4 Output Parameters

1: **x**$(*)$ **– double array**

Note: the dimension of the array **x** must be at least $\max(1, \mathbf{n})$.

The n pseudo-random numbers from the specified exponential distribution.

2: **iseed**(4) **– int32 array**

Contains updated values defining the new state of the selected generator.

3: **ifail – int32 scalar**

0 unless the function detects an error (see Section 6).

6 Error Indicators and Warnings

Errors or warnings detected by the function:

ifail $= 1$

On entry, $\mathbf{a} \leq 0.0$.

ifail $= 2$

On entry, $\mathbf{n} < 0$.

7 Accuracy

Not applicable.

8 Further Comments

None.

9 Example

```
a = 1;
n = int32(5);
igen = int32(1);
iseed = [int32(1762543);
     int32(9324783);
     int32(42344);
     int32(742355)];
[x, iseedOut, ifail] = g05lj(a, n, igen, iseed)
```

```
x =
    2.4155
    0.0503
    0.9004
    0.2968
    0.0515
```

```
iseedOut =
    16516983
     2826895
     4504715
     8850212
ifail =
           0
```