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DECUS NO. **8-319**

TITLE **RAND (Computation of Random Fractions)**

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SOURCE LANGUAGE **FORTRAN D**

ABSTRACT

The program computes a designated number of random fractions in the range of 0.0000 to 0.9999. The computed fractions represent a sample from a uniform distribution.

TAPES REQUIRED

1. <u>Form of program tape</u> - The program is written in the PDP-8 FORTRAN-D language, and is in the source language.

OPERATING INSTRUCTIONS

Normal for the disk operating system. On continuing after the teletype has printed READY, the program pauses for the entry of five integers. The first four integers must consist of two digits each, and are used to specify the starting point for the series of pseudo-random numbers computed. The fifth integer specifies the number of random fractions required. Thus,

$$53 \quad 95 \quad 27 \quad 04 \quad 40$$

entered on the keyboard of the teletype would request the printing of 40 random fractions from a starting point of 53952704. (Note that a given starting point will always generate the same sequence of random fractions, a feature which is frequently of value in the use of random fractions in simulation.) A result tape can be obtained by switching on the low-speed punch before keying "return" after entering the last of the integers.

OUTPUT

The program prints random fractions in the range of 0.0000 to 0.9999. The fractions are printed four to a line, the total number of fractions being specified by the fifth of the control integers.

STORAGE AND LIMITATIONS

Normal for FORTRAN-D

METHOD

The program uses Wingersky's FORTRAN function subprogram which implements the power residue method of generating pseudo-random numbers. This subprogram incorporates an ingenious use of integer arithmetic to program the modulo 1 multiplication necessary for the power residue method. The algorithm is discussed in detail in Lohnes and Cooley's "Introduction to Statistical Procedures," Wiley, 1968.

```
L
C          PROGRAM TO COMPUTE RANDOM FRACTIONS
           L=-1
           ACCEPT 3, K1, K2, K3, K4, N
3          FORMAT (I, I, I, I, I)
           DO 1Ø I=1, N
           M1=11*K4
           M2=11*K3
           M3=11*K2+K4
           M4=11*K1+K3
           J=M1/1ØØ
           K4=M1-1ØØ*J
           M2=M2+J
           J=M2/1ØØ
           K3=M2-1ØØ*J
           M3=M3+J
           J=M3/1ØØ
           K2=M3-1ØØ*J
           M4=M4+J
           J=M4/1ØØ
           K1=M4-1ØØ*J
           X1=K1
           X2=K2
           R=X1*1.ØE-2+X2*1.ØE-4
           L=L+1
           IF (L-4) 1, 2, 2
2          L=Ø
           TYPE 1Ø1, R
           GO TO 1Ø
1          TYPE 1Ø2, R
1Ø         CONTINUE
1Ø1        FORMAT (/, E)
1Ø2        FORMAT (E)
           STOP
           END


*
```