SIMULTANEOUS LINEAR EQUATIONS 3

Program D4-02.0

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ABSTRACT

"Simultaneous Linear Equations 3," program D4-02.0, is designed to be compiled by ACT IV, program H3-02.0. The subject program solves simultaneous linear equations, computes the determinant of the coefficient matrix, and will iterate the solution if desired. Data consists of the elements of an augmented coefficient matrix whose order is not greater than 41. Data must be stated in floating-point form as defined by ACT IV. Crout's reduction method is used to compute the results.

STORAGE

Because of the way ACT IV functions, the exact amount of storage required for the subject program is not known. "Simultaneous Linear Equations 3" uses all of the compiler area (Locations 4200-9463) plus 94 sectors of object program area for matrix storage. Utilizing the remainder of the program storage area allowed by ACT IV for the compiled program, results in a well-optimized program which can be compiled and executed in Load-and-Go mode.

INPUT

After control is transferred to "Simultaneous Linear Equations 3," the computer will type requests for data and wait on an input instruction after each query until the response is entered. These queries and the required responses are as follows:

Query	Response
N=	State the order of the coefficient matrix as an integer with no decimal point. N must be less than 42.
AUGMENTED MATRIX=	State the elements of the augmented coefficient matrix in row order and in floating-point format. (See ACT IV programming manual, "READ" operation.)

Each item input must be followed by a stop code, and a single stop code may be used to indicate a zero entry.

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CALLING SEQUENCE

Computer control will be transferred automatically to the beginning of the subject program (statement "Begin") when compilation is completed.

OUTPUT

"Simultaneous Linear Equations 3" will print the following information in floating-point format.

1. The determinant of the coefficient matrix as follows:

   DETERMINANT=( )

2. The values of the unknowns, X, and the per cent of relative error, E, in two columns. The X values are numbered according to the column to which they pertain; the E values, according to the row. These values appear as follows:

UNKNOWN VALUES	% RELATIVE ERROR
X 1= ( )	E 1=( )
X 2= ( )	E 2=( )
.	
.	
.	
X n= ( )	E n=( )

3. The mean relative error as follows:

   MEAN RELATIVE ERROR= ( )

The solution may be iterated as many times as desired. The determinant is not repeated, but all other information is printed, as shown, for each iteration.

OPERATING PROCEDURE

1. LOADING PROCEDURE

   The subject program is to be compiled by ACT IV in Load-and-Go mode.

OPERATING PROCEDURE (Cont.)

2. INPUT-OUTPUT DEVICES REQUIRED

The subject program does not select input or output devices, but uses those selected by ACT IV during compilation: reader for input and typewriter for output. Input Duplication mode also remains selected. Any of these selections may be changed manually.

3. SENSE SWITCH OPTIONS

Switch	Function
1	RAISED - Halts the computer after a printout is completed. Depress START to return control to the beginning of the program. Depress this switch and then START to begin iteration.
	DEPRESSED - Allows iteration to begin automatically.
2	RAISED - Halts computer when control is transferred to the "Begin" statement. Depress START to move to an input instruction.
	DEPRESSED - Allows computer to continue to an input instruction without stopping when control is transferred to the "Begin" statement.

EXAMPLE

The following example illustrates the input data and the described printout.

EXAMPLE (Cont.)

```
N= 3*
AUGMENTED MATRIX=
9.3746*3.0416*-2.4371*9.2333*
3.0416*6.1832*1.2163*8.2049*
-2.4371*1.2163*8.4429*3.9339*

DETERMINANT= .34265924E+03
  UNKNOWN VALUES              % RELATIVE ERROR
X 1= .89642400E+00          E 1=  .000000
X 2= .76512998E+00          E 2= -.000011
X 3= .61447453E+00          E 3=  .000012
MEAN RELATIVE ERROR=  .000000
```

COMMENT

The subject program does not perform row switching. Therefore, the Kth coefficient of the Kth row should be as large as possible (in absolute value) relative to the other coefficients in the row. In particular, the first element of the first row should be the largest value in that row, and must not be zero.

When the subject program is executed, the compiler is destroyed. Therefore, if additions or changes are to be made, they must be entered prior to execution of the program.