United States
Department of the Interior
Geological Survey

# UTILITY PROGRAMS FOR GROUND MOTION STUDIES

by

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Menlo Park, California

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## INTRODUCTION

Analytical studies of the effect of local geology during earthquakes generally involve a mechanical system and a numerical procedure to determine the wave transmission characteristics of such a mechanical system. If the system is not considered linearly elastic, the study may also require certain type of input motion and will often result in outputs consisting of discrete acceleration values at successive time intervals. Further manipulations and interpretations sometimes become desirable and additional computer processing would be required. This report describes computer programs for this purpose.

The first computer program described integrates a given acceleration time history into velocity and displacement time histories and plots them at appropriate scales. It has an option of low-pass digital filtering to mask off high frequency components before the integration is performed. The second program computes the response spectra of a given acceleration record and the third program plots response spectra in linear scales.

All programs were developed in conjunction with the ground motion research studies underway within the U. S. Geological Survey. They are coded in FORTRAN IV for use with the Survey's computer facilities in Reston, Virginia and its plotting facilities in Menlo Park, California. It is assumed that the acceleration input for the first and the second program resides on a tape or a disk and that response values for the input to the third program are on cards generated by the second program.

In the subsequent sections of this report, each computer program is described; its input requirements and its options, if any, are given. In addition, source program listings and sample runs are included.

## PROGRAM: "INTEGRATE AND PLOT"

The program, "INTEGRATE AND PLOT", consists of a main program and four subroutines. The main program reads the input, performs the integration, and generates instruction for the plotter. The four subroutines are called if low-pass filtering prior to integration is specified.

The integration scheme is based on Newmark's step-by-step integration procedure (Newmark, 1959), i.e.

$$v_{t+\Delta t} = v_t + (1-\alpha)\Delta t \cdot a_t + \alpha \cdot \Delta t \cdot a_{t+\Delta t}$$

$$u_{t+\Delta t} = u_t + \Delta t \cdot v_t + (0.5-\beta)\Delta t^2 \cdot a_t + \beta \cdot \Delta t^2 \cdot a_{t+\Delta t}$$

in which, u,v,a are respectively displacement, velocity, and acceleration; $\alpha$, $\beta$ are integration coefficients; and t, $\Delta t$ are time and time increment. In this program, $\alpha$ and $\beta$ are set at 1/2 and 1/4 respectively, a's are given in g (gravitational acceleration) and $\Delta t$, the time increment is constant.

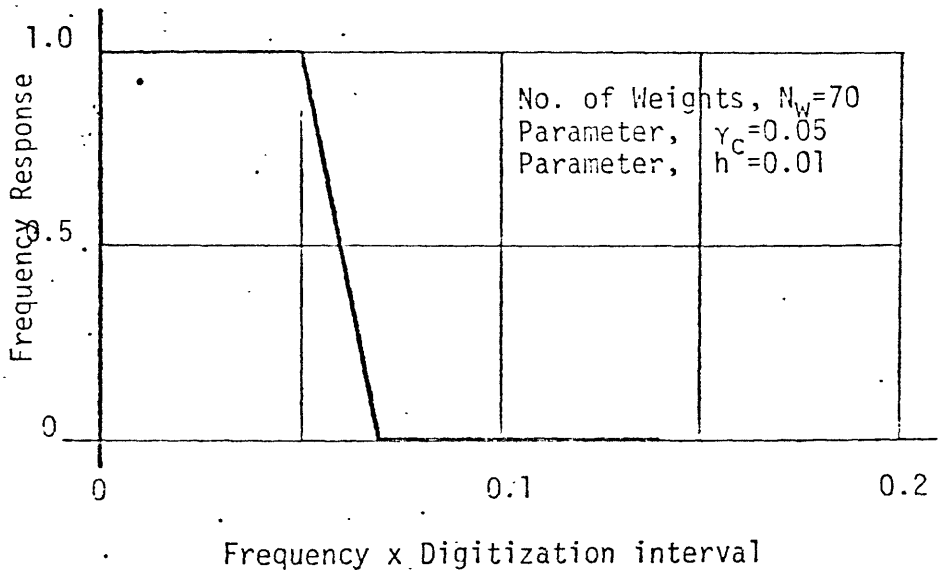
Low-pass filtering may be desirable when certain high frequency components are out of the range of interest or when they are inherited from the numerical procedure applied in the analysis and thus can not be considered as true response of the mechanical system (Chen and Joyner, 1974).

Subroutines on digital filtering were modified from those by Eicher (1970, personal communication). Further details can also be found in Linnett (1961).

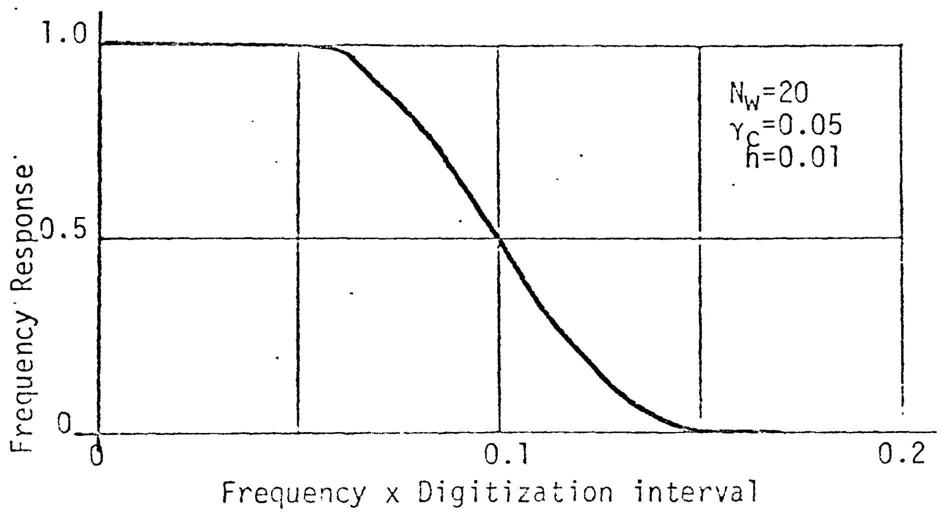
This program provides two choices of zero-phase-shift, low-pass filters whose characteristics are shown in Figure 1. The difference between these two filters is the length of the cut-off range. It should be noted that the actual cut-off frequency also depends on the time increment and that the filtered record is shorter in length than the that of the original record. The number of points lost at both ends of the record through the filtering process equals to the number of weights used.

Since the input acceleration record is retrieved from a tape or a disk, only two input data cards are required for this program. These two cards are:

| | |
|---|---|
| Card No.1 | Format(18A4). Title card; columns 1-72 of this card are used for identification purpose. |
| Card No.2 | Format(F12.0,6I6). |
| Col.1-12 | Time increment ( $\Delta t$) of the input acceleration. |
| Col.13-18 | Number of data points on the input acceleration record (KDATA). |
| Col.19-24 | Number of data points to be integrated (KLIMIT). |
| Col.25-30 | An index (KTYPE) that specifies the unit system to be used: If KTYPE=0, results are in British units; otherwise, in metric units. |
| Col.31-36 | An index (KFLTR) that specifies whether low-pass filtering should be performed; if KFLTR≠0, filtering will be performed. |
| Col.37-42 | The filter number (NOFLTR) specified for use; NOFLTR=47, or 56, see Figure 1. |
| Col.43-48 | An index (KWRITE) that, if different from 0, instructs the computer to replace the input record on disk or tape with the filtered one. |




(a) Filter No. 47




(b) Filter No. 56

Figure 1. -- Characteristics of low-pass filters
(Based on Linnet, 1961)

The output of this program is mostly in graphical form. The printout portion will include only the title, the maximum values of the time histories, and the scales for the plots if digital filtering is not performed. Otherwise, it will also include properties and response characteristics of the filter chosen. The graphical output is generated through a Benson-Lerner plotter with the software package "MENLOPLOT". The time histories for the displacement, velocity, and acceleration component of the input or filtered record are plotted in succession with appropriate scales determined automatically in the program. Appropriate headings and captions are also given along with the plot for easy identification. Illustrations of the output of this program will be given later in the report by means of a sample problem while the listing of this program will also be given in the Appendix.

PROGRAM: "RESPONSE SPECTRUM COMPUTATION"

The program, "RESPONSE SPECTRUM COMPUTATION", is based on the U.C. Berkeley version of a subroutine on response spectrum (Idriss, 1969, personal communication). It consists of two routines: the main program processes the input & output, and calculates the spectral intensity; while the subroutine CMPMAX computes the maximum spectral values and records the times at which these maxma occur.

It is assumed that the acceleration record for which response spectral values are to be computed, resides on a tape or a disk and that the record is given in terms of g, the gravitational acceleration. Such record is equivalent to the input/output of the program "INTEGRATE AND PLOT" or previously described. This program computes the response spectral values at 194 period values from that of 0.01 to 6.0 seconds with smaller intervals on the short period end.

Two forms of output are provided in this program. For the punch-card output, each card lists the following information in the format of (I4,F8.3,5F12.5,F8.2):

| | |
|---|---|
| Columns: 1-4 | An integer that identifies the sequence of data cards. |
| 5-12 | The period (in seconds) at which spectral values are given. |
| 13-24 | The spectral value of maximum relative displacement in ft. |
| 25-36 | The spectral value of maximum relative velocity in ft/sec. |
| 37-48 | The maximum psuedo relative velocity in ft/sec. |
| 49-60 | The maximum absolute acceleration in g. |
| 61-72 | The maximum psuedo absolute acceleration in g. |
| 73-80 | The damping ratio on which spectral values given on this card are based. |

For the print-out output, spectral values are given both in British units and in metric units. Spectral intensities, as included in the print-out output are defined as the area enclosed by the spectrum, the period-axis, and the two vertical lines defined by periods of 0.1 and 2.5 seconds respectively.

Together with the input acceleration record on tape or disk, two input data cards are required to run this program. These two cards are:

| | | |
|---|---|---|
| Card No.1 | | Format(F6.0,5I6) |
| | Col. 1-6 | The time interval (DT) used in the acceleration record. |
| | Col. 9-12 | The total number of data points in the acceleration record (NOFDA). |
| | Col.15-18 | The number of points of the above that should be used for computation (KG). |
| | Cols. 24 30, 36 | The values for the indicies K1, K2, and K3 respectively (see below). |
| Card No.2 | | Format(18A4). Title card; columns 1-72 of this card are used for identification purpose. |

Damping ratios are given in the program in the sequence of: 0.0, 0.01, 0.02, 0.05, 0.10, 0.20. K1 and K2 specify the index of the first and the last damping ratio in this sequence of which response spectra are to be computed. K3 specifies the difference in index between adjacent damping ratio values that are chosen for computation. For example, K1=1, K2=5 and K3=2 would imply that damping ratios of 0.0, 0.02 and 0.10 have been chosen . On the other hand, if only damping ratio of 0.05 is chosen, then K1=4, K2=5 and K3=2 or larger. Finally, if all damping ratios are required for computation, then, K1=1, K2=6 and K3=1.

PROGRAM: "LINEAR RESPONSE SPECTRUM PLOT"

This program, "LINEAR RESPONSE SPECTRUM PLOT", was prepared to plot response spectra in linear scales through the Survey's existing computing and plotting facilities. It was designed to use the punch-card output from the previous program, "RESPONSE SPECTRUM COMPUTATION", as its main source of input. The program first generates instructions to the plotter to plot the grid and the heading; it then processes the spectral values of a specified component (for example, relative velocity), generates coordinate pairs and instructs the plotter to plot accordingly. In addition to the main plot showing headings and spectra, a side plot for the purpose of identification is also incorporated. The total height and the total width of the main plot is flexible while the size of an unit grid stays fixed at one inch squared. A typical plot is reproduced in Figure 2 which, along with some added hand-written descriptions, hopefully will make statements in this section of the report easier to comprehend.

In order to get a better definition in the higher frequency range and to have enough details in case the response spectrum is plotted in logarithimic scale(s), it was necessary to maintain smaller period intervals at the short-period end. However, in the case of linear plots, such consideration leads to unnecessary crowding of data points for small period values. It was thus decided not to plot every data point that is provided by the previous program. Instead, this program ignores the first 8 data points and starts plotting the spectrum at the period of 0.05 second, it then skips every other data point, if needed, to maintain a period increment of no less than 0.01 second.

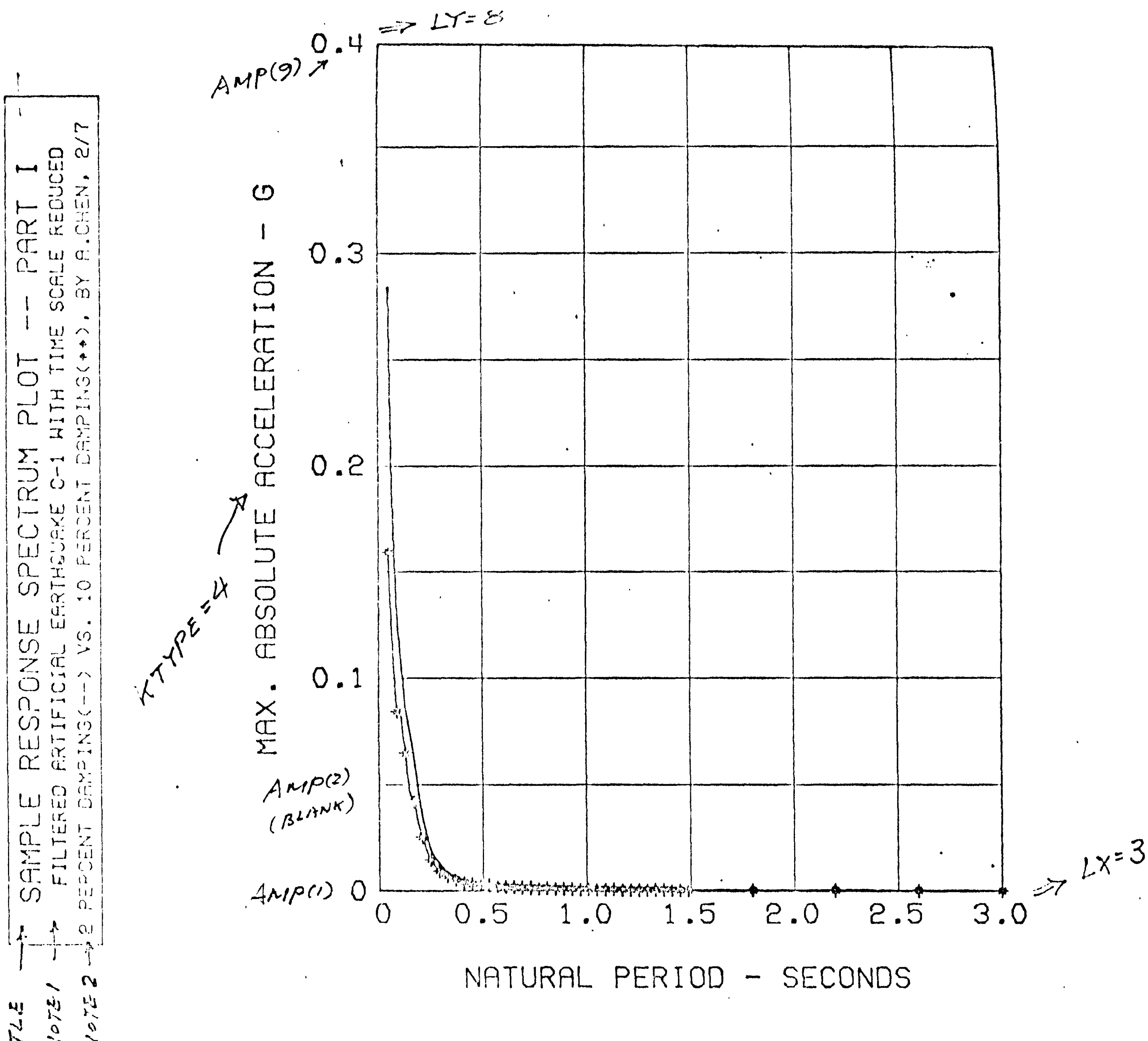



Figure 2. -- A sample of linear response spectrum plot

The maximum number of curves that can be plotted on one single plot by this program is 4. These curves can be identified by pre-designated symbols in the order of how these spectra are processed: the first curve will be plotted in a simple trace with no symbol; the second curve will be marked with asterisks; the third curve, with small triangles; and the fourth one, with small rhombuses. Plots showing velocity or displacement response spectra can be made in either metric or in British units.

The plotter will stop after the fine grid lines are drawn and the operator can change the plotting pen to complete the rest of the plot. The plot shown in Figure 2 was made with a No.1 and a No. 3 pen.

Input data cards that are required to run this program are as following:

| | |
|---|---|
| Card No. 1 | Format(11A4). Title card; columns 1-44 of this card are used to identify the plot. See the side plot in Figure 2. |
| Card No.2&3 | Format(16A4). FNOTE1 & FNOTE2; columns 1-64 of these two cards are also for identification purpose. See the side plot in Figure 2. |
| Card No.4 | Format(5I6) |
| Col.6 | An index (KTYPE) that determines which component of the spectral values is to be plotted. If KTYPE=1; plot maximum relative displacement.<br>2; plot maximum relative velocity.<br>3; maximum psuedo relative velocity.<br>4; maximum absolute acceleration.<br>5; maximum psuedo absolute acceleration. |
| Col.12 | The maximum value of period to be included in the plot (LX). For example if LX=4, the program plots spectral values up to the period of 4 sec. only. |
| Col.18 | The number of divisions (LY) in the y-direction (consider period axis as the x-direction). LY should not exceed 8 if 10" plotter is used. |

Card No.4 (continued)

Col.24 The number of curves to be plotted (NCURVE). This number should not exceed 4.

Col.30 An index (KUNIT) that specifies the units in which the plot is to be made. If KUNIT≠0, displacement and velocity spectrum plots will be made in ft. or ft/sec. Otherwise, they will be in cm or cm/sec.

Card No.5 Format(9A4)

Col.1-36 Each successive 4 columns list the ordinate scale numbers (AMP(I),I=1,9). The sequence is from the bottom one (AMP(1)=0) to the top (AMP(LY+1)) and any of the 4-column entry can be left blank as shown in Figure 2.

Card No.6 Format(F12.5). SCALE

Col.1-12 The y-scale used in the conversion of spectral values into ordinates to fit the plot. If AMP(1)=0 and AMP(I)≠0, then

$$SCALE = (I-1)/AMP(I) .$$

Cards No.7 Format(4x,F8.3,5F12.5).
These cards contain information on the spectral values of various components at a particular period. They should be exactly the output from the program "RESPONSE SPECTRUM COMPUTATION" in its original sequential order. There should be a set of 194 of these cards for each spectrum to be plotted.

## SAMPLE PROBLEM

To illustrate the use of these programs, a sample problem was prepared. The problem considers Cal Tech's artificial earthquake accelerogram C-1 (Jenning et al, 1968) which has a total duration of 12 seconds and consists of 481 acceleration ordinates at 1/40 second intervals. The record was converted into a disk file for this particular application.

In order to test the option of low-pass filtering, the C-1 record was modified such that the time interval was 1/10 that of the original. The record was then put through program "INTEGRATE AND PLOT" with additional instructions that filter No.56 be chosen and that the filtered record replace the original record to occupy the same storage space (tracks) on the disk. As a result, the program produced plots of the filtered record and a new disk file for response spectrum computation. Response spectra at damping values of 0.02 and 0.10 were subsequently computed and plotted by using programs "RESPONSE SPECTRUM COMPUTATION" and "LINEAR RESPONSE SPECTRUM PLOT" respectively. It should be noted that, because of the extremely short duration of the input acceleration record (less than 1.2 sec.), results from"RESPONSE SPECTRUM COMPUTATION" bear very little practical significance other than that they are given merely for illustrative purposes.

Furthermore, it was decided that all plots would be made in metric units and that relative velocity response plots be made for this demonstration. Accordingly, the following input data cards were used for these sample runs.

```
Column  10        20        30        40        50        60        70
....*....+....*....+....*....+....*....+....*....+....*....+....*....+..
```

(For "INTEGRATE AND PLOT")

```
CIT SIMULATED EQ C-1 W/ TIME SCALE REDUCED BY 10, & W/ FILTER NO.56
   0.0025        481    481      9       9     56      9
```

(for "RESPONSE SPECTRUM COMPUTATION")

```
0.0025    441    441      3       5       2
CIT SIMULATED EQ C-1 W/ TIME SCALE REDUCED BY 10, & W/ FILTER NO.56
```

(For "LINEAR RESPONSE SPECTRUM PLOT")

```
SAMPLE PROBLEM -- LIN.RESPONSE SPECTRUM PLOT
    FILTERED ARTIFICIAL EARTHQUAKE C-1 WITH TIME SCALE REDUCED
2 PERCENT DAMPING (--) VS. 10 PERCENT DAMPING(**).    A. CHEN, 3/
     2       2       8       2
   0      0.6      1.2      1.8      2.4
     3.33333

....*....+....*....+....*....+....*....+....*....+....*....+....*....+..
```

Punch-card outputs from "RESPONSE SPECTRUM COMPUTATION" should also be included as input to "LINEAR RESPONSE SPECTRUM PLOT".

Plots that were made by these programs together with their print-out output were reproduced and are presented next. To save space, however, response values for damping=0.10 are omitted. It should be noted also that there is no print-out output for "LINEAR RESPONSE SPECTRUM PLOT".

(Sample output from "INTEGRATE AND PLOT")

LATED EQ C-1 W/ TIME SCALE REDUCED BY 10, & W/ FILTER NO.56
BY THE LOW-PASS DIGITAL FILTER WITH THE PARAMETERS, F(CUT-OFF) = 0.05000
H = 0.05000
NO. OF WEIGHTS = 20 WHICH ARE

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| E-01 | 1.8527E-01 | 1.4569E-01 | 9.2588E-02 | 4.0061E-02 | -8.9230E-05 | -2.1989E-02 | -2.6569E-02 | -1.9714E-02 | -3.9158E-03 |
| E-05 | 4.1233E-03 | 4.1984E-03 | 2.2870E-03 | 5.1445E-04 | -8.9320E-05 | 3.0175E-04 | 9.0188E-04 | 1.0483E-03 | 6.0751E-04 |
| 2E-05 | | | | | | | | | |

NSES FOR NORMALIZED FREQUENCIES FROM 0.001 TO 0.050 IN STEPS OF 0.001

| | | | | |
|---|---|---|---|---|
| 0.99998E 00 | 0.99991E 00 | 0.99980E 00 | 0.99964E 00 | 0.99945E 00 |
| 0.99922E 00 | 0.99895E 00 | 0.99867E 00 | 0.99836E 00 | 0.99804E 00 |
| 0.99771E 00 | 0.99739E 00 | 0.99707E 00 | 0.99676E 00 | 0.99648E 00 |
| 0.99623E 00 | 0.99601E 00 | 0.99583E 00 | 0.99571E 00 | 0.99563E 00 |
| 0.99562E 00 | 0.99566E 00 | 0.99577E 00 | 0.99595E 00 | 0.99619E 00 |
| 0.99650E 00 | 0.99688E 00 | 0.99732E 00 | 0.99781E 00 | 0.99836E 00 |
| 0.99895E 00 | 0.99959E 00 | 0.10002E 01 | 0.10009E 01 | 0.10016E 01 |
| 0.10023E 01 | 0.10029E 01 | 0.10036E 01 | 0.10041E 01 | 0.10046E 01 |
| 0.10050E 01 | 0.10053E 01 | 0.10055E 01 | 0.10056E 01 | 0.10055E 01 |
| 0.10052E 01 | 0.10047E 01 | 0.10039E 01 | 0.10030E 01 | 0.10018E 01 |

RESPONSES FOR NORMALIZED FREQUENCIES FROM 0.052 TO 0.100 IN STEPS OF 0.002

| | | | | |
|---|---|---|---|---|
| 0.99852E 00 | 0.99404E 00 | 0.98821E 00 | 0.98092E 00 | 0.97209E 00 |
| 0.96166E 00 | 0.94959E 00 | 0.93584E 00 | 0.92041E 00 | 0.90332E 00 |
| 0.88462E 00 | 0.86434E 00 | 0.84257E 00 | 0.81937E 00 | 0.79485E 00 |
| 0.76910E 00 | 0.74222E 00 | 0.71433E 00 | 0.68555E 00 | 0.65598E 00 |
| 0.62575E 00 | 0.59499E 00 | 0.56380E 00 | 0.53232E 00 | 0.50067E 00 |

RESPONSES FOR NORMALIZED FREQUENCIES FROM 0.105 TO 0.200 IN STEPS OF 0.005

| | | | | |
|---|---|---|---|---|
| 0.42166E 00 | 0.34447E 00 | 0.27123E 00 | 0.20408E 00 | 0.14498E 00 |
| 0.95486E-01 | 0.56520E-01 | 0.28199E-01 | 0.97695E-02 | -0.29761E-03 |
| -0.40717E-02 | -0.38329E-02 | -0.17089E-02 | 0.62281E-03 | 0.21232E-02 |
| 0.24164E-02 | 0.16761E-02 | 0.40585E-03 | -0.81080E-03 | -0.15244E-02 |

RESPONSES FOR NORMALIZED FREQUENCIES FROM 0.210 TO 0.500 IN STEPS OF 0.010

| | | | | |
|---|---|---|---|---|
| -0.97793E-03 | 0.70351E-03 | 0.11253E-02 | 0.88811E-05 | -0.92643E-03 |
| -0.50241E-03 | 0.52267E-03 | 0.72569E-03 | -0.55254E-04 | -0.67514E-03 |
| -0.32955E-03 | 0.42659E-03 | 0.54580E-03 | -0.78499E-04 | -0.54997E-03 |
| -0.24301E-03 | 0.37700E-03 | 0.44972E-03 | -0.94354E-04 | -0.48333E-03 |
| -0.19056E-03 | 0.35471E-03 | 0.39464E-03 | -0.11104E-03 | -0.44936E-03 |
| -0.15575E-03 | 0.35149E-03 | 0.36448E-03 | -0.13024E-03 | -0.43887E-03 |

THE FILTERED RECORD: TRANSFORMED INPUT POINTS FROM NO. 21 TO NO. 461 IN STEPS OF 1!

HAS A TOTAL LENGTH OF 441 POINTS,

AND A TIME INTERVAL OF 0.2500E-02,

WITH THE MINIMUM OF -4.6813E-02,

AND THE MAXIMUM OF 5.5437E-02!

IT HAS REPLACED THE ORIGINAL RECORD ON THE DISK.

NTEGRATION OF ACCELERATION RECORD AND PLOTS OF DISPLACEMENT, VELOCITY AND ACCELERATION

CIT SIMULATED EQ C-1 W/ TIME SCALE REDUCED BY 10, & W/ FILTER NO.56

MAXIMUM VALUES

FOR DISPLACEMENT 0.01 CMS
FOR VELOCITY 0.67CM/SEC
FOR ACCELERATION 0.06 G.

ERTICAL SCALES USED, 1 INCH = 0.01 CM, FOR DISPLACEMENT
0.30 CM/SEC FOR VELOCITY
0.03 G, FOR ACCELERATION

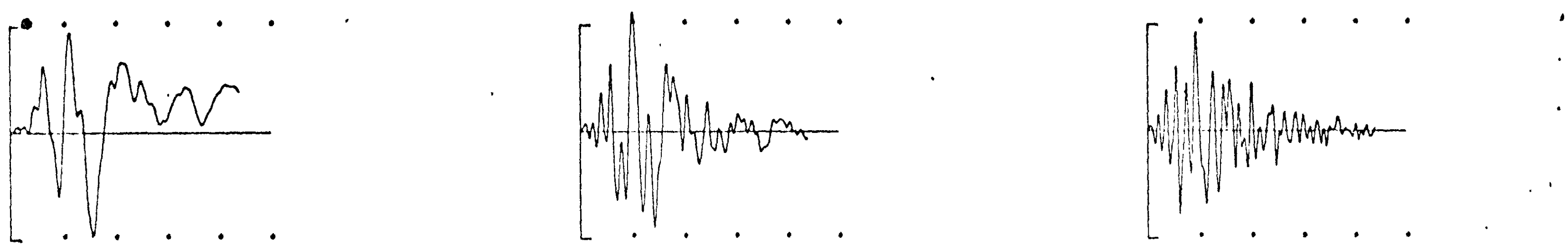



Figure 3. -- Sample output from "INTEGRATE AND PLOT"

(Sample output from "RESPONSE SPECTRUM COMPUTATION")

```
TIME AT WHICH MAX. SPECTRAL VALUES OCCUR
    TD = TIME FOR MAX. RELATIVE DISP.
    TV = TIME FOR MAX. RELATIVE VEL.
    TA = TIME FOR MAX. ABSOLUTE ACC.
DAMPING RATIO = 0.02

PER = 0.010   TIMES FOR MAXIMA --   TD = 0.2300   TV = 0.1425   TA = 0.2275
PER = 0.015   TIMES FOR MAXIMA --   TD = 0.2275   TV = 0.1425   TA = 0.2275
PER = 0.020   TIMES FOR MAXIMA --   TD = 0.2275   TV = 0.1425   TA = 0.2275
PER = 0.025   TIMES FOR MAXIMA --   TD = 0.2050   TV = 0.1975   TA = 0.2050
PER = 0.030   TIMES FOR MAXIMA --   TD = 0.2325   TV = 0.5125   TA = 0.2325
PER = 0.035   TIMES FOR MAXIMA --   TD = 0.5625   TV = 0.5725   TA = 0.5625
PER = 0.040   TIMES FOR MAXIMA --   TD = 0.1600   TV = 0.1700   TA = 0.1600
PER = 0.045   TIMES FOR MAXIMA --   TD = 0.3700   TV = 0.3825   TA = 0.3700
PER = 0.050   TIMES FOR MAXIMA --   TD = 0.2700   TV = 0.2575   TA = 0.2700
PER = 0.055   TIMES FOR MAXIMA --   TD = 0.2775   TV = 0.2625   TA = 0.2775
PER = 0.060   TIMES FOR MAXIMA --   TD = 0.3800   TV = 0.3650   TA = 0.3800
PER = 0.065   TIMES FOR MAXIMA --   TD = 0.3875   TV = 0.3725   TA = 0.3875
PER = 0.070   TIMES FOR MAXIMA --   TD = 0.3950   TV = 0.4475   TA = 0.3950
PER = 0.075   TIMES FOR MAXIMA --   TD = 0.4400   TV = 0.4225   TA = 0.4375
PER = 0.080   TIMES FOR MAXIMA --   TD = 0.4075   TV = 0.4275   TA = 0.4075
PER = 0.085   TIMES FOR MAXIMA --   TD = 0.4150   TV = 0.4325   TA = 0.4150
PER = 0.090   TIMES FOR MAXIMA --   TD = 0.6500   TV = 0.6275   TA = 0.6500
PER = 0.095   TIMES FOR MAXIMA --   TD = 0.6175   TV = 0.3200   TA = 0.6175
PER = 0.100   TIMES FOR MAXIMA --   TD = 0.3425   TV = 0.3225   TA = 0.3425
PER = 0.110   TIMES FOR MAXIMA --   TD = 0.3050   TV = 0.3275   TA = 0.3025
PER = 0.120   TIMES FOR MAXIMA --   TD = 0.3100   TV = 0.3300   TA = 0.3075
PER = 0.130   TIMES FOR MAXIMA --   TD = 0.3150   TV = 0.2900   TA = 0.3125
PER = 0.140   TIMES FOR MAXIMA --   TD = 0.3175   TV = 0.2925   TA = 0.3175
PER = 0.150   TIMES FOR MAXIMA --   TD = 0.4925   TV = 0.2950   TA = 0.4900
PER = 0.160   TIMES FOR MAXIMA --   TD = 0.5025   TV = 0.4625   TA = 0.5000
PER = 0.170   TIMES FOR MAXIMA --   TD = 0.5125   TV = 0.4800   TA = 0.5125
PER = 0.180   TIMES FOR MAXIMA --   TD = 0.6200   TV = 0.4875   TA = 0.6200
PER = 0.190   TIMES FOR MAXIMA --   TD = 0.6350   TV = 0.4900   TA = 0.6325
PER = 0.200   TIMES FOR MAXIMA --   TD = 0.5525   TV = 0.6075   TA = 0.5500
PER = 0.210   TIMES FOR MAXIMA --   TD = 0.5675   TV = 0.6100   TA = 0.5650
PER = 0.220   TIMES FOR MAXIMA --   TD = 0.5750   TV = 0.4125   TA = 0.5750
PER = 0.230   TIMES FOR MAXIMA --   TD = 0.5825   TV = 0.2475   TA = 0.5825
PER = 0.240   TIMES FOR MAXIMA --   TD = 0.5875   TV = 0.2475   TA = 0.5875
PER = 0.250   TIMES FOR MAXIMA --   TD = 0.5925   TV = 0.2475   TA = 0.5925
PER = 0.260   TIMES FOR MAXIMA --   TD = 0.9975   TV = 0.2475   TA = 0.9975
PER = 0.270   TIMES FOR MAXIMA --   TD = 1.0150   TV = 0.2475   TA = 1.0150
PER = 0.280   TIMES FOR MAXIMA --   TD = 0.9025   TV = 0.2475   TA = 0.9000
PER = 0.290   TIMES FOR MAXIMA --   TD = 0.9125   TV = 0.2475   TA = 0.9100
PER = 0.300   TIMES FOR MAXIMA --   TD = 0.9175   TV = 0.2475   TA = 0.9175
PER = 0.310   TIMES FOR MAXIMA --   TD = 0.9250   TV = 0.2475   TA = 0.9250
PER = 0.320   TIMES FOR MAXIMA --   TD = 0.7950   TV = 0.2475   TA = 0.7925
PER = 0.330   TIMES FOR MAXIMA --   TD = 0.8000   TV = 0.2475   TA = 0.7975
PER = 0.340   TIMES FOR MAXIMA --   TD = 0.8075   TV = 0.2475   TA = 0.8050
PER = 0.350   TIMES FOR MAXIMA --   TD = 0.8250   TV = 0.2475   TA = 0.8250
PER = 0.360   TIMES FOR MAXIMA --   TD = 0.8325   TV = 0.2475   TA = 0.8300
PER = 0.370   TIMES FOR MAXIMA --   TD = 0.8375   TV = 0.2475   TA = 0.8350
PER = 0.380   TIMES FOR MAXIMA --   TD = 0.8425   TV = 0.2475   TA = 0.8400
PER = 0.390   TIMES FOR MAXIMA --   TD = 0.8525   TV = 0.2475   TA = 0.8500
PER = 0.400   TIMES FOR MAXIMA --   TD = 0.8575   TV = 0.2475   TA = 0.8550
PER = 0.410   TIMES FOR MAXIMA --   TD = 0.7025   TV = 0.2475   TA = 0.7000
PER = 0.420   TIMES FOR MAXIMA --   TD = 0.7050   TV = 0.2475   TA = 0.7025
PER = 0.430   TIMES FOR MAXIMA --   TD = 0.7075   TV = 0.2475   TA = 0.7050
PER = 0.440   TIMES FOR MAXIMA --   TD = 0.7100   TV = 0.2475   TA = 0.7075
PER = 0.450   TIMES FOR MAXIMA --   TD = 0.7125   TV = 0.2475   TA = 0.7100
```

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PER = 0.460    TIMES FOR MAXIMA --   TD = 0.7125   TV = 0.2475   TA = 0.7100
PER = 0.470    TIMES FOR MAXIMA --   TD = 0.7150   TV = 0.2475   TA = 0.7125
PER = 0.480    TIMES FOR MAXIMA --   TD = 0.7175   TV = 0.2475   TA = 0.7125
PER = 0.490    TIMES FOR MAXIMA --   TD = 0.5225   TV = 0.2475   TA = 0.5200
PER = 0.500    TIMES FOR MAXIMA --   TD = 0.5225   TV = 0.2475   TA = 0.5200
PER = 0.510    TIMES FOR MAXIMA --   TD = 0.5225   TV = 0.2475   TA = 0.5200
PER = 0.520    TIMES FOR MAXIMA --   TD = 0.5250   TV = 0.2475   TA = 0.5200
PER = 0.530    TIMES FOR MAXIMA --   TD = 0.5250   TV = 0.2475   TA = 0.5200
PER = 0.540    TIMES FOR MAXIMA --   TD = 0.3875   TV = 0.2475   TA = 0.3850
PER = 0.550    TIMES FOR MAXIMA --   TD = 0.3875   TV = 0.2475   TA = 0.3850
PER = 0.560    TIMES FOR MAXIMA --   TD = 0.3875   TV = 0.2475   TA = 0.3850
PER = 0.570    TIMES FOR MAXIMA --   TD = 0.3875   TV = 0.2475   TA = 0.3850
PER = 0.580    TIMES FOR MAXIMA --   TD = 0.3875   TV = 0.2475   TA = 0.3850
PER = 0.590    TIMES FOR MAXIMA --   TD = 0.3875   TV = 0.2475   TA = 0.3850
PER = 0.600    TIMES FOR MAXIMA --   TD = 0.3875   TV = 0.2475   TA = 0.3850
PER = 0.610    TIMES FOR MAXIMA --   TD = 0.3900   TV = 0.2475   TA = 0.3850
PER = 0.620    TIMES FOR MAXIMA --   TD = 0.3900   TV = 0.2475   TA = 0.3850
PER = 0.630    TIMES FOR MAXIMA --   TD = 0.3900   TV = 0.2475   TA = 0.3850
PER = 0.640    TIMES FOR MAXIMA --   TD = 0.3900   TV = 0.2475   TA = 0.3850
PER = 0.650    TIMES FOR MAXIMA --   TD = 0.3900   TV = 0.2475   TA = 0.3850
PER = 0.660    TIMES FOR MAXIMA --   TD = 0.3900   TV = 0.2475   TA = 0.3850
PER = 0.670    TIMES FOR MAXIMA --   TD = 0.3900   TV = 0.2475   TA = 0.3850
PER = 0.680    TIMES FOR MAXIMA --   TD = 0.3900   TV = 0.2475   TA = 0.3850
PER = 0.690    TIMES FOR MAXIMA --   TD = 0.3900   TV = 0.2475   TA = 0.3850
PER = 0.700    TIMES FOR MAXIMA --   TD = 0.3900   TV = 0.2475   TA = 0.3850
PER = 0.710    TIMES FOR MAXIMA --   TD = 0.3900   TV = 0.2475   TA = 0.3850
PER = 0.720    TIMES FOR MAXIMA --   TD = 0.3900   TV = 0.2475   TA = 0.3850
PER = 0.730    TIMES FOR MAXIMA --   TD = 0.3900   TV = 0.2475   TA = 0.3850
PER = 0.740    TIMES FOR MAXIMA --   TD = 0.3900   TV = 0.2475   TA = 0.3850
PER = 0.750    TIMES FOR MAXIMA --   TD = 0.3900   TV = 0.2475   TA = 0.3850
PER = 0.760    TIMES FOR MAXIMA --   TD = 0.3900   TV = 0.2475   TA = 0.3850
PER = 0.770    TIMES FOR MAXIMA --   TD = 0.3900   TV = 0.2475   TA = 0.3850
PER = 0.780    TIMES FOR MAXIMA --   TD = 0.3900   TV = 0.2475   TA = 0.3850
PER = 0.790    TIMES FOR MAXIMA --   TD = 0.3900   TV = 0.2475   TA = 0.3850
PER = 0.800    TIMES FOR MAXIMA --   TD = 0.3900   TV = 0.2475   TA = 0.3850
PER = 0.810    TIMES FOR MAXIMA --   TD = 0.3900   TV = 0.2475   TA = 0.3850
PER = 0.820    TIMES FOR MAXIMA --   TD = 0.3900   TV = 0.2475   TA = 0.3850
PER = 0.830    TIMES FOR MAXIMA --   TD = 0.3900   TV = 0.2475   TA = 0.3850
PER = 0.840    TIMES FOR MAXIMA --   TD = 0.3900   TV = 0.2475   TA = 0.3850
PER = 0.850    TIMES FOR MAXIMA --   TD = 0.3900   TV = 0.2475   TA = 0.3850
PER = 0.860    TIMES FOR MAXIMA --   TD = 0.3900   TV = 0.2475   TA = 0.3850
PER = 0.870    TIMES FOR MAXIMA --   TD = 0.3900   TV = 0.2475   TA = 0.3850
PER = 0.880    TIMES FOR MAXIMA --   TD = 0.3900   TV = 0.2475   TA = 0.3850
PER = 0.890    TIMES FOR MAXIMA --   TD = 0.3900   TV = 0.2475   TA = 0.3850
PER = 0.900    TIMES FOR MAXIMA --   TD = 0.3900   TV = 0.2475   TA = 0.3850
PER = 0.910    TIMES FOR MAXIMA --   TD = 0.3900   TV = 0.2475   TA = 0.3850
PER = 0.920    TIMES FOR MAXIMA --   TD = 0.3900   TV = 0.2475   TA = 0.3850
PER = 0.930    TIMES FOR MAXIMA --   TD = 0.3900   TV = 0.2475   TA = 0.3850
PER = 0.940    TIMES FOR MAXIMA --   TD = 0.3900   TV = 0.2475   TA = 0.3850
PER = 0.950    TIMES FOR MAXIMA --   TD = 0.3900   TV = 0.2475   TA = 0.3850
PER = 0.960    TIMES FOR MAXIMA --   TD = 0.3900   TV = 0.2475   TA = 0.3850
PER = 0.970    TIMES FOR MAXIMA --   TD = 0.3900   TV = 0.2475   TA = 0.3850
PER = 0.980    TIMES FOR MAXIMA --   TD = 0.3900   TV = 0.2475   TA = 0.3850
PER = 0.990    TIMES FOR MAXIMA --   TD = 0.3900   TV = 0.2475   TA = 0.3850
PER = 1.000    TIMES FOR MAXIMA --   TD = 0.3900   TV = 0.2475   TA = 0.3850
PER = 1.010    TIMES FOR MAXIMA --   TD = 0.3900   TV = 0.2475   TA = 0.3850
PER = 1.020    TIMES FOR MAXIMA --   TD = 0.3900   TV = 0.2475   TA = 0.3850
PER = 1.030    TIMES FOR MAXIMA --   TD = 0.3900   TV = 0.2475   TA = 0.3850
PER = 1.040    TIMES FOR MAXIMA --   TD = 0.3900   TV = 0.2475   TA = 0.3850
PER = 1.050    TIMES FOR MAXIMA --   TD = 0.3900   TV = 0.2475   TA = 0.3850
PER = 1.060    TIMES FOR MAXIMA --   TD = 0.3900   TV = 0.2475   TA = 0.3850
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PER = 1.070     TIMES FOR MAXIMA --   TD =   0.3900    TV =   0.2475    TA =   0.3850
PER = 1.080     TIMES FOR MAXIMA --   TD =   0.3900    TV =   0.2475    TA =   0.3850
PER = 1.090     TIMES FOR MAXIMA --   TD =   0.3900    TV =   0.2475    TA =   0.3850
PER = 1.100     TIMES FOR MAXIMA --   TD =   0.3900    TV =   0.2475    TA =   0.3850
PER = 1.110     TIMES FOR MAXIMA --   TD =   0.3900    TV =   0.2475    TA =   0.3850
PER = 1.120     TIMES FOR MAXIMA --   TD =   0.3900    TV =   0.2475    TA =   0.3850
PER = 1.130     TIMES FOR MAXIMA --   TD =   0.3900    TV =   0.2475    TA =   0.3850
PER = 1.140     TIMES FOR MAXIMA --   TD =   0.3900    TV =   0.2475    TA =   0.3850
PER = 1.150     TIMES FOR MAXIMA --   TD =   0.3900    TV =   0.2475    TA =   0.3850
PER = 1.160     TIMES FOR MAXIMA --   TD =   0.3900    TV =   0.2475    TA =   0.3850
PER = 1.170     TIMES FOR MAXIMA --   TD =   0.3900    TV =   0.2475    TA =   0.3850
PER = 1.180     TIMES FOR MAXIMA --   TD =   0.3900    TV =   0.2475    TA =   0.3850
PER = 1.190     TIMES FOR MAXIMA --   TD =   0.3900    TV =   0.2475    TA =   0.3850
PER = 1.200     TIMES FOR MAXIMA --   TD =   0.3900    TV =   0.2475    TA =   0.3850
PER = 1.210     TIMES FOR MAXIMA --   TD =   0.3900    TV =   0.2475    TA =   0.3850
PER = 1.220     TIMES FOR MAXIMA --   TD =   0.3900    TV =   0.2475    TA =   0.3850
PER = 1.230     TIMES FOR MAXIMA --   TD =   0.3900    TV =   0.2475    TA =   0.3850
PER = 1.240     TIMES FOR MAXIMA --   TD =   0.3900    TV =   0.2475    TA =   0.3850
PER = 1.250     TIMES FOR MAXIMA --   TD =   0.3900    TV =   0.2475    TA =   0.3850
PER = 1.260     TIMES FOR MAXIMA --   TD =   0.3900    TV =   0.2475    TA =   0.3850
PER = 1.270     TIMES FOR MAXIMA --   TD =   0.3900    TV =   0.2475    TA =   0.3850
PER = 1.280     TIMES FOR MAXIMA --   TD =   0.3900    TV =   0.2475    TA =   0.3850
PER = 1.290     TIMES FOR MAXIMA --   TD =   0.3900    TV =   0.2475    TA =   0.3850
PER = 1.300     TIMES FOR MAXIMA --   TD =   0.3900    TV =   0.2475    TA =   0.3850
PER = 1.310     TIMES FOR MAXIMA --   TD =   0.3900    TV =   0.2475    TA =   0.3850
PER = 1.320     TIMES FOR MAXIMA --   TD =   0.3900    TV =   0.2475    TA =   0.3850
PER = 1.330     TIMES FOR MAXIMA --   TD =   0.3900    TV =   0.2475    TA =   0.3850
PER = 1.340     TIMES FOR MAXIMA --   TD =   0.3900    TV =   0.2475    TA =   0.3850
PER = 1.350     TIMES FOR MAXIMA --   TD =   0.3900    TV =   0.2475    TA =   0.3850
PER = 1.360     TIMES FOR MAXIMA --   TD =   0.3900    TV =   0.2475    TA =   0.3850
PER = 1.370     TIMES FOR MAXIMA --   TD =   0.3900    TV =   0.2475    TA =   0.3850
PER = 1.380     TIMES FOR MAXIMA --   TD =   0.3900    TV =   0.2475    TA =   0.3850
PER = 1.390     TIMES FOR MAXIMA --   TD =   0.3900    TV =   0.2475    TA =   0.3850
PER = 1.400     TIMES FOR MAXIMA --   TD =   0.3900    TV =   0.2475    TA =   0.3850
PER = 1.410     TIMES FOR MAXIMA --   TD =   0.3900    TV =   0.2475    TA =   0.3850
PER = 1.420     TIMES FOR MAXIMA --   TD =   0.3900    TV =   0.2475    TA =   0.3850
PER = 1.430     TIMES FOR MAXIMA --   TD =   0.3900    TV =   0.2475    TA =   0.3850
PER = 1.440     TIMES FOR MAXIMA --   TD =   0.3900    TV =   0.2475    TA =   0.3850
PER = 1.450     TIMES FOR MAXIMA --   TD =   0.3900    TV =   0.2475    TA =   0.3850
PER = 1.460     TIMES FOR MAXIMA --   TD =   0.3900    TV =   0.2475    TA =   0.3850
PER = 1.470     TIMES FOR MAXIMA --   TD =   0.3900    TV =   0.2475    TA =   0.3850
PER = 1.480     TIMES FOR MAXIMA --   TD =   0.3900    TV =   0.2475    TA =   0.3850
PER = 1.490     TIMES FOR MAXIMA --   TD =   0.3900    TV =   0.2475    TA =   0.3850
PER = 1.500     TIMES FOR MAXIMA --   TD =   0.3900    TV =   0.2475    TA =   0.3850
PER = 1.600     TIMES FOR MAXIMA --   TD =   0.3900    TV =   0.2475    TA =   0.3850
PER = 1.700     TIMES FOR MAXIMA --   TD =   0.3900    TV =   0.2475    TA =   0.3850
PER = 1.800     TIMES FOR MAXIMA --   TD =   0.3900    TV =   0.2475    TA =   0.3850
PER = 1.900     TIMES FOR MAXIMA --   TD =   0.3900    TV =   0.2475    TA =   0.3825
PER = 2.000     TIMES FOR MAXIMA --   TD =   0.3900    TV =   0.2475    TA =   0.3825
PER = 2.100     TIMES FOR MAXIMA --   TD =   0.3900    TV =   0.2475    TA =   0.3825
PER = 2.200     TIMES FOR MAXIMA --   TD =   0.3900    TV =   0.2475    TA =   0.3825
PER = 2.300     TIMES FOR MAXIMA --   TD =   0.3900    TV =   0.2475    TA =   0.3825
PER = 2.400     TIMES FOR MAXIMA --   TD =   0.3900    TV =   0.2475    TA =   0.3825
PER = 2.500     TIMES FOR MAXIMA --   TD =   0.3900    TV =   0.2475    TA =   0.3825
PER = 2.600     TIMES FOR MAXIMA --   TD =   0.3900    TV =   0.2475    TA =   0.3825
PER = 2.700     TIMES FOR MAXIMA --   TD =   0.3900    TV =   0.2475    TA =   0.3825
PER = 2.800     TIMES FOR MAXIMA --   TD =   0.3900    TV =   0.2475    TA =   0.3825
PER = 2.900     TIMES FOR MAXIMA --   TD =   0.3900    TV =   0.2475    TA =   0.2650
PER = 3.000     TIMES FOR MAXIMA --   TD =   0.3900    TV =   0.2475    TA =   0.2650
PER = 3.100     TIMES FOR MAXIMA --   TD =   0.3900    TV =   0.2475    TA =   0.2650
PER = 3.200     TIMES FOR MAXIMA --   TD =   0.3900    TV =   0.2475    TA =   0.2625
```

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PER = 3.300     TIMES FOR MAXIMA --    TD =  0.3900    TV =  0.2475    TA =  0.2625
PER = 3.400     TIMES FOR MAXIMA --    TD =  0.3900    TV =  0.2475    TA =  0.2625
PER = 3.500     TIMES FOR MAXIMA --    TD =  0.3900    TV =  0.2475    TA =  0.2625
PER = 3.600     TIMES FOR MAXIMA --    TD =  0.3900    TV =  0.2475    TA =  0.2500
PER = 3.700     TIMES FOR MAXIMA --    TD =  0.3900    TV =  0.2475    TA =  0.2600
PER = 3.800     TIMES FOR MAXIMA --    TD =  0.2775    TV =  0.2475    TA =  0.2600
PER = 3.900     TIMES FOR MAXIMA --    TD =  0.2775    TV =  0.2475    TA =  0.2600
PER = 4.000     TIMES FOR MAXIMA --    TD =  0.2775    TV =  0.2475    TA =  0.2600
PER = 4.200     TIMES FOR MAXIMA --    TD =  0.2775    TV =  0.2475    TA =  0.2575
PER = 4.400     TIMES FOR MAXIMA --    TD =  0.2775    TV =  0.2475    TA =  0.2575
PER = 4.600     TIMES FOR MAXIMA --    TD =  0.2775    TV =  0.2475    TA =  0.2575
PER = 4.800     TIMES FOR MAXIMA --    TD =  0.2775    TV =  0.2475    TA =  0.2550
PER = 5.000     TIMES FOR MAXIMA --    TD =  0.2775    TV =  0.2475    TA =  0.2550
PER = 5.200     TIMES FOR MAXIMA --    TD =  0.2775    TV =  0.2475    TA =  0.2550
PER = 5.400     TIMES FOR MAXIMA --    TD =  0.2775    TV =  0.2475    TA =  0.2550
PER = 5.600     TIMES FOR MAXIMA --    TD =  1.0725    TV =  0.2475    TA =  0.2550
PER = 5.800     TIMES FOR MAXIMA --    TD =  0.2775    TV =  0.2475    TA =  0.2550
PER = 6.000     TIMES FOR MAXIMA --    TD =  0.3900    TV =  0.2475    TA =  0.2525
```

SPECTRAL VALUES--

CIT SIMULATED EQ C-1 W/ TIME SCALE REDUCED BY 10, & W/ FILTER NO.56 DAMPING RATIO = 0.02

| NO. | PERIOD (SEC) | REL. DISP. (FT.) | REL. VEL. (FT/SEC) | PSU.REL.VEL. (FT/SEC) | ABS. ACC. ( G ) | PSU.ABS.ACC. ( G ) |
|---|---|---|---|---|---|---|
| 1 | 0.010 | 0.00000 | 0.00068 | 0.00291 | 0.05683 | 0.05686 |
| 2 | 0.015 | 0.00001 | 0.00183 | 0.00460 | 0.05998 | 0.05990 |
| 3 | 0.020 | 0.00003 | 0.00499 | 0.00794 | 0.07755 | 0.07742 |
| 4 | 0.025 | 0.00006 | 0.01331 | 0.01572 | 0.12271 | 0.12272 |
| 5 | 0.030 | 0.00010 | 0.01678 | 0.02199 | 0.14261 | 0.14303 |
| 6 | 0.035 | 0.00016 | 0.02732 | 0.02792 | 0.15680 | 0.15568 |
| 7 | 0.040 | 0.00024 | 0.03364 | 0.03735 | 0.18169 | 0.18219 |
| 8 | 0.045 | 0.00048 | 0.06494 | 0.06753 | 0.29427 | 0.29283 |
| 9 | 0.050 | 0.00058 | 0.06961 | 0.07298 | 0.28385 | 0.28480 |
| 10 | 0.055 | 0.00057 | 0.05986 | 0.06564 | 0.23322 | 0.23289 |
| 11 | 0.060 | 0.00070 | 0.07171 | 0.07381 | 0.23969 | 0.24004 |
| 12 | 0.065 | 0.00071 | 0.06848 | 0.06834 | 0.20568 | 0.20515 |
| 13 | 0.070 | 0.00070 | 0.06051 | 0.06302 | 0.17573 | 0.17568 |
| 14 | 0.075 | 0.00078 | 0.06536 | 0.06507 | 0.16936 | 0.16930 |
| 15 | 0.080 | 0.00084 | 0.06972 | 0.06616 | 0.16170 | 0.16138 |
| 16 | 0.085 | 0.00087 | 0.06417 | 0.06397 | 0.14663 | 0.14684 |
| 17 | 0.090 | 0.00085 | 0.06000 | 0.05909 | 0.12787 | 0.12811 |
| 18 | 0.095 | 0.00086 | 0.05967 | 0.05686 | 0.11694 | 0.11680 |
| 19 | 0.100 | 0.00086 | 0.06324 | 0.05402 | 0.10555 | 0.10540 |
| 20 | 0.110 | 0.00103 | 0.06499 | 0.05905 | 0.10496 | 0.10475 |
| 21 | 0.120 | 0.00115 | 0.05802 | 0.06014 | 0.09799 | 0.09780 |
| 22 | 0.130 | 0.00117 | 0.05886 | 0.05638 | 0.08488 | 0.08463 |
| 23 | 0.140 | 0.00111 | 0.05787 | 0.04982 | 0.06961 | 0.06943 |
| 24 | 0.150 | 0.00137 | 0.05459 | 0.05737 | 0.07470 | 0.07463 |
| 25 | 0.160 | 0.00151 | 0.05457 | 0.05911 | 0.07222 | 0.07209 |
| 26 | 0.170 | 0.00147 | 0.05549 | 0.05439 | 0.06244 | 0.06243 |
| 27 | 0.180 | 0.00144 | 0.05645 | 0.05028 | 0.05458 | 0.05451 |
| 28 | 0.190 | 0.00139 | 0.05239 | 0.04606 | 0.04735 | 0.04731 |
| 29 | 0.200 | 0.00130 | 0.04789 | 0.04070 | 0.03973 | 0.03971 |
| 30 | 0.210 | 0.00124 | 0.04402 | 0.03722 | 0.03461 | 0.03458 |
| 31 | 0.220 | 0.00120 | 0.03714 | 0.03431 | 0.03048 | 0.03043 |
| 32 | 0.230 | 0.00114 | 0.03365 | 0.03112 | 0.02642 | 0.02640 |
| 33 | 0.240 | 0.00106 | 0.03250 | 0.02779 | 0.02263 | 0.02260 |
| 34 | 0.250 | 0.00098 | 0.03197 | 0.02467 | 0.01927 | 0.01926 |
| 35 | 0.260 | 0.00095 | 0.03118 | 0.02295 | 0.01724 | 0.01722 |
| 36 | 0.270 | 0.00093 | 0.03043 | 0.02172 | 0.01572 | 0.01570 |
| 37 | 0.280 | 0.00090 | 0.02972 | 0.02029 | 0.01415 | 0.01414 |
| 38 | 0.290 | 0.00091 | 0.02907 | 0.01964 | 0.01324 | 0.01321 |
| 39 | 0.300 | 0.00088 | 0.02846 | 0.01853 | 0.01207 | 0.01205 |
| 40 | 0.310 | 0.00084 | 0.02790 | 0.01702 | 0.01073 | 0.01071 |
| 41 | 0.320 | 0.00080 | 0.02739 | 0.01575 | 0.00962 | 0.00961 |
| 42 | 0.330 | 0.00080 | 0.02691 | 0.01521 | 0.00900 | 0.00899 |
| 43 | 0.340 | 0.00079 | 0.02648 | 0.01453 | 0.00834 | 0.00834 |
| 44 | 0.350 | 0.00078 | 0.02609 | 0.01409 | 0.00786 | 0.00786 |
| 45 | 0.360 | 0.00078 | 0.02573 | 0.01370 | 0.00744 | 0.00742 |
| 46 | 0.370 | 0.00077 | 0.02540 | 0.01312 | 0.00693 | 0.00692 |
| 47 | 0.380 | 0.00075 | 0.02511 | 0.01238 | 0.00636 | 0.00635 |
| 48 | 0.390 | 0.00072 | 0.02484 | 0.01159 | 0.00580 | 0.00580 |
| 49 | 0.400 | 0.00069 | 0.02459 | 0.01077 | 0.00526 | 0.00526 |
| 50 | 0.410 | 0.00068 | 0.02437 | 0.01035 | 0.00493 | 0.00492 |
| 51 | 0.420 | 0.00068 | 0.02416 | 0.01018 | 0.00474 | 0.00473 |
| 52 | 0.430 | 0.00068 | 0.02397 | 0.00994 | 0.00452 | 0.00451 |
| 53 | 0.440 | 0.00067 | 0.02381 | 0.00963 | 0.00428 | 0.00427 |
| 54 | 0.450 | 0.00066 | 0.02365 | 0.00926 | 0.00403 | 0.00402 |
| 55 | 0.460 | 0.00065 | 0.02351 | 0.00885 | 0.00377 | 0.00376 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 56 | 0.470 | 0.00063 | 0.02338 | 0.00842 | 0.00351 | 0.00350 |
| 57 | 0.480 | 0.00061 | 0.02327 | 0.00796 | 0.00325 | 0.00324 |
| 58 | 0.490 | 0.00060 | 0.02316 | 0.00769 | 0.00307 | 0.00306 |
| 59 | 0.500 | 0.00059 | 0.02306 | 0.00745 | 0.00292 | 0.00291 |
| 60 | 0.510 | 0.00058 | 0.02297 | 0.00720 | 0.00277 | 0.00276 |
| 61 | 0.520 | 0.00058 | 0.02289 | 0.00696 | 0.00263 | 0.00261 |
| 62 | 0.530 | 0.00057 | 0.02282 | 0.00673 | 0.00249 | 0.00248 |
| 63 | 0.540 | 0.00057 | 0.02275 | 0.00660 | 0.00240 | 0.00239 |
| 64 | 0.550 | 0.00057 | 0.02269 | 0.00653 | 0.00233 | 0.00231 |
| 65 | 0.560 | 0.00057 | 0.02263 | 0.00645 | 0.00226 | 0.00225 |
| 66 | 0.570 | 0.00058 | 0.02257 | 0.00636 | 0.00220 | 0.00218 |
| 67 | 0.580 | 0.00058 | 0.02253 | 0.00628 | 0.00213 | 0.00211 |
| 68 | 0.590 | 0.00058 | 0.02248 | 0.00620 | 0.00207 | 0.00205 |
| 69 | 0.600 | 0.00058 | 0.02244 | 0.00611 | 0.00201 | 0.00199 |
| 70 | 0.610 | 0.00059 | 0.02240 | 0.00603 | 0.00195 | 0.00193 |
| 71 | 0.620 | 0.00059 | 0.02237 | 0.00594 | 0.00189 | 0.00187 |
| 72 | 0.630 | 0.00059 | 0.02234 | 0.00586 | 0.00183 | 0.00182 |
| 73 | 0.640 | 0.00059 | 0.02231 | 0.00578 | 0.00178 | 0.00176 |
| 74 | 0.650 | 0.00059 | 0.02229 | 0.00570 | 0.00173 | 0.00171 |
| 75 | 0.660 | 0.00059 | 0.02226 | 0.00562 | 0.00168 | 0.00166 |
| 76 | 0.670 | 0.00059 | 0.02224 | 0.00554 | 0.00163 | 0.00161 |
| 77 | 0.680 | 0.00059 | 0.02222 | 0.00546 | 0.00158 | 0.00157 |
| 78 | 0.690 | 0.00059 | 0.02220 | 0.00538 | 0.00154 | 0.00152 |
| 79 | 0.700 | 0.00059 | 0.02218 | 0.00531 | 0.00150 | 0.00148 |
| 80 | 0.710 | 0.00059 | 0.02216 | 0.00523 | 0.00145 | 0.00144 |
| 81 | 0.720 | 0.00059 | 0.02215 | 0.00515 | 0.00141 | 0.00140 |
| 82 | 0.730 | 0.00059 | 0.02214 | 0.00508 | 0.00138 | 0.00136 |
| 83 | 0.740 | 0.00059 | 0.02213 | 0.00500 | 0.00134 | 0.00132 |
| 84 | 0.750 | 0.00059 | 0.02211 | 0.00493 | 0.00130 | 0.00128 |
| 85 | 0.760 | 0.00059 | 0.02211 | 0.00486 | 0.00126 | 0.00125 |
| 86 | 0.770 | 0.00059 | 0.02209 | 0.00479 | 0.00123 | 0.00121 |
| 87 | 0.780 | 0.00059 | 0.02209 | 0.00472 | 0.00120 | 0.00118 |
| 88 | 0.790 | 0.00058 | 0.02208 | 0.00465 | 0.00117 | 0.00115 |
| 89 | 0.800 | 0.00058 | 0.02207 | 0.00459 | 0.00114 | 0.00112 |
| 90 | 0.810 | 0.00058 | 0.02206 | 0.00453 | 0.00111 | 0.00109 |
| 91 | 0.820 | 0.00058 | 0.02206 | 0.00446 | 0.00108 | 0.00106 |
| 92 | 0.830 | 0.00058 | 0.02205 | 0.00439 | 0.00105 | 0.00103 |
| 93 | 0.840 | 0.00058 | 0.02205 | 0.00433 | 0.00102 | 0.00101 |
| 94 | 0.850 | 0.00058 | 0.02205 | 0.00427 | 0.00100 | 0.00098 |
| 95 | 0.860 | 0.00058 | 0.02203 | 0.00423 | 0.00098 | 0.00096 |
| 96 | 0.870 | 0.00058 | 0.02204 | 0.00415 | 0.00095 | 0.00093 |
| 97 | 0.880 | 0.00057 | 0.02203 | 0.00411 | 0.00093 | 0.00091 |
| 98 | 0.890 | 0.00057 | 0.02203 | 0.00405 | 0.00091 | 0.00089 |
| 99 | 0.900 | 0.00057 | 0.02202 | 0.00400 | 0.00088 | 0.00087 |
| 100 | 0.910 | 0.00057 | 0.02202 | 0.00394 | 0.00086 | 0.00085 |
| 101 | 0.920 | 0.00057 | 0.02202 | 0.00390 | 0.00084 | 0.00083 |
| 102 | 0.930 | 0.00057 | 0.02201 | 0.00384 | 0.00082 | 0.00081 |
| 103 | 0.940 | 0.00057 | 0.02202 | 0.00379 | 0.00080 | 0.00079 |
| 104 | 0.950 | 0.00057 | 0.02201 | 0.00375 | 0.00079 | 0.00077 |
| 105 | 0.960 | 0.00057 | 0.02201 | 0.00370 | 0.00077 | 0.00075 |
| 106 | 0.970 | 0.00056 | 0.02201 | 0.00366 | 0.00075 | 0.00074 |
| 107 | 0.980 | 0.00055 | 0.02201 | 0.00361 | 0.00074 | 0.00072 |
| 108 | 0.990 | 0.00056 | 0.02201 | 0.00355 | 0.00072 | 0.00070 |
| 109 | 1.000 | 0.00056 | 0.02201 | 0.00352 | 0.00070 | 0.00069 |
| 110 | 1.010 | 0.00056 | 0.02201 | 0.00348 | 0.00069 | 0.00067 |
| 111 | 1.020 | 0.00056 | 0.02200 | 0.00345 | 0.00068 | 0.00066 |
| 112 | 1.030 | 0.00056 | 0.02200 | 0.00339 | 0.00066 | 0.00064 |
| 113 | 1.040 | 0.00056 | 0.02199 | 0.00337 | 0.00065 | 0.00063 |
| 114 | 1.050 | 0.00055 | 0.02199 | 0.00332 | 0.00063 | 0.00062 |
| 115 | 1.060 | 0.00055 | 0.02200 | 0.00328 | 0.00062 | 0.00060 |
| 116 | 1.070 | 0.00055 | 0.02200 | 0.00324 | 0.00061 | 0.00059 |

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|---|---|---|---|---|---|---|
| 117 | 1.080 | 0.00055 | 0.02200 | 0.00320 | 0.00060 | 0.00058 |
| 118 | 1.090 | 0.00055 | 0.02200 | 0.00316 | 0.00058 | 0.00057 |
| 119 | 1.100 | 0.00055 | 0.02200 | 0.00313 | 0.00057 | 0.00056 |
| 120 | 1.110 | 0.00055 | 0.02198 | 0.00311 | 0.00056 | 0.00055 |
| 121 | 1.120 | 0.00055 | 0.02199 | 0.00307 | 0.00055 | 0.00054 |
| 122 | 1.130 | 0.00054 | 0.02200 | 0.00303 | 0.00054 | 0.00052 |
| 123 | 1.140 | 0.00055 | 0.02199 | 0.00300 | 0.00053 | 0.00051 |
| 124 | 1.150 | 0.00054 | 0.02200 | 0.00296 | 0.00052 | 0.00050 |
| 125 | 1.160 | 0.00054 | 0.02201 | 0.00292 | 0.00051 | 0.00049 |
| 126 | 1.170 | 0.00054 | 0.02200 | 0.00291 | 0.00050 | 0.00048 |
| 127 | 1.180 | 0.00054 | 0.02200 | 0.00287 | 0.00049 | 0.00048 |
| 128 | 1.190 | 0.00054 | 0.02200 | 0.00284 | 0.00048 | 0.00047 |
| 129 | 1.200 | 0.00053 | 0.02200 | 0.00282 | 0.00047 | 0.00046 |
| 130 | 1.210 | 0.00053 | 0.02201 | 0.00278 | 0.00046 | 0.00045 |
| 131 | 1.220 | 0.00053 | 0.02202 | 0.00274 | 0.00046 | 0.00044 |
| 132 | 1.230 | 0.00053 | 0.02202 | 0.00272 | 0.00045 | 0.00043 |
| 133 | 1.240 | 0.00053 | 0.02201 | 0.00270 | 0.00044 | 0.00043 |
| 134 | 1.250 | 0.00053 | 0.02202 | 0.00266 | 0.00043 | 0.00042 |
| 135 | 1.260 | 0.00053 | 0.02200 | 0.00265 | 0.00043 | 0.00041 |
| 136 | 1.270 | 0.00053 | 0.02199 | 0.00264 | 0.00042 | 0.00041 |
| 137 | 1.280 | 0.00053 | 0.02198 | 0.00262 | 0.00042 | 0.00040 |
| 138 | 1.290 | 0.00053 | 0.02200 | 0.00259 | 0.00041 | 0.00039 |
| 139 | 1.300 | 0.00053 | 0.02200 | 0.00256 | 0.00040 | 0.00038 |
| 140 | 1.310 | 0.00053 | 0.02200 | 0.00253 | 0.00039 | 0.00038 |
| 141 | 1.320 | 0.00053 | 0.02200 | 0.00251 | 0.00039 | 0.00037 |
| 142 | 1.330 | 0.00053 | 0.02200 | 0.00249 | 0.00038 | 0.00037 |
| 143 | 1.340 | 0.00052 | 0.02201 | 0.00245 | 0.00037 | 0.00036 |
| 144 | 1.350 | 0.00052 | 0.02201 | 0.00244 | 0.00037 | 0.00035 |
| 145 | 1.360 | 0.00053 | 0.02198 | 0.00244 | 0.00037 | 0.00035 |
| 146 | 1.370 | 0.00052 | 0.02201 | 0.00239 | 0.00036 | 0.00034 |
| 147 | 1.380 | 0.00052 | 0.02202 | 0.00237 | 0.00035 | 0.00033 |
| 148 | 1.390 | 0.00052 | 0.02201 | 0.00235 | 0.00035 | 0.00033 |
| 149 | 1.400 | 0.00052 | 0.02201 | 0.00233 | 0.00034 | 0.00033 |
| 150 | 1.410 | 0.00052 | 0.02202 | 0.00230 | 0.00033 | 0.00032 |
| 151 | 1.420 | 0.00052 | 0.02199 | 0.00231 | 0.00033 | 0.00032 |
| 152 | 1.430 | 0.00052 | 0.02201 | 0.00227 | 0.00033 | 0.00031 |
| 153 | 1.440 | 0.00052 | 0.02201 | 0.00225 | 0.00032 | 0.00031 |
| 154 | 1.450 | 0.00051 | 0.02201 | 0.00223 | 0.00032 | 0.00030 |
| 155 | 1.460 | 0.00051 | 0.02201 | 0.00221 | 0.00031 | 0.00030 |
| 156 | 1.470 | 0.00051 | 0.02200 | 0.00220 | 0.00031 | 0.00029 |
| 157 | 1.480 | 0.00051 | 0.02202 | 0.00216 | 0.00030 | 0.00029 |
| 158 | 1.490 | 0.00051 | 0.02200 | 0.00216 | 0.00030 | 0.00028 |
| 159 | 1.500 | 0.00051 | 0.02202 | 0.00213 | 0.00029 | 0.00028 |
| 160 | 1.600 | 0.00050 | 0.02204 | 0.00197 | 0.00025 | 0.00024 |
| 161 | 1.700 | 0.00050 | 0.02202 | 0.00185 | 0.00023 | 0.00021 |
| 162 | 1.800 | 0.00050 | 0.02203 | 0.00174 | 0.00020 | 0.00019 |
| 163 | 1.900 | 0.00050 | 0.02200 | 0.00165 | 0.00018 | 0.00017 |
| 164 | 2.000 | 0.00049 | 0.02205 | 0.00154 | 0.00016 | 0.00015 |
| 165 | 2.100 | 0.00048 | 0.02209 | 0.00143 | 0.00015 | 0.00013 |
| 166 | 2.200 | 0.00049 | 0.02207 | 0.00139 | 0.00014 | 0.00012 |
| 167 | 2.300 | 0.00048 | 0.02207 | 0.00131 | 0.00012 | 0.00011 |
| 168 | 2.400 | 0.00049 | 0.02202 | 0.00128 | 0.00012 | 0.00010 |
| 169 | 2.500 | 0.00048 | 0.02203 | 0.00121 | 0.00011 | 0.00009 |
| 170 | 2.600 | 0.00050 | 0.02196 | 0.00121 | 0.00010 | 0.00009 |
| 171 | 2.700 | 0.00050 | 0.02193 | 0.00117 | 0.00010 | 0.00008 |
| 172 | 2.800 | 0.00052 | 0.02182 | 0.00117 | 0.00009 | 0.00008 |
| 173 | 2.900 | 0.00047 | 0.02203 | 0.00101 | 0.00008 | 0.00007 |
| 174 | 3.000 | 0.00047 | 0.02205 | 0.00099 | 0.00008 | 0.00006 |
| 175 | 3.100 | 0.00047 | 0.02208 | 0.00095 | 0.00007 | 0.00006 |
| 176 | 3.200 | 0.00047 | 0.02203 | 0.00093 | 0.00007 | 0.00006 |
| 177 | 3.300 | 0.00047 | 0.02200 | 0.00090 | 0.00007 | 0.00005 |

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|---|---|---|---|---|---|---|
| 117 | 1.080 | 0.00055 | 0.02200 | 0.00320 | 0.00060 | 0.00058 |
| 118 | 1.090 | 0.00055 | 0.02200 | 0.00316 | 0.00058 | 0.00057 |
| 119 | 1.100 | 0.00055 | 0.02200 | 0.00313 | 0.00057 | 0.00056 |
| 120 | 1.110 | 0.00055 | 0.02198 | 0.00311 | 0.00056 | 0.00055 |
| 121 | 1.120 | 0.00055 | 0.02199 | 0.00307 | 0.00055 | 0.00054 |
| 122 | 1.130 | 0.00054 | 0.02200 | 0.00303 | 0.00054 | 0.00052 |
| 123 | 1.140 | 0.00055 | 0.02199 | 0.00300 | 0.00053 | 0.00051 |
| 124 | 1.150 | 0.00054 | 0.02200 | 0.00296 | 0.00052 | 0.00050 |
| 125 | 1.160 | 0.00054 | 0.02201 | 0.00292 | 0.00051 | 0.00049 |
| 126 | 1.170 | 0.00054 | 0.02200 | 0.00291 | 0.00050 | 0.00048 |
| 127 | 1.180 | 0.00054 | 0.02200 | 0.00287 | 0.00049 | 0.00048 |
| 128 | 1.190 | 0.00054 | 0.02200 | 0.00284 | 0.00048 | 0.00047 |
| 129 | 1.200 | 0.00054 | 0.02200 | 0.00282 | 0.00047 | 0.00046 |
| 130 | 1.210 | 0.00053 | 0.02201 | 0.00278 | 0.00046 | 0.00045 |
| 131 | 1.220 | 0.00053 | 0.02202 | 0.00274 | 0.00046 | 0.00044 |
| 132 | 1.230 | 0.00053 | 0.02202 | 0.00272 | 0.00045 | 0.00043 |
| 133 | 1.240 | 0.00053 | 0.02201 | 0.00270 | 0.00044 | 0.00043 |
| 134 | 1.250 | 0.00053 | 0.02202 | 0.00266 | 0.00043 | 0.00042 |
| 135 | 1.260 | 0.00053 | 0.02200 | 0.00265 | 0.00043 | 0.00041 |
| 136 | 1.270 | 0.00053 | 0.02199 | 0.00264 | 0.00042 | 0.00041 |
| 137 | 1.280 | 0.00053 | 0.02198 | 0.00262 | 0.00042 | 0.00040 |
| 138 | 1.290 | 0.00053 | 0.02200 | 0.00259 | 0.00041 | 0.00039 |
| 139 | 1.300 | 0.00053 | 0.02200 | 0.00256 | 0.00040 | 0.00038 |
| 140 | 1.310 | 0.00053 | 0.02200 | 0.00253 | 0.00039 | 0.00038 |
| 141 | 1.320 | 0.00053 | 0.02200 | 0.00251 | 0.00039 | 0.00037 |
| 142 | 1.330 | 0.00053 | 0.02200 | 0.00249 | 0.00038 | 0.00037 |
| 143 | 1.340 | 0.00052 | 0.02201 | 0.00245 | 0.00037 | 0.00036 |
| 144 | 1.350 | 0.00052 | 0.02201 | 0.00244 | 0.00037 | 0.00035 |
| 145 | 1.360 | 0.00053 | 0.02198 | 0.00244 | 0.00037 | 0.00035 |
| 146 | 1.370 | 0.00052 | 0.02201 | 0.00239 | 0.00036 | 0.00034 |
| 147 | 1.380 | 0.00052 | 0.02202 | 0.00237 | 0.00035 | 0.00033 |
| 148 | 1.390 | 0.00052 | 0.02201 | 0.00235 | 0.00035 | 0.00033 |
| 149 | 1.400 | 0.00052 | 0.02201 | 0.00233 | 0.00034 | 0.00033 |
| 150 | 1.410 | 0.00052 | 0.02202 | 0.00230 | 0.00033 | 0.00032 |
| 151 | 1.420 | 0.00052 | 0.02199 | 0.00231 | 0.00033 | 0.00032 |
| 152 | 1.430 | 0.00052 | 0.02201 | 0.00227 | 0.00033 | 0.00031 |
| 153 | 1.440 | 0.00052 | 0.02201 | 0.00225 | 0.00032 | 0.00031 |
| 154 | 1.450 | 0.00051 | 0.02201 | 0.00223 | 0.00032 | 0.00030 |
| 155 | 1.460 | 0.00051 | 0.02201 | 0.00221 | 0.00031 | 0.00030 |
| 156 | 1.470 | 0.00051 | 0.02200 | 0.00220 | 0.00031 | 0.00029 |
| 157 | 1.480 | 0.00051 | 0.02202 | 0.00216 | 0.00030 | 0.00029 |
| 158 | 1.490 | 0.00051 | 0.02200 | 0.00216 | 0.00030 | 0.00028 |
| 159 | 1.500 | 0.00051 | 0.02202 | 0.00213 | 0.00029 | 0.00028 |
| 160 | 1.600 | 0.00050 | 0.02204 | 0.00197 | 0.00025 | 0.00024 |
| 161 | 1.700 | 0.00050 | 0.02202 | 0.00185 | 0.00023 | 0.00021 |
| 162 | 1.800 | 0.00050 | 0.02203 | 0.00174 | 0.00020 | 0.00019 |
| 163 | 1.900 | 0.00050 | 0.02200 | 0.00165 | 0.00018 | 0.00017 |
| 164 | 2.000 | 0.00049 | 0.02205 | 0.00154 | 0.00016 | 0.00015 |
| 165 | 2.100 | 0.00048 | 0.02209 | 0.00143 | 0.00015 | 0.00013 |
| 166 | 2.200 | 0.00049 | 0.02207 | 0.00139 | 0.00014 | 0.00012 |
| 167 | 2.300 | 0.00048 | 0.02207 | 0.00131 | 0.00012 | 0.00011 |
| 168 | 2.400 | 0.00049 | 0.02202 | 0.00128 | 0.00012 | 0.00010 |
| 169 | 2.500 | 0.00048 | 0.02203 | 0.00121 | 0.00011 | 0.00009 |
| 170 | 2.600 | 0.00050 | 0.02196 | 0.00121 | 0.00010 | 0.00009 |
| 171 | 2.700 | 0.00050 | 0.02193 | 0.00117 | 0.00010 | 0.00008 |
| 172 | 2.800 | 0.00052 | 0.02182 | 0.00117 | 0.00009 | 0.00008 |
| 173 | 2.900 | 0.00047 | 0.02203 | 0.00101 | 0.00008 | 0.00007 |
| 174 | 3.000 | 0.00047 | 0.02205 | 0.00099 | 0.00008 | 0.00006 |
| 175 | 3.100 | 0.00047 | 0.02208 | 0.00095 | 0.00007 | 0.00006 |
| 176 | 3.200 | 0.00047 | 0.02203 | 0.00093 | 0.00007 | 0.00006 |
| 177 | 3.300 | 0.00047 | 0.02200 | 0.00090 | 0.00007 | 0.00005 |

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|---|---|---|---|---|---|---|
| 178 | 3.400 | 0.00048 | 0.02199 | 0.00088 | 0.00006 | 0.00005 |
| 179 | 3.500 | 0.00047 | 0.02206 | 0.00084 | 0.00006 | 0.00005 |
| 180 | 3.600 | 0.00046 | 0.02197 | 0.00080 | 0.00006 | 0.00004 |
| 181 | 3.700 | 0.00048 | 0.02194 | 0.00081 | 0.00006 | 0.00004 |
| 182 | 3.800 | 0.00045 | 0.02208 | 0.00075 | 0.00006 | 0.00004 |
| 183 | 3.900 | 0.00046 | 0.02222 | 0.00074 | 0.00006 | 0.00004 |
| 184 | 4.000 | 0.00045 | 0.02208 | 0.00070 | 0.00005 | 0.00003 |
| 185 | 4.200 | 0.00047 | 0.02225 | 0.00070 | 0.00005 | 0.00003 |
| 186 | 4.400 | 0.00047 | 0.02225 | 0.00067 | 0.00005 | 0.00003 |
| 187 | 4.600 | 0.00046 | 0.02222 | 0.00063 | 0.00004 | 0.00003 |
| 188 | 4.800 | 0.00048 | 0.02228 | 0.00063 | 0.00004 | 0.00003 |
| 189 | 5.000 | 0.00047 | 0.02225 | 0.00060 | 0.00004 | 0.00002 |
| 190 | 5.200 | 0.00047 | 0.02232 | 0.00057 | 0.00004 | 0.00002 |
| 191 | 5.400 | 0.00050 | 0.02261 | 0.00059 | 0.00004 | 0.00002 |
| 192 | 5.600 | 0.00048 | 0.02248 | 0.00054 | 0.00004 | 0.00002 |
| 193 | 5.800 | 0.00047 | 0.02238 | 0.00051 | 0.00003 | 0.00002 |
| 194 | 6.000 | 0.00045 | 0.02229 | 0.00047 | 0.00003 | 0.00002 |

SPECTRAL INTENSITIES FOR DAMPING RATIO = 0.02
BASED ON REL. VEL., SI= 0.058
BASED ON PSEUDO REL. VEL., SI = 0.016

SPECTRAL VALUES--
CIT SIMULATED EQ C-1 W/ TIME SCALE REDUCED BY 10, & W/ FILTER NO.56 DAMPING RATIO = 0.02

| NO. | PERIOD (SEC) | REL. DISP. (CM.) | REL. VEL. (CM/SEC) | PSU.REL.VEL. (CM/SEC) | ABS. ACC. (CM/SEC/SEC) | PSU.ABS.ACC. (CM/SEC/SEC) |
|---|---|---|---|---|---|---|
| 1 | 0.010 | 0.00014 | 0.02073 | 0.08882 | 55.69452 | 55.72229 |
| 2 | 0.015 | 0.00034 | 0.05571 | 0.14034 | 58.78174 | 58.69830 |
| 3 | 0.020 | 0.00077 | 0.15211 | 0.24186 | 76.00226 | 75.87119 |
| 4 | 0.025 | 0.00191 | 0.40568 | 0.47923 | 120.25281 | 120.26578 |
| 5 | 0.030 | 0.00320 | 0.51154 | 0.67025 | 139.75494 | 140.16803 |
| 6 | 0.035 | 0.00474 | 0.83274 | 0.85115 | 153.66870 | 152.57124 |
| 7 | 0.040 | 0.00725 | 1.02536 | 1.13833 | 178.05623 | 178.54404 |
| 8 | 0.045 | 0.01474 | 1.97924 | 2.05833 | 288.38843 | 285.97095 |
| 9 | 0.050 | 0.01770 | 2.12175 | 2.22431 | 278.17407 | 279.10059 |
| 10 | 0.055 | 0.01751 | 1.82441 | 2.00085 | 228.55196 | 228.23705 |
| 11 | 0.060 | 0.02148 | 2.18570 | 2.24974 | 234.90076 | 235.24294 |
| 12 | 0.065 | 0.02155 | 2.08716 | 2.08295 | 201.57120 | 201.04846 |
| 13 | 0.070 | 0.02140 | 1.84425 | 1.92096 | 172.21404 | 172.16888 |
| 14 | 0.075 | 0.02367 | 1.99222 | 1.98339 | 165.97377 | 165.91325 |
| 15 | 0.080 | 0.02568 | 2.12512 | 2.01663 | 158.46367 | 158.15092 |
| 16 | 0.085 | 0.02638 | 1.95594 | 1.94969 | 143.69778 | 143.90685 |
| 17 | 0.090 | 0.02580 | 1.82866 | 1.80096 | 125.31630 | 125.54457 |
| 18 | 0.095 | 0.02620 | 1.81883 | 1.73316 | 114.59836 | 114.45934 |
| 19 | 0.100 | 0.02620 | 1.92767 | 1.64645 | 103.43642 | 103.29628 |
| 20 | 0.110 | 0.03151 | 1.98082 | 1.79986 | 102.86420 | 102.65550 |
| 21 | 0.120 | 0.03501 | 1.76831 | 1.83317 | 96.03081 | 95.84225 |
| 22 | 0.130 | 0.03556 | 1.79407 | 1.71851 | 83.17776 | 82.93613 |
| 23 | 0.140 | 0.03383 | 1.76380 | 1.51838 | 68.21376 | 68.04355 |
| 24 | 0.150 | 0.04175 | 1.66384 | 1.74874 | 73.20895 | 73.14226 |
| 25 | 0.160 | 0.04588 | 1.66342 | 1.80162 | 70.77953 | 70.64449 |
| 26 | 0.170 | 0.04485 | 1.69125 | 1.65777 | 61.19354 | 61.18027 |
| 27 | 0.180 | 0.04390 | 1.72045 | 1.53250 | 53.48413 | 53.41504 |
| 28 | 0.190 | 0.04246 | 1.59673 | 1.40400 | 46.40649 | 46.36049 |
| 29 | 0.200 | 0.03949 | 1.45961 | 1.24055 | 38.93155 | 38.91512 |
| 30 | 0.210 | 0.03791 | 1.34173 | 1.13439 | 33.92220 | 33.89041 |
| 31 | 0.220 | 0.03662 | 1.13209 | 1.04574 | 29.87115 | 29.82190 |
| 32 | 0.230 | 0.03473 | 1.02553 | 0.94864 | 25.89285 | 25.87663 |
| 33 | 0.240 | 0.03236 | 0.99974 | 0.84709 | 22.17574 | 22.14392 |
| 34 | 0.250 | 0.02992 | 0.97454 | 0.75195 | 18.88722 | 18.87048 |
| 35 | 0.260 | 0.02894 | 0.95037 | 0.69943 | 16.89120 | 16.87741 |
| 36 | 0.270 | 0.02845 | 0.92747 | 0.66214 | 15.40861 | 15.38581 |
| 37 | 0.280 | 0.02756 | 0.90599 | 0.61850 | 13.87136 | 13.85848 |
| 38 | 0.290 | 0.02763 | 0.88598 | 0.59860 | 12.97033 | 12.95016 |
| 39 | 0.300 | 0.02697 | 0.86746 | 0.56483 | 11.82994 | 11.81214 |
| 40 | 0.310 | 0.02559 | 0.85040 | 0.51875 | 10.51059 | 10.49868 |
| 41 | 0.320 | 0.02445 | 0.83470 | 0.48015 | 9.42383 | 9.41378 |
| 42 | 0.330 | 0.02435 | 0.82034 | 0.46355 | 8.82398 | 8.81293 |
| 43 | 0.340 | 0.02396 | 0.80722 | 0.44277 | 8.17579 | 8.17014 |
| 44 | 0.350 | 0.02392 | 0.79522 | 0.42945 | 7.70444 | 7.69799 |
| 45 | 0.360 | 0.02392 | 0.78428 | 0.41753 | 7.28666 | 7.27643 |
| 46 | 0.370 | 0.02355 | 0.77432 | 0.39984 | 6.79091 | 6.77985 |
| 47 | 0.380 | 0.02281 | 0.76525 | 0.37720 | 6.23521 | 6.22769 |
| 48 | 0.390 | 0.02193 | 0.75700 | 0.35330 | 5.68809 | 5.68355 |
| 49 | 0.400 | 0.02091 | 0.74947 | 0.32841 | 5.15942 | 5.15099 |
| 50 | 0.410 | 0.02058 | 0.74266 | 0.31532 | 4.83241 | 4.82508 |
| 51 | 0.420 | 0.02074 | 0.73642 | 0.31024 | 4.64331 | 4.63425 |
| 52 | 0.430 | 0.02072 | 0.73075 | 0.30283 | 4.42865 | 4.41839 |
| 53 | 0.440 | 0.02055 | 0.72561 | 0.29342 | 4.19446 | 4.18378 |
| 54 | 0.450 | 0.02021 | 0.72093 | 0.28224 | 3.94515 | 3.93497 |
| 55 | 0.460 | 0.01976 | 0.71664 | 0.26989 | 3.69262 | 3.68099 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 56 | 0.470 | 0.01920 | 0.71274 | 0.25667 | 3.43610 | 3.42623 |
| 57 | 0.480 | 0.01854 | 0.70918 | 0.24763 | 3.14212 | 3.17132 |
| 58 | 0.490 | 0.01827 | 0.70597 | 0.23429 | 3.01269 | 2.99981 |
| 59 | 0.500 | 0.01807 | 0.70295 | 0.22702 | 2.86214 | 2.84854 |
| 60 | 0.510 | 0.01782 | 0.70023 | 0.21952 | 2.71404 | 2.70053 |
| 61 | 0.520 | 0.01756 | 0.69773 | 0.21218 | 2.57276 | 2.55998 |
| 62 | 0.530 | 0.01729 | 0.69549 | 0.20500 | 2.43795 | 2.42669 |
| 63 | 0.540 | 0.01730 | 0.69343 | 0.20131 | 2.35605 | 2.37883 |
| 64 | 0.550 | 0.01741 | 0.69151 | 0.19888 | 2.28622 | 2.26869 |
| 65 | 0.560 | 0.01751 | 0.68968 | 0.19646 | 2.21887 | 2.20105 |
| 66 | 0.570 | 0.01760 | 0.68799 | 0.19398 | 2.15329 | 2.13515 |
| 67 | 0.580 | 0.01766 | 0.68665 | 0.19135 | 2.08828 | 2.06983 |
| 68 | 0.590 | 0.01773 | 0.68524 | 0.18884 | 2.02684 | 2.00808 |
| 69 | 0.600 | 0.01779 | 0.68400 | 0.18626 | 1.96665 | 1.94760 |
| 70 | 0.610 | 0.01784 | 0.68284 | 0.18380 | 1.90957 | 1.89034 |
| 71 | 0.620 | 0.01787 | 0.68196 | 0.18112 | 1.85159 | 1.83274 |
| 72 | 0.630 | 0.01791 | 0.68089 | 0.17865 | 1.79767 | 1.77910 |
| 73 | 0.640 | 0.01795 | 0.68002 | 0.17624 | 1.74595 | 1.72765 |
| 74 | 0.650 | 0.01797 | 0.67932 | 0.17366 | 1.69426 | 1.67620 |
| 75 | 0.660 | 0.01799 | 0.67856 | 0.17126 | 1.64587 | 1.62801 |
| 76 | 0.670 | 0.01800 | 0.67789 | 0.16881 | 1.59943 | 1.58071 |
| 77 | 0.680 | 0.01801 | 0.67717 | 0.16644 | 1.55318 | 1.53559 |
| 78 | 0.690 | 0.01801 | 0.67664 | 0.16399 | 1.50856 | 1.49110 |
| 79 | 0.700 | 0.01802 | 0.67613 | 0.16171 | 1.46675 | 1.44936 |
| 80 | 0.710 | 0.01801 | 0.67557 | 0.15939 | 1.42571 | 1.40840 |
| 81 | 0.720 | 0.01799 | 0.67516 | 0.15701 | 1.38541 | 1.36814 |
| 82 | 0.730 | 0.01799 | 0.67476 | 0.15481 | 1.34775 | 1.33053 |
| 83 | 0.740 | 0.01795 | 0.67441 | 0.15245 | 1.30969 | 1.29248 |
| 84 | 0.750 | 0.01795 | 0.67397 | 0.15038 | 1.27516 | 1.25799 |
| 85 | 0.760 | 0.01791 | 0.67380 | 0.14806 | 1.23941 | 1.22225 |
| 86 | 0.770 | 0.01790 | 0.67339 | 0.14607 | 1.20732 | 1.19017 |
| 87 | 0.780 | 0.01786 | 0.67330 | 0.14384 | 1.17414 | 1.15698 |
| 88 | 0.790 | 0.01782 | 0.67304 | 0.14173 | 1.14274 | 1.12558 |
| 89 | 0.800 | 0.01781 | 0.67269 | 0.13990 | 1.11428 | 1.09711 |
| 90 | 0.810 | 0.01780 | 0.67243 | 0.13804 | 1.08635 | 1.06918 |
| 91 | 0.820 | 0.01775 | 0.67237 | 0.13598 | 1.05758 | 1.04041 |
| 92 | 0.830 | 0.01769 | 0.67223 | 0.13394 | 1.02960 | 1.01241 |
| 93 | 0.840 | 0.01766 | 0.67214 | 0.13208 | 1.00369 | 0.98650 |
| 94 | 0.850 | 0.01762 | 0.67196 | 0.13026 | 0.97865 | 0.96145 |
| 95 | 0.860 | 0.01763 | 0.67162 | 0.12883 | 0.95706 | 0.93985 |
| 96 | 0.870 | 0.01754 | 0.67179 | 0.12664 | 0.93048 | 0.91325 |
| 97 | 0.880 | 0.01753 | 0.67150 | 0.12513 | 0.90935 | 0.89212 |
| 98 | 0.890 | 0.01748 | 0.67147 | 0.12343 | 0.88731 | 0.87008 |
| 99 | 0.900 | 0.01746 | 0.67127 | 0.12189 | 0.86693 | 0.84970 |
| 100 | 0.910 | 0.01741 | 0.67124 | 0.12021 | 0.84602 | 0.82879 |
| 101 | 0.920 | 0.01740 | 0.67103 | 0.11883 | 0.82760 | 0.81036 |
| 102 | 0.930 | 0.01734 | 0.67098 | 0.11715 | 0.80756 | 0.79033 |
| 103 | 0.940 | 0.01729 | 0.67106 | 0.11554 | 0.78838 | 0.77115 |
| 104 | 0.950 | 0.01728 | 0.67092 | 0.11428 | 0.77194 | 0.75471 |
| 105 | 0.960 | 0.01724 | 0.67080 | 0.11280 | 0.75441 | 0.73720 |
| 106 | 0.970 | 0.01721 | 0.67077 | 0.11148 | 0.73822 | 0.72102 |
| 107 | 0.980 | 0.01715 | 0.67077 | 0.10993 | 0.72095 | 0.70377 |
| 108 | 0.990 | 0.01707 | 0.67098 | 0.10834 | 0.70375 | 0.68657 |
| 109 | 1.000 | 0.01707 | 0.67077 | 0.10726 | 0.69010 | 0.67294 |
| 110 | 1.010 | 0.01703 | 0.67071 | 0.10596 | 0.67535 | 0.65821 |
| 111 | 1.020 | 0.01705 | 0.67045 | 0.10504 | 0.66124 | 0.64610 |
| 112 | 1.030 | 0.01696 | 0.67063 | 0.10344 | 0.64720 | 0.63009 |
| 113 | 1.040 | 0.01699 | 0.67028 | 0.10267 | 0.63645 | 0.61976 |
| 114 | 1.050 | 0.01691 | 0.67040 | 0.10119 | 0.62170 | 0.60464 |
| 115 | 1.060 | 0.01685 | 0.67000 | 0.09990 | 0.60829 | 0.59127 |
| 116 | 1.070 | 0.01682 | 0.67048 | 0.09877 | 0.59611 | 0.57911 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 117 | 1.080 | 0.01676 | 0.67060 | 0.09753 | 0.58355 | 0.58659 |
| 118 | 1.090 | 0.01671 | 0.67066 | 0.09633 | 0.57139 | 0.55446 |
| 119 | 1.100 | 0.01671 | 0.67051 | 0.09547 | 0.56144 | 0.54454 |
| 120 | 1.110 | 0.01677 | 0.67008 | 0.09493 | 0.55343 | 0.53655 |
| 121 | 1.120 | 0.01669 | 0.67031 | 0.09364 | 0.54138 | 0.52455 |
| 122 | 1.130 | 0.01661 | 0.67057 | 0.09236 | 0.52958 | 0.51279 |
| 123 | 1.140 | 0.01661 | 0.67034 | 0.09157 | 0.52068 | 0.50392 |
| 124 | 1.150 | 0.01653 | 0.67060 | 0.09034 | 0.50955 | 0.49283 |
| 125 | 1.160 | 0.01644 | 0.67086 | 0.08906 | 0.49933 | 0.48168 |
| 126 | 1.170 | 0.01649 | 0.67057 | 0.08855 | 0.49148 | 0.47484 |
| 127 | 1.180 | 0.01645 | 0.67054 | 0.08758 | 0.48223 | 0.46565 |
| 128 | 1.190 | 0.01638 | 0.67069 | 0.08651 | 0.47264 | 0.45610 |
| 129 | 1.200 | 0.01640 | 0.67054 | 0.08586 | 0.46541 | 0.44890 |
| 130 | 1.210 | 0.01629 | 0.67086 | 0.08460 | 0.45508 | 0.43864 |
| 131 | 1.220 | 0.01623 | 0.67106 | 0.08361 | 0.44636 | 0.42997 |
| 132 | 1.230 | 0.01624 | 0.67103 | 0.08295 | 0.43944 | 0.42309 |
| 133 | 1.240 | 0.01627 | 0.67086 | 0.08244 | 0.43346 | 0.41713 |
| 134 | 1.250 | 0.01615 | 0.67127 | 0.08116 | 0.42363 | 0.40738 |
| 135 | 1.260 | 0.01621 | 0.67066 | 0.08084 | 0.41876 | 0.40253 |
| 136 | 1.270 | 0.01625 | 0.67028 | 0.08039 | 0.41333 | 0.39712 |
| 137 | 1.280 | 0.01627 | 0.67005 | 0.07989 | 0.40776 | 0.39158 |
| 138 | 1.290 | 0.01619 | 0.67042 | 0.07884 | 0.39952 | 0.38344 |
| 139 | 1.300 | 0.01614 | 0.67054 | 0.07803 | 0.39263 | 0.37660 |
| 140 | 1.310 | 0.01609 | 0.67069 | 0.07719 | 0.38562 | 0.36966 |
| 141 | 1.320 | 0.01605 | 0.67066 | 0.07642 | 0.37915 | 0.36323 |
| 142 | 1.330 | 0.01606 | 0.67045 | 0.07585 | 0.37168 | 0.35782 |
| 143 | 1.340 | 0.01592 | 0.67101 | 0.07464 | 0.36527 | 0.34945 |
| 144 | 1.350 | 0.01597 | 0.67071 | 0.07431 | 0.36108 | 0.34533 |
| 145 | 1.360 | 0.01608 | 0.67002 | 0.07428 | 0.35542 | 0.34269 |
| 146 | 1.370 | 0.01591 | 0.67092 | 0.07295 | 0.34977 | 0.33408 |
| 147 | 1.380 | 0.01585 | 0.67103 | 0.07216 | 0.34366 | 0.32865 |
| 148 | 1.390 | 0.01585 | 0.67080 | 0.07166 | 0.33901 | 0.32346 |
| 149 | 1.400 | 0.01586 | 0.67071 | 0.07116 | 0.33438 | 0.31890 |
| 150 | 1.410 | 0.01574 | 0.67118 | 0.07016 | 0.32764 | 0.31220 |
| 151 | 1.420 | 0.01593 | 0.67022 | 0.07050 | 0.32692 | 0.31147 |
| 152 | 1.430 | 0.01575 | 0.67083 | 0.06922 | 0.31903 | 0.30369 |
| 153 | 1.440 | 0.01573 | 0.67074 | 0.06865 | 0.31437 | 0.29912 |
| 154 | 1.450 | 0.01569 | 0.67071 | 0.06798 | 0.30934 | 0.29414 |
| 155 | 1.460 | 0.01564 | 0.67092 | 0.06731 | 0.30441 | 0.28925 |
| 156 | 1.470 | 0.01568 | 0.67045 | 0.06702 | 0.30117 | 0.28606 |
| 157 | 1.480 | 0.01553 | 0.67121 | 0.06592 | 0.29446 | 0.27944 |
| 158 | 1.490 | 0.01564 | 0.67054 | 0.06596 | 0.29276 | 0.27773 |
| 159 | 1.500 | 0.01550 | 0.67109 | 0.06493 | 0.28649 | 0.27156 |
| 160 | 1.600 | 0.01526 | 0.67185 | 0.05992 | 0.24937 | 0.23496 |
| 161 | 1.700 | 0.01528 | 0.67118 | 0.05646 | 0.22231 | 0.20837 |
| 162 | 1.800 | 0.01523 | 0.67135 | 0.05316 | 0.19878 | 0.18530 |
| 163 | 1.900 | 0.01522 | 0.67066 | 0.05032 | 0.17932 | 0.16617 |
| 164 | 2.000 | 0.01491 | 0.67199 | 0.04685 | 0.15979 | 0.14697 |
| 165 | 2.100 | 0.01461 | 0.67324 | 0.04372 | 0.14310 | 0.13062 |
| 166 | 2.200 | 0.01485 | 0.67269 | 0.04240 | 0.13326 | 0.12092 |
| 167 | 2.300 | 0.01466 | 0.67255 | 0.04004 | 0.12124 | 0.10922 |
| 168 | 2.400 | 0.01494 | 0.67112 | 0.03910 | 0.11400 | 0.10223 |
| 169 | 2.500 | 0.01471 | 0.67159 | 0.03698 | 0.10421 | 0.09281 |
| 170 | 2.600 | 0.01520 | 0.66926 | 0.03674 | 0.09991 | 0.08864 |
| 171 | 2.700 | 0.01533 | 0.66833 | 0.03567 | 0.09391 | 0.08288 |
| 172 | 2.800 | 0.01591 | 0.66508 | 0.03570 | 0.09082 | 0.07999 |
| 173 | 2.900 | 0.01425 | 0.67159 | 0.03088 | 0.08059 | 0.06680 |
| 174 | 3.000 | 0.01447 | 0.67205 | 0.03030 | 0.07582 | 0.06337 |
| 175 | 3.100 | 0.01430 | 0.67298 | 0.02899 | 0.07245 | 0.05868 |
| 176 | 3.200 | 0.01441 | 0.67159 | 0.02929 | 0.06891 | 0.05546 |
| 177 | 3.300 | 0.01446 | 0.67066 | 0.02753 | 0.06611 | 0.05233 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 178 | 3.400 | 0.01449 | 0.67019 | 0.02677 | [illegible] | 0.04449 |
| 179 | 3.500 | 0.01422 | 0.67252 | 0.02653 | 0.06651 | 0.04577 |
| 180 | 3.600 | 0.01401 | 0.66973 | 0.02445 | 0.05995 | 0.04262 |
| 181 | 3.700 | 0.01449 | 0.66890 | 0.02461 | 0.05611 | 0.04173 |
| 182 | 3.800 | 0.01378 | 0.67298 | 0.02278 | 0.05641 | 0.03761 |
| 183 | 3.900 | 0.01408 | 0.67717 | 0.02268 | 0.05524 | 0.03649 |
| 184 | 4.000 | 0.01366 | 0.67298 | 0.02146 | 0.05216 | 0.03366 |
| 185 | 4.200 | 0.01431 | 0.67856 | 0.02141 | 0.05035 | 0.03198 |
| 186 | 4.400 | 0.01422 | 0.67810 | 0.02031 | 0.04713 | 0.02896 |
| 187 | 4.600 | 0.01404 | 0.67717 | 0.01918 | 0.04406 | 0.02616 |
| 188 | 4.800 | 0.01457 | 0.67903 | 0.01908 | 0.04263 | 0.02494 |
| 189 | 5.000 | 0.01444 | 0.67810 | 0.01815 | 0.04028 | 0.02278 |
| 190 | 5.200 | 0.01442 | 0.68642 | 0.01742 | 0.03832 | 0.02102 |
| 191 | 5.400 | 0.01536 | 0.68926 | 0.01787 | 0.03797 | 0.02076 |
| 192 | 5.600 | 0.01473 | 0.68507 | 0.01653 | 0.03543 | 0.01852 |
| 193 | 5.?10 | 0.01433 | 0.68228 | 0.01552 | 0.03332 | 0.01679 |
| 194 | 6.000 | 0.01364 | 0.67949 | 0.01428 | 0.03097 | 0.01493 |

(End of sample output from "RESPONSE SPECTRUM COMPUTATION")

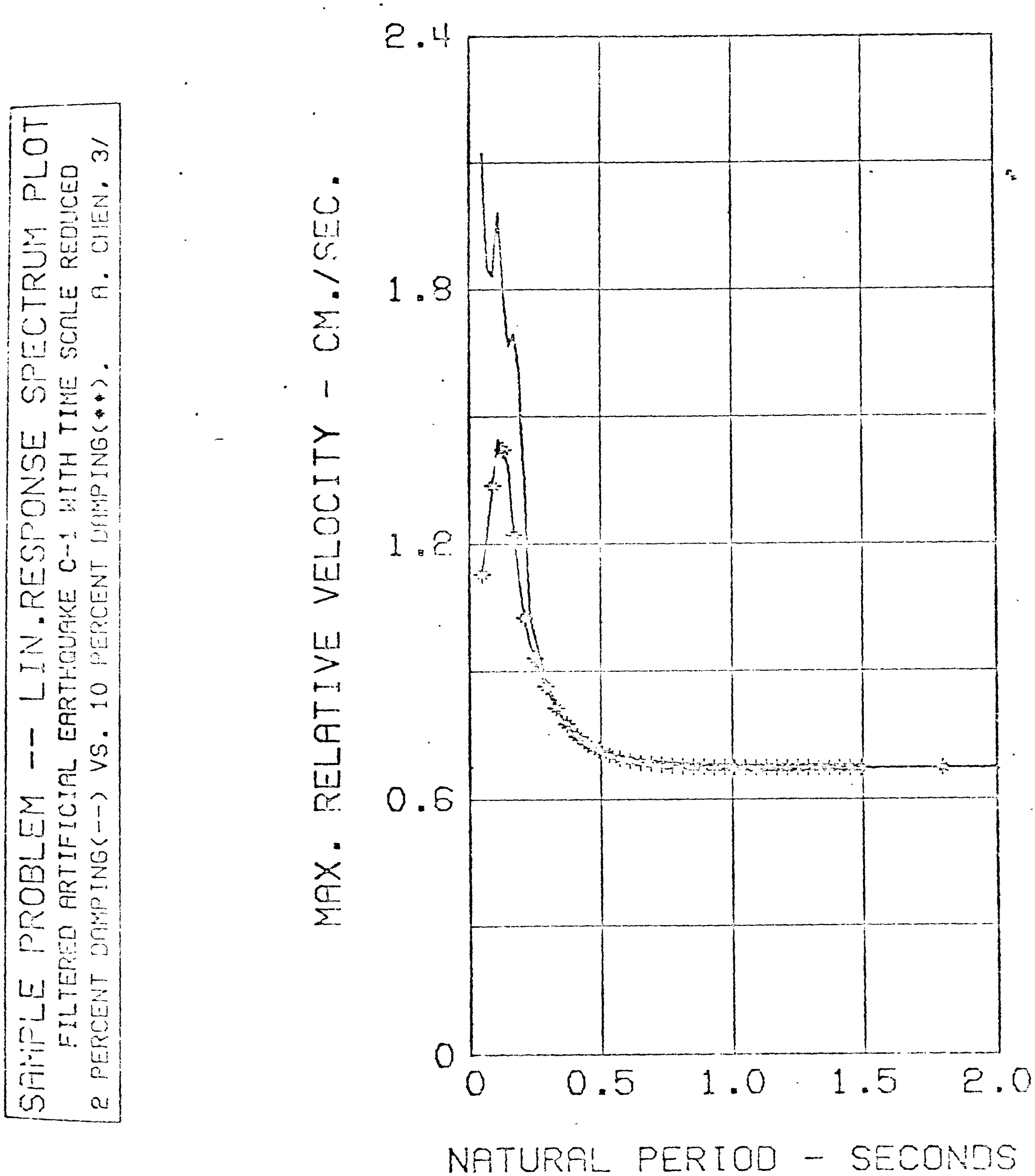


Figure 4. -- Sample output from "LINEAR RESPONSE SPECTRUM PLOT"

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## APPENDIX

Source program listings are included in this section. Source decks as well as any further information concerning the use of these programs may be obtained from the Computer Center Division, U.S. Geological Survey or from the author of this report.

```
C*****************************************************************
C*                                                               *
C*      PROGRAM: 'INTEGRATE AND PLOT'                            *
C*                                                               *
C*            BY: A. CHEN, ENGINEERING GEOLOGY, MENLO PARK, CA, 4/73  *
C*      REVISED: 8/75, TO READ INPUT ACCELERATION FROM DISK;     *
C*                     TO INCLUDE LOW-PASS FILTERING OPTION;     *
C*               3/76, FOR FINAL DOCUMENTATION.                  *
C*                                                               *
C*****************************************************************
C
C
      DIMENSION U(8001,3),X(8001),Y(8001),TITLE(18),YSCALE(3),ZMAX(3)
      REAL*8 DT
    2 FORMAT(18A4)
    3 FORMAT('1INTEGRATION OF ACCELERATION RECORD AND PLOTS OF DISPLACEM
     1ENT, VELOCITY AND ACCELERATION'//11X,18A4/)
    4 FORMAT(F12.0,10I6)
    7 FORMAT('0MAXIMUM VALUES'//16X,'FOR DISPLACEMENT',F6.2,' INCHES'/
     116X,'FOR VELOCITY    ',F6.2,'IN/SEC'/16X,'FOR ACCELERATION',F6.2,
     2' G.'//)
    8 FORMAT('0MAXIMUM VALUES'//16X,'FOR DISPLACEMENT',F6.2,'    CMS'/
     116X,'FOR VELOCITY    ',F6.2,'CM/SEC'/16X,'FOR ACCELERATION',F6.2,
     2' G.'//)
    9 FORMAT('0VERTICAL SCALES USED,  1 INCH =',F7.2,' IN. FOR DISPLACEM
     1ENT'/32X,F7.2,' IN/SEC FOR VELOCITY'/32X,F7.2,' G. FOR ACCELERATIO
     2N'//)
   10 FORMAT('0VERTICAL SCALES USED,  1 INCH =',F7.2,' CM. FOR DISPLACEM
     1ENT'/32X,F7.2,' CM/SEC FOR VELOCITY'/32X,F7.2,' G. FOR ACCELERATIO
     2N'//)
C
C
      REWIND 2
      READ(5,2) TITLE
      READ(5,4) DT,KDATA,KLIMIT,KTYPE,KFLTR,NOFLTR,KWRITE
C
C         IF KTYPE IS NOT ZERO, RESULTS WILL BE GIVEN IN METRIC UNITS.
C         IF KFLTR IS NOT ZERO, LOW-PASS FILTERING WILL BE PERFORMED;
C         IF KWRITE IS NOT ZERO, FILTERED RECORD WILL REPLACE UNFILTERED
C         INPUT RECORD RESIDING ON THE DISK.
C
      READ (2) (X(I),I=1,KDATA)
      REWIND 2
C
      IF(KFLTR .EQ. 0) GO TO 15
      CALL LOWPAS(KDATA,X,Y,NOFLTR,DT,TITLE,KWRITE)
   15 CONTINUE
      WRITE(6,3) TITLE
      XX= 981.456
      IF(KTYPE .EQ. 0) XX=386.4
      DO 20 I=1,KDATA
   20 U(I,3) = XX*X(I)
```

```
      IF(KLIMIT .GE. KDATA) KLIMIT=KDATA-1
      ALPHA = 0.25
      BETA = 0.5
      BETA1 = 1. - BETA
      ALPHA2 = 0.5 - ALPHA
      ZMAX(1) = 0.0
      ZMAX(2) = 0.0
      ZMAX(3) = 0.0
      TIME = 0.0
      U(1,2) = 0.0
      U(1,1) = 0.0
      DT2 = DT*DT
      DO 50 I=2,KLIMIT
      U(I,2) = U(I-1,2) +(BETA1*U(I-1,3)+BETA*U(I,3))*DT
      U(I,1)=U(I-1,1)+U(I-1,2)*DT+(ALPHA2*U(I-1,3)+ALPHA*U(I,3))*DT2
      DO 40 J=1,3
      IF(ABS(U(I,J)) .GT. ZMAX(J)) ZMAX(J) = ABS(U(I,J))
   40 CONTINUE
   50 CONTINUE
      ZMAX(3) = ZMAX(3)/XX
      IF(KTYPE .NE. 0) GO TO 150
      WRITE(6,7) (ZMAX(I),I=1,3)
      GO TO 250
  150 WRITE(6,8) (ZMAX(I),I=1,3)
  250 CONTINUE
C
C           FIND Y SCALES
      DO 57 J=1,3
      ZHALF=ZMAX(J)/2.
      IF(ZMAX(J)-1.) 51,53,53
   51 FAC=10.
   52 ZTEST=FAC*ZHALF
      IF(ZTEST .GE. 1.) GO TO 55
      FAC = FAC*10.
      GO TO 52
   53 FAC=1.
   54 ZTEST=FAC*ZHALF
      IF(ZTEST .LT. 10.) GO TO 55
      FAC = 0.1*FAC
      GO TO 54
   55 ZTEST = ZTEST + 0.5001
      YSCALE(J) = FAC/AINT(ZTEST)
      IF(ZHALF .LT. 0.5) GO TO 56
      IF(ZHALF .GT. 1.5) GO TO 56
      ZTEST = 10./ZHALF
      YSCALE(J) = 0.1*AINT(ZTEST)
   56 CONTINUE
   57 CONTINUE
      YSCALE(3)=YSCALE(3)/XX
C     FIND XSCALE
      PL=KLIMIT/200.
      XSCALE=0.01
```

```
      IF(PL .GE. 12.) XSCALE=0.005
   59 CK = KLIMIT*XSCALE
      KC = 1 + IFIX(CK)
      CK = FLOAT(KC)
      X0 = 2.0
      Y0 = 5.0
      CALL PLOT(0.,0.,3)
      CALL PLOT(0.,0.,2)
      CALL PLOT(0.,0.,3)
      DO 95 J=1,3
      DO 60 I=1,KLIMIT
      X(I)=X0 + XSCALE*I
      Y(I) = Y0 + U(I,J)*YSCALE(J)
   60 CONTINUE
      X1 = X0 + 0.2
      CALL PLOT(X1,3.,3)
      CALL PLOT(X0,3.,2)
      CALL PLOT(X0,7.,2)
      CALL PLOT(X1,7.,2)
      CALL PLOT(X1,5.,3)
      CALL PLOT(X0,5.,2)
      DO 70 I=1,KLIMIT
      CALL PLOT (X(I),Y(I),2)
   70 CONTINUE
      X1 = X0 + 0.3
      X2 = X0 + CK
      CALL PLOT(X2,5.,3)
      CALL PLOT(X1,5.,2)
      CALL PLOT(X1,5.,3)
      XSTAR = X0
      YSTAR = 7.0
      DO 75 I=1,KC
      XSTAR = XSTAR + 1.
      CALL LETTER(1,2,0,XSTAR,YSTAR,1H*)
   75 CONTINUE
      YSTAR = 3.0
      XSTAR = XSTAR + 1.
      DO 80 I=1,KC
      XSTAR = XSTAR - 1.
      CALL LETTER(1,2,0,XSTAR,YSTAR,1H*)
   80 CONTINUE
      IF(J .EQ. 3) YSCALE(J) = XX*YSCALE(J)
      HSCALE=DT/XSCALE
      VSCALE=1/YSCALE(J)
      CALL LETTER(72,2,0,X0,1.5,TITLE)
      CALL SYMBOL(X0,1.,0.12,'1 IN. = ',0.,8)
      CALL NUMBER(999.,999.,0.12,HSCALE,0.,2)
      CALL SYMBOL(999.,999.,0.12,' SEC. (HORIZONTAL); ',0.,20)
      CALL SYMBOL(999.,999.,0.12,'1 IN. = ',0.,8)
      CALL NUMBER(999.,999.,0.12,VSCALE,0.,2)
      GO TO (82,84,85),J
   82 IF(KTYPE .NE. 0) GO TO 83
```

```
      CALL SYMBOL(999.,999.,0.12,' IN.OF DISPLACEMENT',0.,19)
      GO TO 90
 83   CALL SYMBOL(999.,999.,0.12,' CM OF DISPLACEMENT',0.,19)
      GO TO 90
 84   IF(KTYPE .NE. 0) GO TO 85
      CALL SYMBOL(999.,999.,0.12,' IN/SEC OF VELOCITY',0.,19)
      GO TO 90
 85   CALL SYMBOL(999.,999.,0.12,' CM/SEC OF VELOCITY',0.,19)
      GO TO 90
 86   CALL SYMBOL(999.,999.,0.12,' G OF ACCELERATION',0.,18)
 90   CALL SYMBOL(999.,999.,0.12,' (VERTICAL)',0.,11)
 95   X0 = X0 + 6. + CK
      CALL PLOT(X2,0.,999)
      DO 100 I=1,3
      YSCALE(I) = 1./YSCALE(I)
100   CONTINUE
      IF(KTYPE .NE. 0) GO TO 110
      WRITE(6,9) (YSCALE(I),I=1,3)
      GO TO 120
110   WRITE(6,10)(YSCALE(I),I=1,3)
120   CONTINUE
      STOP
      END
```

```
      SUBROUTINE LOWPAS(NY,YIN,YOUT,NOFLTR,DELXT,TITLE,KWRITE)
C*                                                                    *
C*        LOW-PASS FILTERING OF DIGITIZED ACCELERATION RECORDS        *
C*                                                                    *
C*        3/71, ADAPTED FROM PROGRAM #9323 BY ANDREASON & EICHER      *
C*        8/75 REVISED FOR USE AS A SUBROUTINE OF 'INTEGRATE AND PLOT' *
C*                                                                    *
C *********************************************************************
C
C
      REAL*8 DELXT
      DIMENSION YIN(8001),YOUT(8001),TITLE(18),WEIGT(300),FILT(301)
   12 FORMAT(1H1,18A4/' MODIFIED BY THE LOW-PASS DIGITAL FILTER WITH THE
     1 PARAMETERS, F(CUT-OFF) =',F8.5/70X,3HH =,F8.5/58X,'NO. OF WEIGHTS
     2 =',I4,5X,'WHICH ARE'//)
   14 FORMAT(1P10E12.4)
   15 FORMAT(51H0RESPONSES FOR NORMALIZED FREQUENCIES FROM 0.001 TO,
     * 24H 0.050 IN STEPS OF 0.001)
   16 FORMAT(5E18.5)
   17 FORMAT(51H0RESPONSES FOR NORMALIZED FREQUENCIES FROM 0.052 TO,
     * 24H 0.100 IN STEPS OF 0.002)
   18 FORMAT(51H0RESPONSES FOR NORMALIZED FREQUENCIES FROM 0.105 TO,
     * 24H 0.200 IN STEPS OF 0.005)
   19 FORMAT(51H0RESPONSES FOR NORMALIZED FREQUENCIES FROM 0.210 TO,
     * 24H 0.500 IN STEPS OF 0.010)
   22 FORMAT(1H0/55H0THE FILTERED RECORD: TRANSFORMED INPUT POINTS FROM
     1NO.,I4,' TO NO. ',I4,' IN STEPS OF',I2,';'//22X,'HAS A TOTAL LENGT
     2H OF',I5,' POINTS,'//22X,'AND A TIME INTERVAL OF ',E10.4,',',//22X,
     3'WITH THE MINIMUM OF ',1PE11.4,','//23X,'AND THE MAXIMUM OF ',
     41PE11.4,';'//)
   23 FORMAT(22X,'IT HAS NOT REPLACED THE ORIGINAL RECORD ON THE DISK.')
   24 FORMAT(22X,'IT HAS REPLACED THE ORIGINAL RECORD ON THE DISK.')
C
C
      I1 = 1
      I2 = NY
      CUT = 0.05
      N1 = 70
      IF(NOFLTR .GT. 50) N1=20
      H = 0.01
      IF(NOFLTR .GT. 50) H=0.05
      DO 25 L=1,N1
   25 WEIGT(L) = 0.0
      W0 = 0.0
      CALL CMPW(CUT,H,N1,FILT,WEIGT,W0)
      WRITE(6,12) TITLE, CUT, H, N1
      WRITE(6,14) W0,(WEIGT(L),L=1,N1)
      CALL FRSP(0.001,1,0.001,50,W0,WEIGT,N1,YOUT)
      WRITE(6,15)
      WRITE(6,16) (YOUT(L),L=1,50)
      CALL FRSP(0.052,1,0.002,25,W0,WEIGT,N1,YOUT)
      WRITE(6,17)
```

```
      WRITE(6,16)  (YOUT(L),L=1,25)
      CALL FRSP(0.105,1,0.005,20,W0,WEIGT,N1,YOUT)
      WRITE(6,18)
      WRITE(6,16)  (YOUT(L),L=1,20)
      CALL FRSP(0.210,1,0.01,30,W0,WEIGT,N1,YOUT)
      WRITE(6,19)
      WRITE(6,16)  (YOUT(L),L=1,30)
      IDEL = 1
      IF(I1.LT.(N1+1))  I1=N1+1
      IF(I2.LE.I1 .OR. I2 .GT. (NY-N1))I2=NY-N1
      IF(I2.LT.I1) GO TO 90
      NYOUT=(I2-I1)/IDEL + 1
      I2 = I1 + (NYOUT-1)*IDEL
      CALL WTOY(YIN,YOUT,W0,WEIGT, N1,I1,I2,IDEL,YMIN,YMAX)
      IF(DELXT.LE.0.0) DELXT=1.0
      DELX = DELXT*FLOAT(IDEL)
      WRITE(6,22) I1, I2, IDEL, NYOUT, DELX, YMIN, YMAX
      NY = NYOUT
      DO 30 L=1,NY
      YIN(L) = YOUT(L)
   30 CONTINUE
      IF(KWRITE .EQ. 0) WRITE(6,23)
      IF(KWRITE .NE. 0) WRITE(6,24)
      IF(KWRITE .EQ. 0) GO TO 90
      WRITE (2) (YIN(L),L=1,NY)
      ENDFILE 2
      REWIND 2
   90 CONTINUE
      RETURN
      END
```

```
      SUBROUTINE CMPW(CUT,H,N,FILT,WEIGT,WO)
C
C ****************************************************************************************
      DIMENSION FILT(301),WEIGT(300)
      KA=N+1
      SUMHC=H+CUT
      FILT(KA)=SUMHC+SUMHC
      SUM=0.0
      IF (KA   .LT. 2)   GO TO 20
      DEN=0.0
      DNTRM=3.1415927
      RHK=6.2831853*H
      RCPHK=6.2831853*SUMHC
      CPH1=COS(RHK)
      SPH1=SIN(RHK)
      CPCH1=COS(RCPHK)
      SPCH1=SIN(RCPHK)
      FHP1=4.0*H
      FHP=0.0
      CPH=1.0
      SPH=0.0
      CPCH=1.0
      SPCH=0.0
      DO 10 I=1,N
      C1=CPH*CPH1-SPH*SPH1
      SPH=SPH*CPH1+CPH*SPH1
      CPH=C1
      C2=CPCH*CPCH1-SPCH*SPCH1
      SPCH=SPCH*CPCH1+CPCH*SPCH1
      CPCH=C2
      FHP=FHP+FHP1
      FAC1=1.0-FHP
      IF (ABS(FAC1)-0.0001) 11,12,12
   11 QFAC=0.78539816
      GO TO 13
   12 QFAC=CPH/(FAC1*(1.0+FHP))
   13 DEN=DEN+DNTRM
      FILT(I)=QFAC*(SPCH/DEN)
   10 SUM=SUM+FILT(I)
   20 DELTA=1.0-(FILT(KA)+SUM+SUM)
      TERM=DELTA/FLOAT(N+N+1)
      WO=FILT(KA)+TERM+WO
      IF (N .LT. 1)   GO TO 99
      DO 30 I=1,N
   30 WEIGT(I)=WEIGT(I)+FILT(I)+TERM
   99 RETURN
      END
```

```
      SUBROUTINE FRSP(RO,I1,DR,NR,WO,W,NW,YOUT)
C ******************************************************************
C
      DIMENSION YOUT(8001),W(300)
      DRAD=6.2831853*DR
      CDR=COS(DRAD)
      SDR=SIN(DRAD)
      PR=(RO-DR)*6.2831853
      PCR=COS(PR)
       SR=SIN(PR)
      I2=I1+NR-1
      DO 40 I=I1,I2
      SUM=0.0
      IF (NW .LT. 1) GO TO 34
      CR=PCR*CDR- SR*SDR
      SR= SR*CDR+PCR*SDR
      PSK=0.0
      PCK=1.0
      DO 30 J=1,NW
      CKR=PCK*CR-PSK*SR
      SUM=SUM+W(J)*CKR
      PSK=PSK*CR+PCK*SR
   30 PCK=CKR
      PCR=CR
   34 YOUT(I)=WO+SUM+SUM
   40 CONTINUE
      RETURN
      END
```

```
      SUBROUTINE WTDY    (YIN,YOUT,WO,W,NW,I1,I2,IJ,YMIN,YMAX)
C**********************************************************************
C
      DIMENSION YIN(8001), YOUT(8001), W(300)
      K=0
      YMAX=-1.0E38
      YMIN=1.0E38
      DO 30 I=I1,I2,IJ
      SUM=YIN(I)*WO
      IF (NW .LT. 1) GO TO 25
      DO 20 J=1,NW
      IPJ=I+J
      IMJ=I-J
   20 SUM=SUM+(YIN(IMJ)+YIN(IPJ))*W(J)
   25 K=K+1
      IF (SUM .GT. YMAX) YMAX=SUM
      IF (SUM .LT. YMIN) YMIN=SUM
   30 YOUT(K)=SUM
      RETURN
      END
```

```
C******************************************************************************
C*                                                                           *
C*       PROGRAM: 'RESPONSE SPECTRUM COMPUTATION'                            *
C*                                                                           *
C*                                                                           *
C*       A. CHEN, ENGINEERING GEOLOGY, MENLO PARK, CA.                       *
C*                                                                           *
C*       4/69, ADAPTED FROM THE PROGRAM WRITTEN BY IDRISS.                   *
C*       5/73, REVISED TO EXTEND PERIOD RANGE & TO INCLUDE METRIC UNITS*
C*       8/75 REVISED TO READ ACCELERATION FROM DISK.                        *
C*       3/76 REVISED FOR FINAL DOCUMENTATION.                               *
C******************************************************************************
C
C         DIMENSION AND DATA STATEMENTS
      DIMENSION A(8005), T(200), ZLD(6), PRV(200), PAA(200), RV(200),
     1            AA(200), RD(200), NM(4), DW(4), TITLE(18)
C
      DATA NM/18,140,25,11/
      DATA DW/0.005,0.01,0.1,0.2/
      DATA ZLD/0.,0.01,0.02,0.05,0.10,0.2/
      REAL*8 DT
C
C         FORMAT STATEMENTS
C
    2 FORMAT(18A4)
   12 FORMAT(F6.0,10I6)
  112 FORMAT(1H1,5X,'TIME AT WHICH MAX. SPECTRAL VALUES OCCUR'/
     1 10X,'TD = TIME FOR MAX. RELATIVE DISP.'/
     2 10X,'TV = TIME FOR MAX. RELATIVE VEL. '/
     3 10X,'TA = TIME FOR MAX. ABSOLUTE ACC.'/
     4 5X, 'DAMPING RATIO =',F5.2//)
  312 FORMAT(1H1,5X,'SPECTRAL VALUES--'/10X,18A4,5X,'DAMPING RATIO =',
     1 F5.2//5X,3HNO.,4X,6HPERIOD,5X,10HREL. DISP.,6X,9HREL. VEL.,3X,
     2 12HPSU.REL.VEL.,6X,9HABS. ACC.,3X,12HPSU.ABS.ACC.)
  313 FORMAT(13X,5H(SEC),10X,5H(FT.),8X,8H(FT/SEC),6X,8H(FT/SEC),9X,
     1 5H( G ),10X,5H( G )/)
  322 FORMAT(I8,F10.3,5F15.5)
  323 FORMAT (I4,F8.3,5F12.5,F8.2)
  324 FORMAT(13X,5H(SEC),10X,5H(CM.),8X,8H(CM/SEC),6X,8H(CM/SEC),4X,
     112H(CM/SEC/SEC),2X,12H(CM/SEC/SEC)/)
  362 FORMAT(//10X,'SPECTRAL INTENSITIES FOR DAMPING RATIO =',F5.2/
     1 22X,'BASED ON REL. VEL., SI=',F8.3/
     2 15X,'BASED ON PSUEDO REL. VEL., SI =',F8.3)
C
C        PUNCH CARD OUTPUT WOULD ALWAYS BE BRITISH UNIT SYSTEM.
C
      REWIND 2
      KCOUT = 9
      READ(5,12) DT,NOFDTA,KG,K1,K2,K3
      AFAC=32.2
      READ(5,2) TITLE
      READ (2) (A(I),I=1,NOFDTA)
```

```
C
      REWIND 2
C        CHANGE A INTO FT/SEC/SEC
C
      DO 400 I=1,KG
      A(I)=A(I)*AFAC
  400 CONTINUE
      KUG = KG-1
C
      DO 900 NDD = K1,K2,K3
C
      D = ZLD(NDD)
      WRITE (6,112) D
      N = 1
      T(N) = 0.01
      YY = SQRT(1.-D*D)
      DO 300 L=1,4
      M = NN(L)
      DO 200 LOOP = 1, M
      W = 6.2831853/T(N)
      WD = YY*W
      W2 = W*W
      W3 = W2*W
C*************************************************************************
      CALL CYPMAX (KUG,A,T(N),W,W2,W3,WD,D,DT,ZD,ZV,ZA)
C*************************************************************************
      AA(N) = ZA/32.2
      RV(N) = ZV
      RD(N) = ZD
      PRV(N) = W*ZD
      PAA(N) = W2*ZD/32.2
      T(N+1) = T(N) + DW(L)
  200 N = N + 1
  300 CONTINUE
      M = N-1
      WRITE (6,312) TITLE, D
      WRITE (6,313)
      DO 320 N = 1, M
      WRITE (7,323) N,T(N),RD(N),RV(N),PRV(N),AA(N),PAA(N),D
  320 WRITE (6,322) N, T(N), RD(N), RV(N), PRV(N), AA(N), PAA(N)
C
C        SPECTRAL INTENSITY CALCULATION
C
      S1 = 0.
      S2 = 0.
      DO 350 L=20,169
      DD = (T(L)-T(L-1))/2.
      S1 = S1 + DD*(RV(L) + RV(L-1))
  350 S2 = S2 + DD*(PRV(L) + PRV(L-1))
      WRITE (6,352) D, S1, S2
      IF(KCGOUT .EQ. 0) GO TO 900
      WRITE(6,312) TITLE,D
      WRITE(6,324)
      DO 800 N=1,M
      RD(N)=30.48*RD(N)
      RV(N)=30.48*RV(N)
      PRV(N)=30.48*PRV(N)
      AA(N)=980.*AA(N)
      PAA(N)=980.*PAA(N)
  800 WRITE (6,322) N, T(N), RD(N), RV(N), PRV(N), AA(N), PAA(N)
  900 CONTINUE
      STOP
      END
```

```
C*********************************************************************
C                                                                    *
      SUBROUTINE CMPMAX (KUG,UG,PR,W,W2,W3,WD,D,DT,ZD,ZV,ZA)
C                                                                    *
C*********************************************************************
C
      DIMENSION  UG(6005), XD(2), XV(2), T(3)
C
      ZD = 0.
      ZV = 0.
      ZA = 0.
      XD(1) = 0.
      XV(1) = 0.
      F1 = 2.*D/(W3*DT)
      F2 = 1./W2
      F3 = D*W
      F4 = 1./WD
      F5 = F3*F4
      F6 = 2.*F3
      E = EXP(-F3*DT)
      S = SIN(WD*DT)
      C = COS(WD*DT)
      G1 = E*S
      G2 = E*C
      H1 = WD*G2 - F3*G1
      H2 = WD*G1 + F3*G2
      DO 100 K=1,KUG
      Y = K-1
      DUG = UG(K+1) - UG(K)
      Z1 = F2*DUG
      Z2 = F2*UG(K)
      Z3 = F1*DUG
      Z4 = Z1/DT
       B = XD(1) + Z2 -Z3
       A = F4*XV(1) + F5*B + F4*Z4
      XD(2) = A*G1 + B*G2 + Z3 -Z2 - Z1
      XV(2) = A*H1 - B*H2 - Z4
      XD(1) = XD(2)
      XV(1) = XV(2)
      AA = -F6*XV(1) - W2*XD(1)
       F = ABS(XD(1))
       G = ABS(XV(1))
       H = ABS(AA)
      IF(F .LE. ZD) GO TO 75
      T(1) = Y
       ZD = F
   75 IF(G .LE. ZV) GO TO 85
      T(2) = Y
       ZV = G
   85 IF(H .LE. ZA) GO TO 100
      T(3) = Y
       ZA = H
  100 CONTINUE
      DO 110 L=1,3
  110 T(L) = DT*T(L)
C
      WRITE (6,112) PR, (T(L),L=1,3)
C
C
  112 FORMAT (5X,'PER =',F6.3,4X,'TIMES FOR MAXIMA --',3X,
     1 'TD =',F7.4,3X,'TV =',F8.4,3X,'TA =',F8.4)
C
```

```
C*************************************************************************
C                                                                        *
C*        PROGRAM: 'LINEAR RESPONSE SPECTRUM PLOT'                       *
C*                                                                       *
C*              BY: A. CHEN, ENGINEERING GEOLOGY, MENLO PARK, CA, 5/69   *
C*                                                                       *
C*        REVISED: 5/73 TO INCLUDE METRIC UNITS;                         *
C*                 3/76 FOR FINAL DOCUMENTATION.                         *
C*                                                                       *
C*************************************************************************
C
C         DIMENSION AND FORMAT STATEMENTS
C
      DIMENSION AMP(10), Z(5), T(196), X(196), Y(196), TITLE(11),
     1          FNOTE1(16), FNOTE2(16), NUM(6), XP(200), YP(200),
     2          ISYM(4)
      DATA NUM/109,164,174,184,189,194/
      DATA ISYM/0,67,70,71/
C
    2 FORMAT (12I6)
   12 FORMAT (18A4)
   22 FORMAT (6F12.5)
   32 FORMAT (4X,F8.3,5F12.5)
   42 FORMAT (1H0,5X,'* * * OOUP-S, WRONG DATA, CHECK VALUES OF KTYPE, L
     1X AND LY.  BETTER LUCK NEXT TIME * * *')
C
      READ(5,12) TITLE
      READ(5,12) FNOTE1
      READ(5,12) FNOTE2
      READ (5,2) KTYPE, LX, LY, NCURVE, KUNIT
      READ(5,12) (AMP(I),I=1,9)
      READ (5,22) SCALE
      NPOINT = NUM(LX) - 13
C
C         SAFEGUARD SYSTEM AGAINST MISPUNCHED DATA FOR KTYPE, LX AND LY
C
      IF(KTYPE .GT. 5) GO TO 99
      IF(LX .GT. 6) GO TO 99
      IF(LY .GT. 8) GO TO 99
      GO TO 300
   99 CONTINUE
      DO 100 LOOP=1,8
      WRITE (6,42)
  100 CONTINUE
      GO TO 999
C
C         TO WARM UP PLOTTING PEN - PART 1, INCLUDE USER'S IDENTIFICATION
  300 CALL PLOT (2.3,1.,3)
      CALL PLOT (1.4,1.,2)
      CALL PLOT (1.4,9.,2)
      CALL PLOT (2.3,9.,2)
      CALL PLOT (2.3,1.,2)
```

```
      CALL LETTER(64,2,90,2.20,1.10,FNOTE2)
C
C        PLOT GRID. GRID SIZE IS VARIED ACCORDING TO VALUES OF LX AND LY
C        LX = NO. OF SECOND FOR PERIOD,    LY = NO. OF DIVISIONS FOR AMP.
      AX = 2.*LX + 5.
      LX = 2*LX- 1
      AY= 1.*LY + 1.5
      LY = LY -1
      DO 320 I=1,LX
      A = 5. + 1.*I
      CALL PLOT (A,1.5,3)
      CALL PLOT (A,AY,2)
  320 CONTINUE
      DO 340 I=1,LY
      A = 1.5 + 1.*I
      CALL PLOT (5.,A,3)
      CALL PLOT (AX,A,2)
  340 CONTINUE
C
C        CHANGE PEN TO PLOT HEADING
      CALL PLOT (0.,0.,-3)
C
C        TO WARM UP PLOTTING PEN - PART 2, INCLUDE EARTHQUAKE NAME
      CALL LETTER(64,2,90,1.95,1.10,FNOTE1)
      CALL LETTER(44,3,90,1.70,1.05,TITLE)
C
      CALL PLOT (5.,1.5,3)
      CALL PLOT (5.,AY,2)
      CALL PLOT (AX,AY,2)
      CALL PLOT (AX,1.5,2)
      CALL PLOT (5.,1.5,2)
C
      A = 1.2
      CALL LETTER (1,3,0,4.97,A,1H0)
      I=0
  345 I=I+1
      B = 5. + 1.*I - 0.26
      C = 0.5*I
      CALL NUMBER(B,A,0.18,C,0.,+1)
      ATEST = LX+1-I
      IF(ATEST) 350,350,345
  350 AHOR = 0.34 + AX/2.
      CALL LETTER (24,3,0,AHOR,0.60,24HNATURAL PERIOD - SECONDS)
      LY=LY+2
      A=4.2
      DO 360 I=1,LY
      B= I*1. + 0.42
  360 CALL LETTER (4,3,0,A,B,AMP(I))
C
C        TYPE OF COMPONENT TO BE PLOTTED DEPENDS ON THE VALUE OF KTYPE
C
C           KTYPE=1, PROGRAM PLOTS MAXIMUM RELATIVE DISPLACEMENT.
```

```
C             KTYPE=2, PROGRAM PLOTS MAXIMUM RELATIVE VELOCITY.
C             KTYPE=3, MAXIMUM PSUEDO RELATIVE VELOCITY.
C             (IF KUNIT IS NOT ZERO, THE ABOVE WILL BE GIVEN IN FT. & SEC.
C              OTHERWISE, THEY WILL BE GIVEN IN CM & SEC.)
C             KTYPE=4, PROGRAM PLOTS MAXIMUM ABSOLUTE ACCELERATION IN G
C             KTYPE=5, MAXIMUM PSUEDO ABSOLUTE ACCELERATION IN G
C
      A = 4.0
      IF(KUNIT .NE. 0) GO TO 450
      GO TO (365,370,375,380,385), KTYPE
  365 AHOR = AY/2. - 2.13
      CALL LETTER (32,3,90,A,AHOR,32HMAX. RELATIVE DISPLACEMENT - CM.)
      GO TO 400
  370 AHOR = AY/2. - 2.22
      CALL LETTER (33,3,90,A,AHOR,33HMAX. RELATIVE VELOCITY - CM./SEC.)
      GO TO 400
  375 AHOR = AY/2. - 2.10
      CALL LETTER (32,3,90,A,AHOR,32HMAX. PSUEDO REL. VEL. - CM./SEC.)
      GO TO 400
  380 AHOR = AY/2.-1.95
      CALL LETTER (30,3,90,A,AHOR,30HMAX. ABSOLUTE ACCELERATION - G)
      GO TO 400
  385 AHOR = AY/2. -1.50
      CALL LETTER (25,3,90,A,AHOR,25HMAX. PSUEDO ABS. ACC. - G)
  400 CONTINUE
      IF(KTYPE .LE. 3) SCALE=30.48*SCALE
      GO TO 550
  450 CONTINUE
      GO TO (465,470,475,480,485), KTYPE
  465 AHOR = AY/2. - 2.13
      CALL LETTER (32,3,90,A,AHOR,32HMAX. RELATIVE DISPLACEMENT - FT.)
      GO TO 500
  470 AHOR = AY/2. - 2.22
      CALL LETTER (33,3,90,A,AHOR,33HMAX. RELATIVE VELOCITY - FT./SEC.)
      GO TO 500
  475 AHOR = AY/2. - 2.10
      CALL LETTER (32,3,90,A,AHOR,32HMAX. PSUEDO REL. VEL. - FT./SEC.)
      GO TO 500
  480 AHOR = AY/2.-1.95
      CALL LETTER (30,3,90,A,AHOR,30HMAX. ABSOLUTE ACCELERATION - G)
      GO TO 500
  485 AHOR = AY/2. -1.50
      CALL LETTER (25,3,90,A,AHOR,25HMAX. PSUEDO ABS. ACC. - G)
  500 CONTINUE
  550 CONTINUE
C
C         GRID PLOTTING IS FINISHED
C
C         READ SPECTRAL VALUES, CONVERT AND PLOT CURVES
C
      DO 700 LOOP=1, NCURVE
      LTYPE = 2
```

```
      IF(LOOP .EQ. 1) LTYPE=0
      ICODE = ISYM(LOOP)
      DO 600 I=1,194
      READ (5,22) T(I),(Z(N),N=1,5)
      X(I) = 5. + T(I)*2.
      Y(I) = 1.5 + Z(KTYPE)*SCALE
  600 CONTINUE
      DO 610 I=1,6
      J = 2*I + 7
      YP(I) = Y(J)
  610 XP(I) = X(J)
      DO 620 I=7,181
      YP(I) = Y(I+13)
  620 XP(I) = X(I+13)
      CALL LINE(XP,YP,NPOINT,2,LTYPE,ICODE)
  700 CONTINUE
C
      CALL PLOT (AX,1.5,999)
  999 STOP
      END
```