Appendix A

SCREEN DUMPS AND SELECTED PLOTS FOR SAMPLE PROBLEM #1 AND SAMPLE PROBLEM #2

The soil module is executed to develop the required free field data. The first step is to develop the acceleration time history data file in CARES format. In this example, we use the Gilroy #1 record, "gilroy1.th", and convert it to "rock.th".

```
          ************************************************
          ************************************************
          *****           C A R E S (SOIL)           *****
          ************************************************
          ************************************************
          * ANALYSIS #                                   *
          *                                              *
          * 1. CONVERTS INPUT ACCELERATION TIME HISTORY  *
          *    DATA FILE TO CARES FORMAT                 *
          *                                              *
          * 2. GENERATES ACCELEROGRAM TO MATCH A GIVEN   *
          *    TARGET RESPONSE SPECTRUM                  *
          *                                              *
          * 3. GENERATES FOURIER COMPONENTS FOR GIVEN    *
          *   ACCELEROGRAM; USED AS INPUT TO SOIL COLUMN *
          *    AND SSI ANALYSIS                          *
          *                                              *
          * 4. PERFORMS CONVOLUTION ANALYSIS OF A GIVEN  *
          *    SOIL COLUMN TO ACCELEROGRAM DEFINED IN    *
          *    TERMS OF ITS FOURIER COMPONENTS           *
          *                                              *
          * 5. GENERATES TIME HISTORY OF ACCELEROGRAM    *
          *    FOR A GIVEN FOURIER COMPONENT FILE        *
          *                                              *
          * 6. GENERATES ACCELERATION RESPONSE SPECTRUM  *
          *    FOR A GIVEN ACCELERATION TIME HISTORY     *
          *                                              *
          * 7. GENERATES POWER SPECTRAL DENSITY FUNCTION *
          *    FOR A GIVEN FOURIER COMPONENT FILE        *
          *                                              *
          * 8. EXIT FROM CARES.SOIL                      *
          ************************************************

     INPUT ITEM  FOR THE ANALYSIS..(1,2,3,4,5,6,7 or 8) ?
1
     ANALYSIS #  =   1

     IS THIS CORRECT (Y/N)
y

     TIME HISTORY FILE CONVERSION:
     CONVERTS A GIVEN TIME HISTORY TO CARES FORMAT

     INPUT FILE NAME?
gilroy1.th
     NUMBER OF HEADER CARDS IN INPUT FILE?
3
```

```
     TIME INCREMENT FOR INPUT TIME HISTORY (secs)?
0.02
     NUMBER OF RECORDS IN INPUT FILE (LE.20,000)?
2000

     ENTER THE FORMAT OF THE INPUT TIME HISTORY RECORD
6F12.0
     THE FORMAT OF THE TIME HISTORY RECORD = (6F12.0)
     IS THIS FORMAT CORRECT(Y/N)?
y
     OUTPUT FILE NAME (UP TO 20 LTRS) ?
rock.th
     HEADER CARD FOR OUTPUT FILE (UP TO 80 LTRS)?
GILROY #1 - GAVILAN COLLEGE, WATER TANK (CARES FORMAT)
     ENTER RECORD INCREMENT TO BE USED
     eg. ENTER 1 TO USE EVERY TIME HISTORY RECORD
     eg. ENTER 2 TO USE EVERY OTHER TIME HISTORY RECORD
1

     IS ONLY A SEGMENT OF THE INPUT TIME HISTORY WANTED (Y/N)
n

     ENTER SCALE FACTOR TO CONVERT TO in/sec2 ?
1
```

The second step is to develop the Fourier components for the free field criteria motion. The criteria motion used for this example is stored on file "rock.th" which is the Gilroy #1 record. The output is the Fourier components of the pulse which is saved on file "rock.fc" .

```
     ************************************************
     ************************************************
     *****           C A R E S (SOIL)          *****
     ************************************************
     ************************************************
     * ANALYSIS #                                   *
     *                                              *
     * 1. CONVERTS INPUT ACCELERATION TIME HISTORY  *
     *    DATA FILE TO CARES FORMAT                 *
     *                                              *
     * 2. GENERATES ACCELEROGRAM TO MATCH A GIVEN   *
     *    TARGET RESPONSE SPECTRUM                  *
     *                                              *
     * 3. GENERATES FOURIER COMPONENTS FOR GIVEN    *
     *   ACCELEROGRAM; USED AS INPUT TO SOIL COLUMN *
     *    AND SSI ANALYSIS                          *
     *                                              *
     * 4. PERFORMS CONVOLUTION ANALYSIS OF A GIVEN  *
     *   SOIL COLUMN TO ACCELEROGRAM DEFINED IN     *
     *    TERMS OF ITS FOURIER COMPONENTS           *
     *                                              *
```

```
* 5. GENERATES TIME HISTORY OF ACCELEROGRAM        *
*    FOR A GIVEN FOURIER COMPONENT FILE            *
*                                                  *
* 6. GENERATES ACCELERATION RESPONSE SPECTRUM      *
*    FOR A GIVEN ACCELERATION TIME HISTORY         *
*                                                  *
* 7. GENERATES POWER SPECTRAL DENSITY FUNCTION     *
*    FOR A GIVEN FOURIER COMPONENT FILE            *
*                                                  *
* 8. EXIT FROM CARES.SOIL                          *
****************************************************


     INPUT ITEM  FOR THE ANALYSIS..(1,2,3,4,5,6,7 or 8) ?
3
     ANALYSIS #  =   3

     IS THIS CORRECT (Y/N)
y

             PROGRAM TO COMPUTE FOURIER
          COMPONENTS OF ACCELEROMETER RECORD

     INPUT TIME HISTORY FILE NAME.....?
rock.th

     INPUT TIME HISTORY FILE NAME.....=   rock.th

     IS THIS FILE NAME CORRECT (Y/N)..?
y


         SCALE TIME HISTORY UP OR DOWN (Y/N)...?
n
     INPUT TIME HISTORY HAS   2000 RECORDS
     HAS BEEN PADDED WITH       48 ZEROS
     NEW  TIME HISTORY HAS   2048 RECORDS


  GILROY #1 - GAVILAN COLLEGE, WATER TANK (CARES FORMAT)
  PEAK ACCEL. =    170.7100 in/sec2  @  t =   3.92 sec
     NO. OF RECORDS         =       2048
     TIME INCREMENT (SEC) =  0.200E-01
     PEAK POSITIVE ACCEL. =  0.171E+03
     AT RECORD NUMBER      =       197
     PEAK NEGATIVE ACCEL. = -0.162E+03
     AT RECORD NUMBER      =       208
     PEAK ACCELERATION     =  0.171E+03


     IS THIS DATA CORRECT (Y/N)...?
y

     OUTPUT FOURIER COMPONENT FILE NAME..?
rock.fc

     OUTPUT FOURIER FILE NAME ..........=   rock.fc
```

```
     IS THIS FILE NAME CORRECT (Y/N)..?
y
  TITLE CARD FOR OUTPUT FILE ?
FOURIER COMPONENTS OF ROCK TIME HISTORY

     NEW OUTPUT TITLE CARD:
     FOURIER COMPONENTS : FOURIER COMPONENTS OF ROCK TIME HISTORY
     IS THIS TITLE CARD OK (Y/N) ?
Y

     MAX. RECORD TIME (SEC)       =   0.40960E+02
     RECORD TIME INCREMENT (SEC) =   0.20000E-01
     NO. OF RECORDS IN INPUT      =     2048
     NO. OF MODE COMPONENTS       =     1025
     FREQUENCY INTERVAL (CPS)     =   0.24414E-01
     MAXIMUM FREQUENCY (CPS)      =   0.25000E+02
     MAX. ACCEPTABLE FREQ. (CPS) =   0.25000E+02
     PEAK ACCELERATION (IPS2)     =   0.17071E+03
```

The next step in the process is to perform the convolution analysis required to develop the time history of the surface motion compatible with the rock outcrop motion having the Fourier components contained on file "rock.fc". The resulting surface motion is saved on user named file "surface.th". The soil degradation data is contained on the user specified file "soil.degr" and the final soil properties which are determined during the convolution studies are contained on file "soil.final". The resulting surface Fourier component file is contained on file "surface.fc". This file is used as input to the structures module Analysis 3 which performs the structural response calculation.

```
************************************************
************************************************
*****          C A R E S (SOIL)          *****
************************************************
************************************************
* ANALYSIS #                                   *
*                                              *
* 1. CONVERTS INPUT ACCELERATION TIME HISTORY  *
*    DATA FILE TO CARES FORMAT                 *
*                                              *
* 2. GENERATES ACCELEROGRAM TO MATCH A GIVEN   *
*    TARGET RESPONSE SPECTRUM                  *
*                                              *
* 3. GENERATES FOURIER COMPONENTS FOR GIVEN    *
*   ACCELEROGRAM; USED AS INPUT TO SOIL COLUMN *
*    AND SSI ANALYSIS                          *
*                                              *
* 4. PERFORMS CONVOLUTION ANALYSIS OF A GIVEN  *
*   SOIL COLUMN TO ACCELEROGRAM DEFINED IN     *
*    TERMS OF ITS FOURIER COMPONENTS           *
*                                              *
```

```
     * 5. GENERATES TIME HISTORY OF ACCELEROGRAM      *
     *    FOR A GIVEN FOURIER COMPONENT FILE          *
     *                                                *
     * 6. GENERATES ACCELERATION RESPONSE SPECTRUM    *
     *    FOR A GIVEN ACCELERATION TIME HISTORY       *
     *                                                *
     * 7. GENERATES POWER SPECTRAL DENSITY FUNCTION   *
     *    FOR A GIVEN FOURIER COMPONENT FILE          *
     *                                                *
     * 8. EXIT FROM CARES.SOIL                        *
     **************************************************

     INPUT ITEM  FOR THE ANALYSIS..(1,2,3,4,5,6,7 or 8) ?
4
     ANALYSIS #  =   4

     IS THIS CORRECT (Y/N)
y

         **************************************************
         *                                                *
         *                  CARES SOIL                    *
         *                                                *
         *                                                *
         *                                                *
         *              CONVOLUTION ANALYSIS              *
         *                                                *
         *      READ FOURIER INPUT AND SOIL DATA,         *
         *    COMPUTE FINAL SOIL STRAIN AND PROPERTIES    *
         *           (NONLINEAR ANALYSIS).                *
         *                   THEN                         *
         *     COMPUTE FOURIER COMPONENTS OF OUTPUT.      *
         *                                                *
         **************************************************

     IS INPUT DATA FILE ALREADY FORMED (Y/N)..?
n

   OPTION 1 = SOIL AMPLIFICATION DUE TO A SPECIFIED TIME HISTORY
   OPTION 2 = SOIL AMPLIFICATION DUE TO A UNIT PULSE

     INPUT OPTION NUMBER
1
     ANALYSIS WILL BE PERFORMED FOR A SPECIFIED TIME HISTORY
     IS OPTION = 1 CORRECT (Y/N)
y
     NAME OF INPUT FILE TO BE FORMED  ?
soilcol.in
     PROBLEM TITLE CARD ?
CONVOLVE ROCK OUTCROP MOTION TO SURFACE
     NUMBER OF SOIL COLUMN LAYERS
8
     IS GROUND WATER TO BE CONSIDERED IN THE PROBLEM (Y/N)
n
```

```
     NUMBER OF SOIL LAYERS =  8
     GROUND WATER IS NOT CONSIDERED IN THIS PROBLEM
  IS INPUT CORRECT (Y/N)
y
     LAYER INTERFACE OF INPUT MOTION
     (SURFACE= 0, OUTCROP= MAX LAYER +1)
9
     INPUT FOURIER COMPONENT FILE NAME
rock.fc

     FOURIER COMPONENT FILE : rock.fc
     IS INPUT AT INTERFACE    9
     IS THIS CORRECT (Y/N)
y

  SOIL COLUMN CONFIGURATION:
     LAYER  1
     LAYER THICKNESS  (ft) ?
16.40
     UNIT WEIGHT   (#/ft3) ?
125.00
     SHEAR MODULUS (#/ft2) ?
1069970.0

  CHECK LAYER DATA: 1
     LAYER THICKNESS (ft)                 16.40
     UNIT WEIGHT (#/ft3)                 125.00
     SHEAR MODULUS (#/ft2)           1069970.00
  IS INPUT CORRECT (Y/N)
y
     LAYER  2
     LAYER THICKNESS  (ft) ?
23.00
     UNIT WEIGHT   (#/ft3) ?
125.00
     SHEAR MODULUS (#/ft2) ?
4550620.00

  CHECK LAYER DATA: 2
     LAYER THICKNESS (ft)                 23.00
     UNIT WEIGHT (#/ft3)                 125.00
     SHEAR MODULUS (#/ft2)           4550620.00
  IS INPUT CORRECT (Y/N)
y
     LAYER  3
     LAYER THICKNESS  (ft) ?
29.50
     UNIT WEIGHT   (#/ft3) ?
125.00
     SHEAR MODULUS (#/ft2) ?
4550620.00

  CHECK LAYER DATA: 3
     LAYER THICKNESS (ft)                 29.50
     UNIT WEIGHT (#/ft3)                 125.00
     SHEAR MODULUS (#/ft2)           4550620.00
  IS INPUT CORRECT (Y/N)
```

```
y
    LAYER  4
    LAYER THICKNESS  (ft) ?
31.20
    UNIT WEIGHT   (#/ft3) ?
125.00
    SHEAR MODULUS (#/ft2) ?
4550620.00

  CHECK LAYER DATA: 4
    LAYER THICKNESS (ft)                31.20
    UNIT WEIGHT (#/ft3)                125.00
    SHEAR MODULUS (#/ft2)          4550620.00
  IS INPUT CORRECT (Y/N)
y
    LAYER  5
    LAYER THICKNESS  (ft) ?
31.10
    UNIT WEIGHT   (#/ft3) ?
125.00
    SHEAR MODULUS (#/ft2) ?
4550620.00

  CHECK LAYER DATA: 5
    LAYER THICKNESS (ft)                31.10
    UNIT WEIGHT (#/ft3)                125.00
    SHEAR MODULUS (#/ft2)          4550620.00
  IS INPUT CORRECT (Y/N)
y
    LAYER  6
    LAYER THICKNESS  (ft) ?
98.40
    UNIT WEIGHT   (#/ft3) ?
125.00
    SHEAR MODULUS (#/ft2) ?
16585750.00

  CHECK LAYER DATA: 6
    LAYER THICKNESS (ft)                98.40
    UNIT WEIGHT (#/ft3)                125.00
    SHEAR MODULUS (#/ft2)         16585750.00
  IS INPUT CORRECT (Y/N)
y
    LAYER  7
    LAYER THICKNESS  (ft) ?
82.00
    UNIT WEIGHT   (#/ft3) ?
125.00
    SHEAR MODULUS (#/ft2) ?
10447360.00

  CHECK LAYER DATA: 7
    LAYER THICKNESS (ft)                82.00
    UNIT WEIGHT (#/ft3)                125.00
    SHEAR MODULUS (#/ft2)         10447360.00
  IS INPUT CORRECT (Y/N)
y
```

```
    LAYER  8
    LAYER THICKNESS  (ft) ?
238.30
    UNIT WEIGHT   (#/ft3) ?
165.00
    SHEAR MODULUS (#/ft2) ?
40799020.00

  CHECK LAYER DATA: 8
    LAYER THICKNESS (ft)                  238.30
    UNIT WEIGHT (#/ft3)                   165.00
    SHEAR MODULUS (#/ft2)            40799020.00
  IS INPUT CORRECT (Y/N)
y

    SOIL PROFILE
      LAYER  THICKNESS  UNIT WT   SHEAR MOD
               (ft)      (pcf)     (psf)
        1      16.40     125.0    1069970.0
        2      23.00     125.0    4550620.0
        3      29.50     125.0    4550620.0
        4      31.20     125.0    4550620.0
        5      31.10     125.0    4550620.0
        6      98.40     125.0   16585750.0
        7      82.00     125.0   10447360.0
        8     238.30     165.0   40799020.0
  IS INPUT CORRECT (Y/N)
y

  OUTCROP DATA
    ROCK UNIT WEIGHT (#/ft3)
165.00
    ROCK SHEAR MODULUS (#/ft2)
55162070.00
    ROCK DAMPING (%)
1.67

  CHECK ROCK DATA
    ROCK UNT WT  (#/ft3)                  165.00
    ROCK SHEAR MODULUS (#/ft2)       55162072.00
    ROCK DAMPING (%)                        1.67
  IS INPUT CORRECT (Y/N)
y

    IS STRAIN CALCULATED IN THE TIME (T) OR FREQUENCY (F) DOMAIN


    DO YOU WANT TO USE A CUT-OFF FREQUENCY FOR THE STRAIN CALC (Y/N) ?
n
    MAXIMUM ALLOWABLE ERROR IN STRAIN CALCULATION (%) ?
2.0
    FINAL SOIL PROPERTIES FILE NAME ?
soil.final
    STRAIN CUT-OFF FREQUENCY =         1000.00 cps
    FINAL SOIL PROPERTIES FILE NAME:  soil.final
  IS DATA CORRECT (Y/N)
n
```

```
     IS STRAIN CALCULATED IN THE TIME (T) OR FREQUENCY (F) DOMAIN
F

     DO YOU WANT TO USE A CUT-OFF FREQUENCY FOR THE STRAIN CALC (Y/N) ?
N
     MAXIMUM ALLOWABLE ERROR IN STRAIN CALCULATION (%) ?
2.0
     FINAL SOIL PROPERTIES FILE NAME ?
soil.final

     STRAIN CALCULATION IN FREQUENCY DOMAIN
     MAXIMUM ALLOWABLE ERROR =             2.00 %
     STRAIN CUT-OFF FREQUENCY =        1000.00 cps
     FINAL SOIL PROPERTIES FILE NAME:  soil.final
  IS DATA CORRECT (Y/N)
n

     IS STRAIN CALCULATED IN THE TIME (T) OR FREQUENCY (F) DOMAIN
F

     DO YOU WANT TO USE A CUT-OFF FREQUENCY FOR THE STRAIN CALC (Y/N) ?
n
     MAXIMUM ALLOWABLE ERROR IN STRAIN CALCULATION (%) ?
2.0
     FINAL SOIL PROPERTIES FILE NAME ?
soil.final

     STRAIN CALCULATION IN FREQUENCY DOMAIN
     MAXIMUM ALLOWABLE ERROR =             2.00 %
     STRAIN CUT-OFF FREQUENCY =        1000.00 cps
     FINAL SOIL PROPERTIES FILE NAME:  soil.final
  IS DATA CORRECT (Y/N)
y
     NUMBER OF OUTPUT DEPTHS FOR FOURIER COMPONENTS
     (FOR STRAIN-ONLY CALCULATION INPUT 0).........?
1
     DEPTH FOR OUTPUT 1 (ft) ?
0.00
     OUTPUT FILE NAME FOR DEPTH 1  ?
surface.fc

  CHECK OUTPUT INFORMATION
     NUMBER OF OUTPUT DEPTHS       1

     OUTPUT FILE NUMBER                1
     OUTPUT DEPTH (ft)              0.00
     OUTPUT FILE NAME             surface.fc
  IS INPUT CORRECT (Y/N)
y
     DOES A SOIL DEGRADATION FILE EXIST (Y/N)
y
     SOIL DEGRADATION FILE NAME ?
soil.degr
```

SOIL DEGRADATION FILE: soil.degr

IS THIS CORRECT (Y/N)

Y

WORKING ON PROBLEM 1

CHECK INPUT FILE

TITLE:CONVOLVE ROCK OUTCROP MOTION TO SURFACE

INPUT MOTION, rock.fc IS SPECIFIED AT OUTCROP

NUMBER OF SOIL LAYERS: 8

DEPTH TO GROUND WATER TABLE = 99999.9 ft

LAYER	THICKNESS (ft)	UNIT WEIGHT (pcf)	SHEAR MODULUS (psf)
1	16.40	125.00	1069970.
2	23.00	125.00	4550620.
3	29.50	125.00	4550620.
4	31.20	125.00	4550620.
5	31.10	125.00	4550620.
6	98.40	125.00	16585750.
7	82.00	125.00	10447360.
8	238.30	165.00	40799020.

OUTCROP PROPERTIES
OUTCROP UNIT WEIGHT = 165.00 pcf
OUTCROP SHEAR MODULUS = 55162072. psf
OUTCROP DAMPING = 1.67 %
FINAL SOIL PROPERTIES FILE, soil.final ,
IS DETERMINED BY CALCULATING THE STRAIN IN THE FREQUENCY DOMAIN
WITH MAXIMUM ALLOWABLE ERROR IN STRAIN CALCULATION = 2.00 %
STRAIN CUT-OFF FREQUENCY = 1000.00 cps

CONVOLUTION IS CALCULATED AT 1 DEPTHS
DEPTH 1 = 0.00

OUTPUT FILE NAME (DEPTH 1) : surface.fc

FOURIER COMPONENT FILE NAME: rock.fc

MAX. RECORD TIME (SEC) = 0.40960E+02
RECORD TIME INCREMENT (SEC) = 0.20000E-01
NO. OF RECORDS IN INPUT = 2048
NO. OF MODE COMPONENTS = 1025
FREQUENCY INTERVAL (CPS) = 0.24414E-01
MAXIMUM FREQUENCY (CPS) = 0.25000E+02
MAX. ACCEPTABLE FREQ. (CPS) = 0.25000E+02
PEAK ACCELERATION (IPS2) = 0.17071E+03

PEAK ACCELERATION (IPS2) = 1.70710E+02
YDDRMS (IPS2) = 1.99064E+01

BEGINNING ITERATIONS
ILAYER = 1
NLAYER = 8

MAXIMUM # OF COMPONENTS = 1025
OF COMPONENTS FOR STRAIN CALC = 1025

STRAIN CUT-OFF FREQUENCY = 25.00 (cps)

ITERATION # 0

LAYER	DEPTH (ft)	ASSUMED EFF. SHEAR STRAIN (%)	CALC. EFF. SHEAR STRAIN (%)	ERROR (%)
1	8.20	0.0100	0.0632	532.11
2	27.90	0.0100	0.0428	327.73
3	54.15	0.0100	0.0825	725.40
4	84.50	0.0100	0.0931	830.67
5	115.65	0.0100	0.1021	921.24
6	180.40	0.0100	0.0274	174.28
7	270.60	0.0100	0.0494	393.89
8	430.75	0.0100	0.0162	62.32

MAXIMUM # OF COMPONENTS = 1025
OF COMPONENTS FOR STRAIN CALC = 1025

STRAIN CUT-OFF FREQUENCY = 25.00 (cps)

ITERATION # 1

LAYER	DEPTH (ft)	ASSUMED EFF. SHEAR STRAIN (%)	CALC. EFF. SHEAR STRAIN (%)	ERROR (%)
1	8.20	0.0632	0.0743	17.59
2	27.90	0.0428	0.0373	12.86
3	54.15	0.0825	0.0984	19.19
4	84.50	0.0931	0.1598	71.75
5	115.65	0.1021	0.1258	23.20
6	180.40	0.0274	0.0314	14.58
7	270.60	0.0494	0.0799	61.78
8	430.75	0.0162	0.0155	4.24

MAXIMUM # OF COMPONENTS = 1025
OF COMPONENTS FOR STRAIN CALC = 1025

STRAIN CUT-OFF FREQUENCY = 25.00 (cps)

ITERATION # 2

LAYER	DEPTH (ft)	ASSUMED EFF. SHEAR STRAIN (%)	CALC. EFF. SHEAR STRAIN (%)	ERROR (%)
1	8.20	0.0743	0.0676	8.99
2	27.90	0.0373	0.0303	18.73
3	54.15	0.0984	0.0921	6.41
4	84.50	0.1598	0.2077	29.92
5	115.65	0.1258	0.1313	4.39
6	180.40	0.0314	0.0324	2.94
7	270.60	0.0799	0.0880	10.16
8	430.75	0.0155	0.0154	1.04

MAXIMUM # OF COMPONENTS = 1025
OF COMPONENTS FOR STRAIN CALC = 1025

STRAIN CUT-OFF FREQUENCY = 25.00 (cps)

ITERATION # 3

LAYER	DEPTH (ft)	ASSUMED EFF. SHEAR STRAIN (%)	CALC. EFF. SHEAR STRAIN (%)	ERROR (%)
1	8.20	0.0676	0.0598	11.54
2	27.90	0.0303	0.0266	12.12
3	54.15	0.0921	0.0850	7.63
4	84.50	0.2077	0.2477	19.25
5	115.65	0.1313	0.1327	1.06
6	180.40	0.0324	0.0325	0.55
7	270.60	0.0880	0.0891	1.27
8	430.75	0.0154	0.0153	0.79

MAXIMUM # OF COMPONENTS = 1025
OF COMPONENTS FOR STRAIN CALC = 1025

STRAIN CUT-OFF FREQUENCY = 25.00 (cps)

ITERATION # 4

LAYER	DEPTH (ft)	ASSUMED EFF. SHEAR STRAIN (%)	CALC. EFF. SHEAR STRAIN (%)	ERROR (%)
1	8.20	0.0598	0.0537	10.21
2	27.90	0.0266	0.0248	6.76
3	54.15	0.0850	0.0797	6.30
4	84.50	0.2477	0.2879	16.26
5	115.65	0.1327	0.1327	0.02
6	180.40	0.0325	0.0325	0.06
7	270.60	0.0891	0.0883	0.92
8	430.75	0.0153	0.0151	0.93

MAXIMUM # OF COMPONENTS = 1025
OF COMPONENTS FOR STRAIN CALC = 1025

STRAIN CUT-OFF FREQUENCY = 25.00 (cps)

ITERATION # 5

LAYER	DEPTH (ft)	ASSUMED EFF. SHEAR STRAIN (%)	CALC. EFF. SHEAR STRAIN (%)	ERROR (%)
1	8.20	0.0537	0.0490	8.72
2	27.90	0.0248	0.0236	4.98
3	54.15	0.0797	0.0755	5.25
4	84.50	0.2879	0.3368	16.97
5	115.65	0.1327	0.1320	0.53
6	180.40	0.0325	0.0323	0.54
7	270.60	0.0883	0.0865	2.01
8	430.75	0.0151	0.0149	1.33

MAXIMUM # OF COMPONENTS = 1025
OF COMPONENTS FOR STRAIN CALC = 1025

STRAIN CUT-OFF FREQUENCY = 25.00 (cps)

ITERATION # 6

LAYER	DEPTH (ft)	ASSUMED EFF. SHEAR STRAIN (%)	CALC. EFF. SHEAR STRAIN (%)	ERROR (%)
1	8.20	0.0490	0.0461	5.95
2	27.90	0.0236	0.0229	2.90
3	54.15	0.0755	0.0728	3.60
4	84.50	0.3368	0.3588	6.54
5	115.65	0.1320	0.1307	0.96
6	180.40	0.0323	0.0321	0.73
7	270.60	0.0865	0.0851	1.63
8	430.75	0.0149	0.0148	0.83

MAXIMUM # OF COMPONENTS = 1025
OF COMPONENTS FOR STRAIN CALC = 1025

STRAIN CUT-OFF FREQUENCY = 25.00 (cps)

ITERATION # 7

LAYER	DEPTH (ft)	ASSUMED EFF. SHEAR STRAIN (%)	CALC. EFF. SHEAR STRAIN (%)	ERROR (%)
1	8.20	0.0461	0.0447	3.07
2	27.90	0.0229	0.0227	1.06

3	54.15	0.0728	0.0715	1.80
4	84.50	0.3588	0.3619	0.87
5	115.65	0.1307	0.1298	0.71
6	180.40	0.0321	0.0320	0.30
7	270.60	0.0851	0.0846	0.58
8	430.75	0.0148	0.0148	0.15

MAXIMUM # OF COMPONENTS = 1025
OF COMPONENTS FOR STRAIN CALC = 1025

STRAIN CUT-OFF FREQUENCY = 25.00 (cps)

ITERATION # 8

LAYER	DEPTH (ft)	ASSUMED EFF. SHEAR STRAIN (%)	CALC. EFF. SHEAR STRAIN (%)	ERROR (%)
1	8.20	0.0447	0.0441	1.36
2	27.90	0.0227	0.0226	0.28
3	54.15	0.0715	0.0710	0.74
4	84.50	0.3619	0.3624	0.13
5	115.65	0.1298	0.1294	0.34
6	180.40	0.0320	0.0320	0.05
7	270.60	0.0846	0.0845	0.12
8	430.75	0.0148	0.0148	0.01

FINAL DATA

STRAIN CALCULATION IS PERFORMED IN THE FREQUENCY DOMAIN

GROUND WATER IS NOT CONSIDERED IN THIS PROBLEM

NUMBER OF ITERATIONS = 8 .

SHEAR LAYER	DEPTH to CENTER (ft)	EFF. SHEAR STRAIN (%)	DAMPING (%)	FINAL SHEAR MOD (ksf)	FINAL VEL (fps)
1	8.20	0.0447	8.19	578.4	386.0
2	27.90	0.0227	3.87	3656.1	970.5
3	54.15	0.0715	14.10	2008.4	719.3
4	84.50	0.3619	15.90	524.8	367.7
5	115.65	0.1298	9.24	1796.9	680.4
6	180.40	0.0320	5.60	10786.8	1666.9
7	270.60	0.0846	3.26	5275.2	1165.7
8	430.75	0.0148	1.67	40799.0	2821.7
rock			1.67	55162.1	3281.0

NO. OF DEPTHS FOR OUTPUT = 1
DEPTH 1 0.00 FT

If plots or spectra of the free field motions are required then the option to do an inverse Fourier transform is executed to generate accelerograms from the Fourier components. In this example, the Fourier components of the surface motion, "surface.fc", are combined to obtain the time history which is saved on the file "surface.th"

```
*************************************************
*************************************************
*****            C A R E S (SOIL)           *****
*************************************************
*************************************************
* ANALYSIS #                                    *
*                                               *
* 1. CONVERTS INPUT ACCELERATION TIME HISTORY    *
*    DATA FILE TO CARES FORMAT                  *
*                                               *
* 2. GENERATES ACCELEROGRAM TO MATCH A GIVEN     *
*    TARGET RESPONSE SPECTRUM                   *
*                                               *
* 3. GENERATES FOURIER COMPONENTS FOR GIVEN      *
*   ACCELEROGRAM; USED AS INPUT TO SOIL COLUMN  *
*    AND SSI ANALYSIS                           *
*                                               *
* 4. PERFORMS CONVOLUTION ANALYSIS OF A GIVEN    *
*    SOIL COLUMN TO ACCELEROGRAM DEFINED IN     *
*    TERMS OF ITS FOURIER COMPONENTS            *
*                                               *
* 5. GENERATES TIME HISTORY OF ACCELEROGRAM      *
*    FOR A GIVEN FOURIER COMPONENT FILE         *
*                                               *
* 6. GENERATES ACCELERATION RESPONSE SPECTRUM    *
*    FOR A GIVEN ACCELERATION TIME HISTORY      *
*                                               *
* 7. GENERATES POWER SPECTRAL DENSITY FUNCTION   *
*    FOR A GIVEN FOURIER COMPONENT FILE         *
*                                               *
* 8. EXIT FROM CARES.SOIL                       *
*************************************************


     INPUT ITEM  FOR THE ANALYSIS..(1,2,3,4,5,6,7 or 8) ?
5
     ANALYSIS #  =   5

     IS THIS CORRECT (Y/N)
Y
                  PROGRAM TO COMPUTE TIME HISTORY

     INPUT FOURIER COMPONENT FILE NAME ?
surface.fc
```

```
          FOURIER COMPONENT FILE NAME =  surface.fc

     IS THIS FILE NAME CORRECT (Y/N) ?
y
     ENTER OUTPUT TIME HISTORY FILE NAME ?
surface.th

          OUTPUT TIME HISTORY FILE NAME =  surface.th

     IS THIS FILE NAME CORRECT (Y/N) ?
y
       CONVOLVED MOTION:    CONVOLVE ROCK OUTCROP MOTION TO SURFACE
  READ MODE COMPONENTS 0 - 1024
     PEAK ACCELERATION (IPS2)     =   1.75120E+02
     AT RECORD NUMBER             =       219

     TIME HISTORY FILE NAME = surface.th
```

The response spectra for the surface motion is calculated and the spectra is saved on the file "surface.sp".

```
     ************************************************
     ************************************************
     *****             C A R E S (SOIL)        *****
     ************************************************
     ************************************************
     * ANALYSIS #                                   *
     *                                              *
     * 1. CONVERTS INPUT ACCELERATION TIME HISTORY  *
     *    DATA FILE TO CARES FORMAT                 *
     *                                              *
     * 2. GENERATES ACCELEROGRAM TO MATCH A GIVEN   *
     *    TARGET RESPONSE SPECTRUM                  *
     *                                              *
     * 3. GENERATES FOURIER COMPONENTS FOR GIVEN    *
     *   ACCELEROGRAM; USED AS INPUT TO SOIL COLUMN *
     *    AND SSI ANALYSIS                          *
     *                                              *
     * 4. PERFORMS CONVOLUTION ANALYSIS OF A GIVEN  *
     *    SOIL COLUMN TO ACCELEROGRAM DEFINED IN    *
     *    TERMS OF ITS FOURIER COMPONENTS           *
     *                                              *
     * 5. GENERATES TIME HISTORY OF ACCELEROGRAM    *
     *    FOR A GIVEN FOURIER COMPONENT FILE        *
     *                                              *
     * 6. GENERATES ACCELERATION RESPONSE SPECTRUM  *
     *    FOR A GIVEN ACCELERATION TIME HISTORY     *
     *                                              *
```

```
    * 7. GENERATES POWER SPECTRAL DENSITY FUNCTION  *
    *    FOR A GIVEN FOURIER COMPONENT FILE         *
    *                                               *
    * 8. EXIT FROM CARES.SOIL                       *
    *************************************************


    INPUT ITEM  FOR THE ANALYSIS..(1,2,3,4,5,6,7 or 8) ?
6
    ANALYSIS #  =   6

    IS THIS CORRECT (Y/N)
y

    CODE TO TAKE ACCELEROGRAM PULSES FROM AN INPUT FILE
                   AND
    COMPUTE SPECTRA AT DAMPING (%) AND STORE ON FILE SPECT
           ACCELEROGRAM PULSE d= IN/SEC**2

  INPUT TIME HISTORY FILE NAME ?
surface.th
  OUTPUT RESPONSE SPECTRUM FILE NAME
surface.sp

  INPUT FILE NAME =     surface.th
  OUTPUT FILE NAME =    surface.sp

    IS THIS CORRECT (Y/N)
y
  DAMPING (%) ?
5.0

  DAMPING =  5.00 %

    IS THIS CORRECT (Y/N)
y

    FINAL VELOCITY                       =          -0.14 in/sec
    NO. OF ADDITIONAL RECORDS ADDED       =             4
    TOTAL NO. OF RECORDS FOR SPECTRA      =          2052
    MAX. NO. OF RECORDS ALLOWED           =          8400


    *************************************************
    *************************************************
    *****           C A R E S  (SOIL)         *****
    *************************************************
    *************************************************
    * ANALYSIS #                                    *
    *                                               *
    * 1. CONVERTS INPUT ACCELERATION TIME HISTORY   *
    *    DATA FILE TO CARES FORMAT                  *
    *                                               *
    * 2. GENERATES ACCELEROGRAM TO MATCH A GIVEN    *
    *    TARGET RESPONSE SPECTRUM                   *
    *                                               *
    * 3. GENERATES FOURIER COMPONENTS FOR GIVEN     *
```

```
*   ACCELEROGRAM; USED AS INPUT TO SOIL COLUMN *
*    AND SSI ANALYSIS                           *
*                                               *
* 4. PERFORMS CONVOLUTION ANALYSIS OF A GIVEN   *
*    SOIL COLUMN TO ACCELEROGRAM DEFINED IN     *
*    TERMS OF ITS FOURIER COMPONENTS            *
*                                               *
* 5. GENERATES TIME HISTORY OF ACCELEROGRAM     *
*    FOR A GIVEN FOURIER COMPONENT FILE         *
*                                               *
* 6. GENERATES ACCELERATION RESPONSE SPECTRUM   *
*    FOR A GIVEN ACCELERATION TIME HISTORY      *
*                                               *
* 7. GENERATES POWER SPECTRAL DENSITY FUNCTION  *
*    FOR A GIVEN FOURIER COMPONENT FILE         *
*                                               *
* 8. EXIT FROM CARES.SOIL                       *
*************************************************

    INPUT ITEM  FOR THE ANALYSIS..(1,2,3,4,5,6,7 or 8) ?
8
    ANALYSIS #  =   8

    IS THIS CORRECT (Y/N)
Y
```

The following screen dump shows the execution of Analysis 2 in the structural package. This option generates the structural data to be used as input to the structural Analysis 3. The file "ssiex.in" is generated and used as input to Analysis 3. It should be noted that once this file has been created it can be modified through the system editor and subsequent runs can be made without implementing Analysis 2.

```
      ***********************************************
      ***********************************************
      *****        C A R E S (STRUCTURE)       *****
      ***********************************************
      ***********************************************
      * ANALYSIS #                                  *
      *                                             *
      * 1. GENERATES THE FOURIER COEFFICIENTS FOR A *
      *    GIVEN ACCELEROGRAM                       *
      *                                             *
      * 2. FORMS THE DATA FILE REQUIRED AS INPUT TO *
      *    STRUCTURAL RESPONSE SSI ANALYSIS         *
      *                                             *
      * 3. PERFORMS THE SSI ANALYSIS                *
      *                                             *
      *                                             *
      * 4. EXIT FROM CARES                          *
      ***********************************************


      INPUT ITEM  FOR THE ANALYSIS..(1,2,3,or 4) ?
2
      ANALYSIS #  =   2

      IS THIS CORRECT (Y/N)
Y

         ***********************************************
         *                                             *
         *                                             *
         *      C A R E S       S Y S T E M            *
         *                                             *
         *        (MODULE: SEISMIC/STRUCTURES)         *
         *                                             *
         *                                             *
         *   STRUCTURES ARE MODELED USING TWO OR THREE *
         *   DIMENSIONAL BEAM AND SPRING ELEMENTS WITH *
         *    INPUT MOTION APPLIED TO THE MODEL.       *
         *   THE NODAL SEQUENCE SHOULD BE SELECTED TO  *
         *    GIVE SMALL BANDWIDTH                     *
         *                                             *
         ***********************************************
```

```
              ENTER NAME FOR THE FILE STORING INPUT DATA......?
ssiex.in
              SSI ANALYSIS DATA FILE    = ssiex.in
     IS THIS NAME CORRECT........................(Y/N) ?
Y
     ENTER TITLE FOR THE PROBLEM :
TYPICAL SSI STRUCTURE INPUT DATA

     ENTER CONTROL CARD  :

     NOD  NSTIF1   NSTIF2   NSTIF3    IANAL

     NOD      = NUMBER OF NODES ( <=500)
     NSTIF1   = NUMBER OF BEAM ELEMENTS
     NSTIF2   = NUMBER OF SPRING ELEMENTS
     NSTIF3   = NUMBER OF SHEAR WALL ELEMENTS
     IANAL
              = 0   FREQUENCY DOMAIN SHAKER
              = 1   FREQUENCY DOMAIN TIME HISTORY

12  5  0  0  1

     CONTROL PARAMETERS  :

     NUMBER OF NODES                         =    12
     NUMBER OF BEAM ELEMENTS                 =     5
     NUMBER OF SPRING ELEMENTS               =     0
     NUMBER OF SHEAR WALL ELEMENTS           =     0
     ANALYSIS TYPE                           =     1


     IS THE CONTROL CARD OK.................(Y/N) ?
Y
     ENTER NODAL COORDINATES AND LUMPED WEIGHTS   :


     INPUT NUMBER =     1

     NODE NO. X-COORD. Y-COORD. Z-COORD. WEIGHT      :
        N     (FT)      (FT)     (FT)     (KIP)
        1    0.000     0.000    0.000    689.90
     INPUT NUMBER =     2

     NODE NO. X-COORD. Y-COORD. Z-COORD. WEIGHT      :
        N     (FT)      (FT)     (FT)     (KIP)
        2    0.000     0.000    9.840    741.70
     INPUT NUMBER =     3

     NODE NO. X-COORD. Y-COORD. Z-COORD. WEIGHT      :
        N     (FT)      (FT)     (FT)     (KIP)
        3    0.000     0.000   16.400    101.20
     INPUT NUMBER =     4

     NODE NO. X-COORD. Y-COORD. Z-COORD. WEIGHT      :
        N     (FT)      (FT)     (FT)     (KIP)
```

```
    4    0.000      0.000   22.600    988.20
INPUT NUMBER = .    5

NODE NO. X-COORD. Y-COORD. Z-COORD. WEIGHT      :
    N     (FT)       (FT)     (FT)      (KIP)
    5    0.000      0.000   28.920    131.80
INPUT NUMBER =      6

NODE NO. X-COORD. Y-COORD. Z-COORD. WEIGHT      :
    N     (FT)       (FT)     (FT)      (KIP)
    6    0.000      0.000   39.360    150.60
INPUT NUMBER =      7

NODE NO. X-COORD. Y-COORD. Z-COORD. WEIGHT      :
    N     (FT)       (FT)     (FT)      (KIP)
    7    0.000      0.000   48.000    618.60
INPUT NUMBER =      8

NODE NO. X-COORD. Y-COORD. Z-COORD. WEIGHT      :
    N     (FT)       (FT)     (FT)      (KIP)
    8    0.000      0.000   52.920    550.40
INPUT NUMBER =      9

NODE NO. X-COORD. Y-COORD. Z-COORD. WEIGHT      :
    N     (FT)       (FT)     (FT)      (KIP)
    9   15.250      0.000    9.840      0.00
INPUT NUMBER =     10

NODE NO. X-COORD. Y-COORD. Z-COORD. WEIGHT      :
    N     (FT)       (FT)     (FT)      (KIP)
   10   15.250      0.000   28.920      0.00
INPUT NUMBER =     11

NODE NO. X-COORD. Y-COORD. Z-COORD. WEIGHT      :
    N     (FT)       (FT)     (FT)      (KIP)
   11   20.750      0.000   52.920      0.00
INPUT NUMBER =     12

NODE NO. X-COORD. Y-COORD. Z-COORD. WEIGHT      :
    N     (FT)       (FT)     (FT)      (KIP)
   12    0.000     50.000    0.000      0.00

ENTER NO. OF NODAL ROTARY AND TORSIONAL INERTIAS:
8
NO. OF NODAL ROTATY AND TORSIONAL INERTIAS = ,    8

IS THIS NUMBER OK .........................(Y/N) ?
Y
INPUT NUMBER  =    1

NODE NO. DIR.(4-X,5-Y,6-Z) INERTIA(KIP*FT*SEC**2)
    1             5        1767.00
.INPUT NUMBER  =    2

NODE NO. DIR.(4-X,5-Y,6-Z) INERTIA(KIP*FT*SEC**2)
    2             5        2188.00
INPUT NUMBER  =    3
```

```
      NODE NO. DIR.(4-X,5-Y,6-Z) INERTIA(KIP*FT*SEC**2)
          3            5           822.60
      INPUT NUMBER  =    4

      NODE NO. DIR.(4-X,5-Y,6-Z) INERTIA(KIP*FT*SEC**2)
          4            5           803.30
      INPUT NUMBER  =    5

      NODE NO. DIR.(4-X,5-Y,6-Z) INERTIA(KIP*FT*SEC**2)
          5            5          1072.00
      INPUT NUMBER  =    6

      NODE NO. DIR.(4-X,5-Y,6-Z) INERTIA(KIP*FT*SEC**2)
          6            5          1224.00
      INPUT NUMBER  =    7

      NODE NO. DIR.(4-X,5-Y,6-Z) INERTIA(KIP*FT*SEC**2)
          7            5          2618.00
      INPUT NUMBER  =    8

      NODE NO. DIR.(4-X,5-Y,6-Z) INERTIA(KIP*FT*SEC**2)
          8            5          2064.00
      ENTER NO. OF COUPLED DEGREES OF FREEDOM (<200) :
0
      NO. OF COUPLED DEGREES OF FREEDOM =     0

      IS THIS NUMBER OK .................(Y/N) ?
Y

      ADDITIONAL DOF RESTRAINTS CAN BE GIVEN IN 3 WAYS:
                NREST1 = # INDIVIDUAL RESTRAINTS - SPEC NODE AND DOF
                NREST2 = # NODES WITH ALL DOF RESTRAINED - SPEC NODES
                NREST3 = # DOF RESTRAINED AT ALL NODES - SPEC DOF

30  0  0
      INDIVIUAL RESTRAINT   1NODE  DOF # ?

1  2
      INDIVIUAL RESTRAINT   2NODE  DOF # ?

1  4
      INDIVIUAL RESTRAINT   3NODE  DOF # ?

1  6
      INDIVIUAL RESTRAINT   4NODE  DOF # ?

2  2
      INDIVIUAL RESTRAINT   5NODE  DOF # ?

2  4
      INDIVIUAL RESTRAINT   6NODE  DOF # ?

2  6
      INDIVIUAL RESTRAINT   7NODE  DOF # ?

3  2
```

```
     INDIVIUAL RESTRAINT   8NODE  DOF # ?
3  4
     INDIVIUAL RESTRAINT   9NODE  DOF # ?
3  6
     INDIVIUAL RESTRAINT  10NODE  DOF # ?
4  2
     INDIVIUAL RESTRAINT  11NODE  DOF # ?
4  4
     INDIVIUAL RESTRAINT  12NODE  DOF # ?
4  6
     INDIVIUAL RESTRAINT  13NODE  DOF # ?
5  2
     INDIVIUAL RESTRAINT  14NODE  DOF # ?
5  4
     INDIVIUAL RESTRAINT  15NODE  DOF # ?
5  6
     INDIVIUAL RESTRAINT  16NODE  DOF # ?
6  2
     INDIVIUAL RESTRAINT  17NODE  DOF # ?
6  4
     INDIVIUAL RESTRAINT  18NODE  DOF # ?
6  6
     INDIVIUAL RESTRAINT  19NODE  DOF # ?
7  2
     INDIVIUAL RESTRAINT  20NODE  DOF # ?
7  4
     INDIVIUAL RESTRAINT  21NODE  DOF # ?
7  6
     INDIVIUAL RESTRAINT  22NODE  DOF # ?
8  2
     INDIVIUAL RESTRAINT  23NODE  DOF # ?
8  4
     INDIVIUAL RESTRAINT  24NODE  DOF # ?
8  6
     INDIVIUAL RESTRAINT  25NODE  DOF # ?
12  1
     INDIVIUAL RESTRAINT  26NODE  DOF # ?
12  2
```

```
     INDIVIUAL RESTRAINT  27NODE  DOF # ?

12  3
     INDIVIUAL RESTRAINT  28NODE  DOF # ?

12  4
     INDIVIUAL RESTRAINT  29NODE  DOF # ?

12  5
     INDIVIUAL RESTRAINT  30NODE  DOF # ?

12  6

     ENTER NO.OF RIGID LINKS CONNECTING SLAVE TO MASTER NODES:

LIMITATIONS SSI NODE CANNOT BE SLAVE
        SLAVE NODE CANNOT BE MASTER TO ANOTHER NODE

5
     NO. OF RIGID LINKS =     5

     IS THIS CORRECT ?
y
     INPUT NUMBER  =     1

     MASTER NODE AT END OF LINK...SLAVE AT END OF LINK
1   2
     INPUT NUMBER  =     2

     MASTER NODE AT END OF LINK...SLAVE AT END OF LINK
1   9
     INPUT NUMBER  =     3

     MASTER NODE AT END OF LINK...SLAVE AT END OF LINK
5  10
     INPUT NUMBER  =     4

     MASTER NODE AT END OF LINK...SLAVE AT END OF LINK
8   7
     INPUT NUMBER  =     5

     MASTER NODE AT END OF LINK...SLAVE AT END OF LINK
8  11

     HOW MANY OUTPUT NODES DO YOU WANT FOR POST PROCESSING  ?
        FILE WILL BE SAVED CONTAINING FOURIER COMPONENTS
         OF RESPONSE AT EACH DOF FOR EACH NODE

6
     NO. OF NODES FOR POST-PROCESSING  =     6

     IS THIS NUMBER OK......................(Y/N)  ?
y

     SPECIFY NODE NUMBERS FOR POST-PROCESS :
2  5  8  9  10  11
```

```
     B E A M    E L E M E N T    D A T A :


     ENTER NUMBER OF MATERIAL GROUPS (<200) :
2

     FOR MATERIAL GROUP NUMBER =    1

     ENTER: E(YOUNG,S MOD) G(SHEAR MOD) DAMPING:
                (KSF)          (KSF)       (%)
            518400.00      216000.00    2.00

      YOUNG,S MODULUS (ksf)             =   0.5184E+06
      SHEAR   MODULUS (ksf)             =   0.2160E+06
      DAMPING (%)                       =    2.000


     FOR MATERIAL GROUP NUMBER =    2

     ENTER: E(YOUNG,S MOD) G(SHEAR MOD) DAMPING:
                (KSF)          (KSF)       (%)
          5184000000.00  216000000.00  2.00

      YOUNG,S MODULUS                   =   0.5184E+10
      SHEAR   MODULUS                   =   0.2160E+09
     DAMPING RATIO                      =    2.000

     ENTER NUMBER OF SECTION PROP GROUPS (<200) :
        LOCAL AXES: X-AXIS OF MEMBER; Y-IN IS IK NODES PLANE

1

     FOR SECTION PROPERTY GROUP NUMBER =    1
     ENTER: AREA; SH AREA-Y; SH AREA-Z;    IY;     IZ;     J
            ------ SQ FEET-----------    -------FT**4-----

          105.2   52.6      52.6     14800.0  14800.0  100000.0
     FOR BEAM  NUMBER  =     1
     ENTER: START , END , K-NODE(ON LOC.X-Z PL , MAT# , SECT#)
2  3  12  1  1
     FOR BEAM  NUMBER  =     2
     ENTER: START , END , K-NODE(ON LOC.X-Z PL , MAT# , SECT#)
3  4  12  1  1
     FOR BEAM  NUMBER  =     3
     ENTER: START , END , K-NODE(ON LOC.X-Z PL , MAT# , SECT#)
4  5  12  1  1
     FOR BEAM  NUMBER  =     4
     ENTER: START , END , K-NODE(ON LOC.X-Z PL , MAT# , SECT#)
5  6  12  1  1
     FOR BEAM  NUMBER  =     5
     ENTER: START , END , K-NODE(ON LOC.X-Z PL , MAT# , SECT#)
6  7  12  1  1
```

```
              SELECT SSI MODEL..ITYPE:
          IF CIRCULAR FOUNDATION (1, 2 , OR 3)
      1.FREQUENCY INDEPENDENT PARAMETER MODEL
      2.BEREDUGO NOVAK MODEL
      3.KAUSEL MODEL

          IF RECTANGULAR FOUNDATION (5, 6, OR 7)
      5.FOR ENTIRE RECT FOUNDATION
      6.FOR UNIT WIDTH IN X-DIRECTION
      7.FOR UNIT WIDTH IN Y-DIRECTION

       NODE AT WHICH SSI DATA IS APPLIED = INODE

           ITYPE = ?, INODE = ?
1  1

      ENTER SOIL PROPERTIES AND GEOMETRY FOR CIRC FOUNDATION:

          SOIL BENEATH FOUNDATION
      G   =  SHEAR MODULUS (KSF)
      MU  =  POISSON RATIO
      DEN =  SOIL DENSITY      (KIPS/FT**3)
          SOIL TO SIDE OF FOUNDATION
      GS   =  SHEAR MODULUS (KSF)
      MUS  =  POISSON RATIO
      DENS =  SOIL DENSITY      (KIPS/FT**3)
      H    =  DEPTH OF BURIAL
      R    =  RADIUS OF FOUNDATION
      BETA =  SOIL DAMPING (%)


4509.00  0.47  0.120  4509.00  0.47  0.120  0.00  17.25  0.00


      INPUT STRUCTURAL DAMPING TYPE:
      1.  READ IN MASS AND STIFFNESS MATRIX MULT
      2.  CONSTANT RATIO BASED ON FIRST 2 MODES
      3.  COMPOSITE
3

      FREE FIELD PULSE SPECIFICATION :

      IDENTIFY THE PULSE DIRECTIONS:   (X) ,    (Y) ,    (Z)
      IN SEQUENCE ON ONE LINE ( 1=X , 2=Y , 3=Z ).
      REPLACE WITH ZERO IF NO PULSE IN THAT DIR.
1  0  0

      FOR PULSE NO. =     1 , ENTER THE FILE NAME :
surface.fc

      ENTER SCALE FACTOR      :
0.0833
         DO YOU WANT TO MAKE ANOTHER MODEL.........(Y/N) ?
n
```

The input file is now complete and the structural response analysis is implemented through Analysis 3. The input files required to execute this option are the structural description (contained in "ssiex.in") for this example, and the Fourier components of the free fied motion (contained in "surface.fc" for this example). The output from this option consists of the Fourier components of the selected components of the structure's displacements. These are saved on file "ssiex.ou" and are used for postprocessing to obtain in-structure accelerograms and spectra.

```
     ***********************************************
     ***********************************************
     *****          C A R E S (STRUCTURE)      *****
     ***********************************************
     ***********************************************
     * ANALYSIS #                                  *
     *                                             *
     * 1. GENERATES THE FOURIER COEFFICIENTS FOR A *
     *    GIVEN ACCELEROGRAM                       *
     *                                             *
     * 2. FORMS THE DATA FILE REQUIRED AS INPUT TO *
     *    STRUCTURAL RESPONSE SSI ANALYSIS         *
     *                                             *
     * 3. PERFORMS THE SSI ANALYSIS                *
     *                                             *
     *                                             *
     * 4. EXIT FROM CARES                          *
     ***********************************************


     INPUT ITEM  FOR THE ANALYSIS..(1,2,3,or 4) ?
3
     ANALYSIS #  =   3

     IS THIS CORRECT (Y/N)
Y
        ***********************************************
        *                                             *
        *                                             *
        *          C A R E S     S Y S T E M          *
        *                                             *
        *             (MODULE:  SEISMIC)              *
        *                                             *
        *                                             *
        *                                             *
        *   PERFORMS EVALUATION OF DYNAMIC RESPONSES  *
        *   OF STRUCTURES SUBJECTED TO SEISMIC MOTION *
        *   USING LUMPED MODEL AND FREQUENCY DEPENDENT *
        *    SOIL INTERACTION COEFFICIENTS            *
        *                                             *
        *                                             *
        ***********************************************
```

```
              GENERAL OUTPUT IS STORED IN FILE<SSI.RUN> .

     ENTER INPUT-DATA FILE NAME  :
ssiex.in
               INPUT-DATA FILE NAME =  ssiex.in

              IS THIS NAME CORRECT......................(Y/N) ?
y
              ENTER FILE NAME FOR POST-PROCESSING :
ssiex.ou
              POST-PROCESS FILE NAME     =  ssiex.ou

              IS THIS NAME CORRECT......................(Y/N) ?
y
  LENGTH OF STIFFNESS MATRIX =      93

     MAXIMUM FREQUENCY FOR ANALYSIS =  25.00 cps

     DESIRED CUT-OFF FREQUENCY FOR ANALYSIS (cps)?
12.50

 CUT-OFF FREQUENCY =  12.50 cps

 IS THIS CORRECT (Y/N)
y
  BEGIN SOLUTION    1 FREQUENCY OUT OF   512
  BEGIN SOLUTION    2 FREQUENCY OUT OF   512
  BEGIN SOLUTION    3 FREQUENCY OUT OF   512
  BEGIN SOLUTION    4 FREQUENCY OUT OF   512
  BEGIN SOLUTION    5 FREQUENCY OUT OF   512
  BEGIN SOLUTION    6 FREQUENCY OUT OF   512
  BEGIN SOLUTION    7 FREQUENCY OUT OF   512
  BEGIN SOLUTION    8 FREQUENCY OUT OF   512
  BEGIN SOLUTION    9 FREQUENCY OUT OF   512
  BEGIN SOLUTION   10 FREQUENCY OUT OF   512
  BEGIN SOLUTION   11 FREQUENCY OUT OF   512
  BEGIN SOLUTION   12 FREQUENCY OUT OF   512
  BEGIN SOLUTION   13 FREQUENCY OUT OF   512
  BEGIN SOLUTION   14 FREQUENCY OUT OF   512
  BEGIN SOLUTION   15 FREQUENCY OUT OF   512
  BEGIN SOLUTION   16 FREQUENCY OUT OF   512
  BEGIN SOLUTION   17 FREQUENCY OUT OF   512
  BEGIN SOLUTION   18 FREQUENCY OUT OF   512
  BEGIN SOLUTION   19 FREQUENCY OUT OF   512
  BEGIN SOLUTION   20 FREQUENCY OUT OF   512
  BEGIN SOLUTION   21 FREQUENCY OUT OF   512
  BEGIN SOLUTION   22 FREQUENCY OUT OF   512
  BEGIN SOLUTION   23 FREQUENCY OUT OF   512
                  *
                  *
                  *
                  *
                  *
  BEGIN SOLUTION  494 FREQUENCY OUT OF   512
  BEGIN SOLUTION  495 FREQUENCY OUT OF   512
```

```
BEGIN SOLUTION   496 FREQUENCY OUT OF   512
BEGIN SOLUTION   497 FREQUENCY OUT OF   512
BEGIN SOLUTION   498 FREQUENCY OUT OF   512
BEGIN SOLUTION   499 FREQUENCY OUT OF   512
BEGIN SOLUTION   500 FREQUENCY OUT OF   512
BEGIN SOLUTION   501 FREQUENCY OUT OF   512
BEGIN SOLUTION   502 FREQUENCY OUT OF   512
BEGIN SOLUTION   503 FREQUENCY OUT OF   512
BEGIN SOLUTION   504 FREQUENCY OUT OF   512
BEGIN SOLUTION   505 FREQUENCY OUT OF   512
BEGIN SOLUTION   506 FREQUENCY OUT OF   512
BEGIN SOLUTION   507 FREQUENCY OUT OF   512
BEGIN SOLUTION   508 FREQUENCY OUT OF   512
BEGIN SOLUTION   509 FREQUENCY OUT OF   512
BEGIN SOLUTION   510 FREQUENCY OUT OF   512
BEGIN SOLUTION   511 FREQUENCY OUT OF   512
BEGIN SOLUTION   512 FREQUENCY OUT OF   512
READING 7 FOR NODE   2
 WRITING ON OUTPUT FILE FOR NODE   2 DOF  1
 WRITING ON OUTPUT FILE FOR NODE   2 DOF  3
 WRITING ON OUTPUT FILE FOR NODE   2 DOF  5
READING 7 FOR NODE   5
 WRITING ON OUTPUT FILE FOR NODE   5 DOF  1
 WRITING ON OUTPUT FILE FOR NODE   5 DOF  3
 WRITING ON OUTPUT FILE FOR NODE   5 DOF  5
READING 7 FOR NODE   8
 WRITING ON OUTPUT FILE FOR NODE   8 DOF  1
 WRITING ON OUTPUT FILE FOR NODE   8 DOF  3
 WRITING ON OUTPUT FILE FOR NODE   8 DOF  5
READING 7 FOR NODE   9
 WRITING ON OUTPUT FILE FOR NODE   9 DOF  1
 WRITING ON OUTPUT FILE FOR NODE   9 DOF  2
 WRITING ON OUTPUT FILE FOR NODE   9 DOF  3
 WRITING ON OUTPUT FILE FOR NODE   9 DOF  4
 WRITING ON OUTPUT FILE FOR NODE   9 DOF  5
 WRITING ON OUTPUT FILE FOR NODE   9 DOF  6
READING 7 FOR NODE  10
 WRITING ON OUTPUT FILE FOR NODE  10 DOF  1
 WRITING ON OUTPUT FILE FOR NODE  10 DOF  2
 WRITING ON OUTPUT FILE FOR NODE  10 DOF  3
 WRITING ON OUTPUT FILE FOR NODE  10 DOF  4
 WRITING ON OUTPUT FILE FOR NODE  10 DOF  5
 WRITING ON OUTPUT FILE FOR NODE  10 DOF  6
READING 7 FOR NODE  11
 WRITING ON OUTPUT FILE FOR NODE  11 DOF  1
 WRITING ON OUTPUT FILE FOR NODE  11 DOF  2
 WRITING ON OUTPUT FILE FOR NODE  11 DOF  3
 WRITING ON OUTPUT FILE FOR NODE  11 DOF  4
 WRITING ON OUTPUT FILE FOR NODE  11 DOF  5
 WRITING ON OUTPUT FILE FOR NODE  11 DOF  6
```

The structural response calculation is now complete and the structures module is exited.

```
************************************************
************************************************
*****        C A R E S (STRUCTURE)        *****
************************************************
************************************************
* ANALYSIS #                                   *
*                                              *
* 1. GENERATES THE FOURIER COEFFICIENTS FOR A  *
*    GIVEN ACCELEROGRAM                        *
*                                              *
* 2. FORMS THE DATA FILE REQUIRED AS INPUT TO  *
*    STRUCTURAL RESPONSE SSI ANALYSIS          *
*                                              *
* 3. PERFORMS THE SSI ANALYSIS                 *
*                                              *
*                                              *
* 4. EXIT FROM CARES                           *
************************************************

    INPUT ITEM  FOR THE ANALYSIS..(1,2,3,or 4) ?
4
    ANALYSIS #  =   4

    IS THIS CORRECT (Y/N)
Y
```

The Post Processing module is next invoked so that response spectra may be developed. The input file required for this operation is the output file from Analysis 3 of the structures module. In this case, the file is "ssiex.ou". Three spectra are generated (nodes 2, 8, and 11 all in direction 1). The output spectra are saved on user named files: spec2.1ou", "spec8.1ou", and "spec11.1ou". The accelerograms are saved on user name files "acc2.1ou", "acc8.1ou", and "acc11.1ou" .

```
************************************************
************************************************
*****          C A R E S (POST)           *****
************************************************
************************************************
* ANALYSIS #                                     *
*                                                *
* 1. COMPUTES TIME HISTORY                       *
*    FOR GIVEN FOURIER COMPONENTS                *
*                                                *
* 2. GENERATES RESPONSE SPECTRA FOR GIVEN        *
*    ACCELERATION TIME HISTORY.                  *
*                                                *
* 3. GENERATES RESPONSE SPECTRA FOR GIVEN        *
*    SSI OUTPUT DATA                             *
*                                                *
* 4. PSD-RELATED ACCEL TIME HISTORY              *
*    SPECTRA ANALYSIS                            *
*                                                *
* 5. EXIT FROM CARES                             *
*                                                *
************************************************

     INPUT ITEM  FOR THE ANALYSIS..(1,2,3,4 or 5) ?
3
     ANALYSIS #  =   3

     IS THIS CORRECT (Y/N)
Y
```

```
     ******************************************************
     * PROGRAM TO TAKE FOURIER COMPONENTS (ft/sec2)        *
     * FROM SIM CODE OUTPUT  AND :                         *
     *  1 - DETERMINE THE TIME HISTORY (in/sec2) AT A      *
     *      SPECIFIED GAGE LOCATION AND DEGREE OF FREEDOM  *
     *  2 - COMPUTE SPECTRA AT UP TO 5 DAMPING RATIOS      *
     ******************************************************

     GENERAL INFORMATION IS STORED ON FILE:SPECTRUM.RUN
     INPUT FILE NAME FROM SSI ANALYSIS........ ?
ssiex.ou
     FILE NAME FROM SSI ANALYSIS  = ssiex.ou

     IS THIS NAME CORRECT....................(Y/N) ?
y


          READING FILE ssiex.ou

     FOLLOWING DATA FROM SSI ANALYSIS OUTPUT
     NUMBER OF NODES          =    12
     NUMBER OF DEG OF FREEDOM =    18
     NUMBER OF FREQUENCIES    =  1025
     NO OF DISPL SOL ON FILE  =    27
     NODE       DOF :

         2        1
         2        3
         2        5
         5        1
         5        3
         5        5
         8        1
         8        3
         8        5
         9        1
         9        2
         9        3
         9        4
         9        5
         9        6
        10        1
        10        2
        10        3
        10        4
        10        5
        10        6
        11        1
        11        2
        11        3
        11        4
        11        5
        11        6
     INPUT NO. OF LOCATIONS AT WHICH YOU WISH TO GENERATE
     RESPONSE SPECTRA   :
 3
     TOTAL NO. OF LOCATIONS FOR SPECTRA =    3
```

```
     IS THIS NUMBER CORRECT.....................(Y/N) ?
y
     LOCATION NO.    1
     INPUT : NODE NUMBER & DIRECTION :
                2            1

     CHECK LOCATION # 1
     NODE #           =      2
     DEGREE OF FREEDOM =      1

     IS THIS CORRECT....................(Y/N) ?
y
     LOCATION NO.    2
     INPUT : NODE NUMBER & DIRECTION :
                8            1

     CHECK LOCATION # 2
     NODE #           =      8
     DEGREE OF FREEDOM =      1

     IS THIS CORRECT....................(Y/N) ?
y
     LOCATION NO.    3
     INPUT : NODE NUMBER & DIRECTION :
               11            1

     CHECK LOCATION # 3
     NODE #           =     11
     DEGREE OF FREEDOM =      1

     IS THIS CORRECT....................(Y/N) ?
y
     START SOLUTION  FOR NODE   2 DIRECTION  1


     INPUT NO. OF DAMPING RATIOS TO BE USED...(MAX.5) ?
1
     INPUT THE 1 st DAMPING RATIO.........(%)  ?
5.00
     SPECTRA OUTPUT FILE NAME FOR THE DAMPING.....?
spec2.1ou
     ASSIGN A FILE NAME TO STORING ACCELERATION TIME HISTORY
     FOR LOCATION    2 DIRECTION    1
acc2.1ou
     ACCEL. HISTORY FILE NAME FOR LOCATION   2 DIR. 1 = acc2.1ou


     IS THIS NAME CORRECT.......... (Y/N) ?
y
     PEAK ACCELERATION (IPS2)     =   1.89060E+02
     AT RECORD NUMBER             =       220
```

```
    TIME HISTORY FILE NAME = acc2.1ou
  COMPL ACCEL START SPECTRA

    FINAL VELOCITY                      =          -0.01 in/sec
    NO. OF ADDITIONAL RECORDS ADDED      =              0
    TOTAL NO. OF RECORDS FOR SPECTRA     =           2048
    MAX. NO. OF RECORDS ALLOWED          =           8400

    START SOLUTION FOR NODE   8 DIRECTION  1


    INPUT NO. OF DAMPING RATIOS TO BE USED...(MAX.5) ?
1
    INPUT THE 1 st DAMPING RATIO.........(%)  ?
5.00
    SPECTRA OUTPUT FILE NAME FOR THE DAMPING.....?
spec8.1ou
    ASSIGN A FILE NAME TO STORING ACCELERATION TIME HISTORY
    FOR LOCATION    8 DIRECTION    1
acc8.1ou
    ACCEL. HISTORY FILE NAME FOR LOCATION   8 DIR. 1 = acc8.1ou


    IS THIS NAME CORRECT.......... (Y/N) ?
y
    PEAK ACCELERATION (IPS2)      =   3.00585E+02
    AT RECORD NUMBER              =       220

    TIME HISTORY FILE NAME = acc8.1ou
  COMPL ACCEL START SPECTRA

    FINAL VELOCITY                      =          -0.01 in/sec
    NO. OF ADDITIONAL RECORDS ADDED      =              0
    TOTAL NO. OF RECORDS FOR SPECTRA     =           2048
    MAX. NO. OF RECORDS ALLOWED          =           8400

    START SOLUTION FOR NODE  11 DIRECTION  1


    INPUT NO. OF DAMPING RATIOS TO BE USED...(MAX.5) ?
1
    INPUT THE 1 st DAMPING RATIO.........(%)  ?
5.00
    SPECTRA OUTPUT FILE NAME FOR THE DAMPING.....?
spec11.1ou
    ASSIGN A FILE NAME TO STORING ACCELERATION TIME HISTORY
    FOR LOCATION   11 DIRECTION    1
acc11.1ou
    ACCEL. HISTORY FILE NAME FOR LOCATION  11 DIR. 1 = acc11.1ou


    IS THIS NAME CORRECT.......... (Y/N) ?
y
```

```
   PEAK ACCELERATION (IPS2)      =   3.00585E+02
   AT RECORD NUMBER              =       220

   TIME HISTORY FILE NAME = acc11.1ou
COMPL ACCEL START SPECTRA

   FINAL VELOCITY                          =          -0.01 in/sec
   NO. OF ADDITIONAL RECORDS ADDED          =              0
   TOTAL NO. OF RECORDS FOR SPECTRA         =           2048
   MAX. NO. OF RECORDS ALLOWED              =           8400
```

```
*************************************************
*************************************************
*****          C A R E S (POST)            *****
*************************************************
*************************************************
* ANALYSIS #                                    *
*                                               *
* 1. COMPUTES TIME HISTORY                      *
*    FOR GIVEN FOURIER COMPONENTS               *
*                                               *
* 2. GENERATES RESPONSE SPECTRA FOR GIVEN       *
*    ACCELERATION TIME HISTORY.                 *
*                                               *
* 3. GENERATES RESPONSE SPECTRA FOR GIVEN       *
*    SSI OUTPUT DATA                            *
*                                               *
* 4. PSD-RELATED ACCEL TIME HISTORY             *
*    SPECTRA ANALYSIS                           *
*                                               *
* 5. EXIT FROM CARES                            *
*                                               *
*************************************************

    INPUT ITEM  FOR THE ANALYSIS..(1,2,3,4 or 5) ?
5
    ANALYSIS #  =   5

    IS THIS CORRECT (Y/N)
Y
```

The plot modules are now executed with the files developed in the Post Processor used as input. The sample problem plots that are generated are included at the end of the screen dumps.

NODE 2, X-DIRECTION ACCELERATION TIME HISTORY PLOT:

:

```
        **************************************************
        *                                                *
        *       C A R E S P L O T       S Y S T E M      *
        *                                                *
        *                 (MODULE: SEISMIC)              *
        *  --GENERAL PLOTTING PROGRAM FOR CARES SYSTEM-- *
        *     PLOTTING OPTIONS:                          *
        *    1.CONVERTS INPUT ACCELERATION TIME HISTORY  *
        *       DATA FILE TO CARES FORMAT                *
        *     2.PLOT TIME HISTORIES                      *
        *     3.PLOT RESPONSE SPECTRA                    *
        *     4.PLOT AMPLIFICATION/PSD FUNCTIONS         *
        *     5.PLOT GENERAL X-Y  GRAPHS                 *
        *     6.EXIT FROM CARES                          *
        **************************************************

     SELECT AN OPT. YOU WISH TO EXECUTE...(1 thru 6)?

     1.CONVERT ACCELERATION FILE.
     2.PLOT TIME HISTORIES.
     3.PLOT RESPONSE SPECTRA.
     4.PLOT AMPLIFICATIONS/PSD FUNCTIONS.
     5.PLOT GENERAL X-Y GRAPHS.
     6.EXIT FROM THE PROGRAM.
2
     RUN OPTION    =    2
     IS THIS OPTION CORRECT................(Y/N) ?
Y
        **************************************************
        *                                                *
        *          C A R E S       S Y S T E M           *
        *                                                *
        *                (MODULE: SEISMIC)               *
        *                                                *
        *                TIME HISTORY PLOT               *
        *                                                *
        *             PLOT TIME HISTORIES FOR            *
        *                  CARES SYSTEM.                 *
        *                                                *
        **************************************************



     ENTER TIME HISTORY TYPE #:
     ACCELERATION       1
     VELOCITY           2
```

```
     DISPLACEMENT        3
1

  INPUT TIME HISTORY IS FOR ACCELERATION (in/sec2)
     IS THIS CORRECT (Y/N)
y
     # OF TIME HISTORY CURVES TO BE PLOTTED (3 MAX)
1
     ENTER THE TIME HISTORY FILE NAME FOR CURVE 1
acc2.1ou
     FILE NAME FOR CURVE 1 = acc2.1ou
     IS THIS CORRECT (Y/N): ?
y
     MAXIMUM  VALUE OF TIME =     40.9400 sec
     MINIMUM  VALUE OF TIME =      0.0000 sec
     ENTER DESIRED MAX. TIME (sec)
40
     ENTER DESIRED MIN. TIME (sec)  :
0

     TIME AXIS FOR PLOT WILL HAVE:
     A MINIMUM VALUE OF  0.00 sec
     A MAXIMUM VALUE OF 40.00 sec

     IS THIS CORRECT (Y/N)
y
     INPUT INCREMENT FOR MAJOR TICK MARKS ON THE X AXIS (sec)
10
     INPUT INCREMENT FOR MINOR TICK MARKS ON THE X AXIS (sec)
5

     MAJOR TICK MARKS ARE AT 10.00 sec INTERVALS AND
     THERE ARE  2 MINOR TICK INTERVALS PER MAJOR TICK INTERVAL

     IS THIS CORRECT (Y/N)
y
     MAXIMUM  VALUE OF ACCELERATION =      0.4893 g
     MINIMUM  VALUE OF ACCELERATION =     -0.3233 g
     ENTER DESIRED MAX. ACCELERATION (g)
+0.80
     ENTER DESIRED MIN. ACCELERATION (g)
-0.80

     Y AXIS FOR PLOT WILL HAVE:
     A MINIMUM ACCELERATION OF     -0.8000 g
     A MAXIMUM ACCELERATION OF      0.8000 g

     IS THIS CORRECT (Y/N)
y
     INPUT INCREMENT FOR MAJOR TICK MARKS ON THE Y AXIS (g)
0.10
     INPUT INCREMENT FOR MINOR TICK MARKS ON THE Y AXIS (g)
0.05

     MAJOR TICK MARKS ARE AT 0.100 (g) INTERVALS AND
     THERE ARE  2 MINOR TICK INTERVALS PER MAJOR TICK INTERVAL
```

```
     IS THIS CORRECT (Y/N)
y

     ENTER THE PLOT TITLE (MAX 60 CHARACTERS)
NODE 2 (X-DIRECTION)

     TITLE FOR PLOT WILL BE:
     TIME HISTORY PLOT: NODE 2 (X-DIRECTION)
  IS THIS CORRECT (Y/N)
y

 Plotting on device 1

     SAVE PLOT TO A FILE (Y/N) ?
y
     FILE NAME TO SAVE PLOT
node2x.thplt
 Plotting on device 11, file = node2x.thplt

 **** VNI-HOOPS error in ac_Pause has severity 3.
 **** There was an unexpected Hoops internal error -
 **** Nothing to wait for - no events are enabled
 **** Traceback =======>
 ****             ac_Await_Event
 **** called from ac_Await_Event
 **** called from ac_Pause
 **** called from ac_plot
 **** called from ac_set

     SELECT AN OPT. YOU WISH TO EXECUTE...(1 thru 6)?

     1.CONVERT ACCELERATION FILE.
     2.PLOT TIME HISTORIES.
     3.PLOT RESPONSE SPECTRA.
     4.PLOT AMPLIFICATIONS/PSD FUNCTIONS.
     5.PLOT GENERAL X-Y GRAPHS.
     6.EXIT FROM THE PROGRAM.
6
     RUN OPTION   =    6
     IS THIS OPTION CORRECT................(Y/N) ?
y
```

NODE 8, X-DIRECTION ACCELERATION TIME HISTORY PLOT:

```
**************************************************
*                                                *
*      C A R E S P L O T     S Y S T E M         *
*                                                *
*                   (MODULE: SEISMIC)            *
*  --GENERAL PLOTTING PROGRAM FOR CARES SYSTEM-- *
*     PLOTTING OPTIONS:                          *
*    1.CONVERTS INPUT ACCELERATION TIME HISTORY  *
*       DATA FILE TO CARES FORMAT                *
*     2.PLOT TIME HISTORIES                      *
*     3.PLOT RESPONSE SPECTRA                    *
*     4.PLOT AMPLIFICATION/PSD FUNCTIONS         *
```

```
        *     5.PLOT GENERAL X-Y  GRAPHS                       *
        *     6.EXIT FROM CARES                                *
        ********************************************************

    SELECT AN OPT. YOU WISH TO EXECUTE...(1 thru 6)?

    1.CONVERT ACCELERATION FILE.
    2.PLOT TIME HISTORIES.
    3.PLOT RESPONSE SPECTRA.
    4.PLOT AMPLIFICATIONS/PSD FUNCTIONS.
    5.PLOT GENERAL X-Y GRAPHS.
    6.EXIT FROM THE PROGRAM.
2
    RUN OPTION    =    2
    IS THIS OPTION CORRECT................(Y/N) ?
y
        ********************************************************
        *                                                      *
        *            C A R E S      S Y S T E M                *
        *                                                      *
        *                 (MODULE: SEISMIC)                    *
        *                                                      *
        *                 TIME HISTORY PLOT                    *
        *                                                      *
        *             PLOT TIME HISTORIES FOR                  *
        *                  CARES SYSTEM.                       *
        *                                                      *
        ********************************************************


    ENTER TIME HISTORY TYPE #:
    ACCELERATION       1
    VELOCITY           2
    DISPLACEMENT       3
1

  INPUT TIME HISTORY IS FOR ACCELERATION (in/sec2)
    IS THIS CORRECT (Y/N)
y
    # OF TIME HISTORY CURVES TO BE PLOTTED (3 MAX)
1
    ENTER THE TIME HISTORY FILE NAME FOR CURVE 1
acc8.1ou
    FILE NAME FOR CURVE 1 = acc8.1ou
    IS THIS CORRECT (Y/N): ?
y
    MAXIMUM  VALUE OF TIME =     40.9400 sec
    MINIMUM  VALUE OF TIME =      0.0000 sec
    ENTER DESIRED MAX. TIME (sec)
40.0
    ENTER DESIRED MIN. TIME (sec)  :
0.0

    TIME AXIS FOR PLOT WILL HAVE:
```

```
     A MINIMUM VALUE OF  0.00 sec
     A MAXIMUM VALUE OF 40.00 sec

     IS THIS CORRECT (Y/N)
y
     INPUT INCREMENT FOR MAJOR TICK MARKS ON THE X AXIS (sec)
10.0
     INPUT INCREMENT FOR MINOR TICK MARKS ON THE X AXIS (sec)
5.0

     MAJOR TICK MARKS ARE AT 10.00 sec INTERVALS AND
     THERE ARE  2 MINOR TICK INTERVALS PER MAJOR TICK INTERVAL

     IS THIS CORRECT (Y/N)
y
     MAXIMUM  VALUE OF ACCELERATION =      0.7779 g
     MINIMUM  VALUE OF ACCELERATION =     -0.4747 g
     ENTER DESIRED MAX. ACCELERATION (g)
+0.80
     ENTER DESIRED MIN. ACCELERATION (g)
-0.80

     Y AXIS FOR PLOT WILL HAVE:
     A MINIMUM ACCELERATION OF     -0.8000 g
     A MAXIMUM ACCELERATION OF      0.8000 g

     IS THIS CORRECT (Y/N)
y
     INPUT INCREMENT FOR MAJOR TICK MARKS ON THE Y AXIS (g)
0.10
     INPUT INCREMENT FOR MINOR TICK MARKS ON THE Y AXIS (g)
0.05

     MAJOR TICK MARKS ARE AT 0.100 (g) INTERVALS AND
     THERE ARE  2 MINOR TICK INTERVALS PER MAJOR TICK INTERVAL

     IS THIS CORRECT (Y/N)
y

     ENTER THE PLOT TITLE (MAX 60 CHARACTERS)
NODE 8 (X-DIRECTION)

     TITLE FOR PLOT WILL BE:
     TIME HISTORY PLOT: NODE 8 (X-DIRECTION)
  IS THIS CORRECT (Y/N)
y

 Plotting on device 1

     SAVE PLOT TO A FILE (Y/N) ?
y
     FILE NAME TO SAVE PLOT
node8x.thplt
 Plotting on device 11, file = node8x.thplt

 **** VNI-HOOPS error in ac_Pause has severity 3.
 **** There was an unexpected Hoops internal error -
```

```
**** Nothing to wait for - no events are enabled
**** Traceback =======>
****                ac_Await_Event
**** called from ac_Await_Event
**** called from ac_Pause
**** called from ac_plot
**** called from ac_set

     SELECT AN OPT. YOU WISH TO EXECUTE...(1 thru 6)?

     1.CONVERT ACCELERATION FILE.
     2.PLOT TIME HISTORIES.
     3.PLOT RESPONSE SPECTRA.
     4.PLOT AMPLIFICATIONS/PSD FUNCTIONS.
     5.PLOT GENERAL X-Y GRAPHS.
     6.EXIT FROM THE PROGRAM.
6
     RUN OPTION   =    6
     IS THIS OPTION CORRECT...............(Y/N) ?
y
```

NODE 11, X-DIRECTION ACCELERATION TIME HISTORY PLOT:

```
        ************************************************
        *                                              *
        *      C A R E S P L O T      S Y S T E M      *
        *                                              *
        *                (MODULE: SEISMIC)             *
        *  --GENERAL PLOTTING PROGRAM FOR CARES SYSTEM--  *
        *     PLOTTING OPTIONS:                        *
        *    1.CONVERTS INPUT ACCELERATION TIME HISTORY *
        *       DATA FILE TO CARES FORMAT              *
        *     2.PLOT TIME HISTORIES                    *
        *     3.PLOT RESPONSE SPECTRA                  *
        *    4.PLOT AMPLIFICATION/PSD FUNCTIONS        *
        *     5.PLOT GENERAL X-Y  GRAPHS               *
        *     6.EXIT FROM CARES                        *
        ************************************************

     SELECT AN OPT. YOU WISH TO EXECUTE...(1 thru 6)?

     1.CONVERT ACCELERATION FILE.
     2.PLOT TIME HISTORIES.
     3.PLOT RESPONSE SPECTRA.
     4.PLOT AMPLIFICATIONS/PSD FUNCTIONS.
     5.PLOT GENERAL X-Y GRAPHS.
     6.EXIT FROM THE PROGRAM.
2
     RUN OPTION   =    2
     IS THIS OPTION CORRECT...............(Y/N) ?
y
        ************************************************
        *                                              *
        *           C A R E S     S Y S T E M          *
```

```
*                                                    *
*                (MODULE: SEISMIC)                   *
*                                                    *
*                TIME HISTORY PLOT                   *
*                                                    *
*           PLOT TIME HISTORIES FOR                  *
*                CARES SYSTEM.                       *
*                                                    *
******************************************************
```

```
     ENTER TIME HISTORY TYPE #:
     ACCELERATION        1
     VELOCITY            2
     DISPLACEMENT        3
1

   INPUT TIME HISTORY IS FOR ACCELERATION (in/sec2)
     IS THIS CORRECT (Y/N)
y
     # OF TIME HISTORY CURVES TO BE PLOTTED (3 MAX)
1
     ENTER THE TIME HISTORY FILE NAME FOR CURVE 1
acc11.1ou
     FILE NAME FOR CURVE 1 = acc11.1ou
     IS THIS CORRECT (Y/N): ?
y
     MAXIMUM  VALUE OF TIME =      40.9400 sec
     MINIMUM  VALUE OF TIME =       0.0000 sec
     ENTER DESIRED MAX. TIME (sec)
40
     ENTER DESIRED MIN. TIME (sec)  :
0.0

     TIME AXIS FOR PLOT WILL HAVE:
     A MINIMUM VALUE OF  0.00 sec
     A MAXIMUM VALUE OF 40.00 sec

     IS THIS CORRECT (Y/N)
y
     INPUT INCREMENT FOR MAJOR TICK MARKS ON THE X AXIS (sec)
10.0
     INPUT INCREMENT FOR MINOR TICK MARKS ON THE X AXIS (sec)
5.0

     MAJOR TICK MARKS ARE AT 10.00 sec INTERVALS AND
     THERE ARE  2 MINOR TICK INTERVALS PER MAJOR TICK INTERVAL

     IS THIS CORRECT (Y/N)
y
     MAXIMUM  VALUE OF ACCELERATION =      0.7779 g
     MINIMUM  VALUE OF ACCELERATION =     -0.4747 g
     ENTER DESIRED MAX. ACCELERATION (g)
+0.80
```

```
     ENTER DESIRED MIN. ACCELERATION (g)
-0.80

     Y AXIS FOR PLOT WILL HAVE:
     A MINIMUM ACCELERATION OF     -0.8000 g
     A MAXIMUM ACCELERATION OF      0.8000 g

     IS THIS CORRECT (Y/N)
y
     INPUT INCREMENT FOR MAJOR TICK MARKS ON THE Y AXIS (g)
0.10
     INPUT INCREMENT FOR MINOR TICK MARKS ON THE Y AXIS (g)
0.05

     MAJOR TICK MARKS ARE AT 0.100 (g) INTERVALS AND
     THERE ARE  2 MINOR TICK INTERVALS PER MAJOR TICK INTERVAL

     IS THIS CORRECT (Y/N)
y

     ENTER THE PLOT TITLE (MAX 60 CHARACTERS)
NODE 11 (X-DIRECTION)

     TITLE FOR PLOT WILL BE:
     TIME HISTORY PLOT: NODE 11 (X-DIRECTION)
  IS THIS CORRECT (Y/N)
y

 Plotting on device 1

     SAVE PLOT TO A FILE (Y/N) ?
y
     FILE NAME TO SAVE PLOT
node11x.thplt
 Plotting on device 11, file = node11x.thplt

 **** VNI-HOOPS error in ac_Pause has severity 3.
 **** There was an unexpected Hoops internal error -
 **** Nothing to wait for - no events are enabled
 **** Traceback =======>
 ****            ac_Await_Event
 **** called from ac_Await_Event
 **** called from ac_Pause
 **** called from ac_plot
 **** called from ac_set

     SELECT AN OPT. YOU WISH TO EXECUTE...(1 thru 6)?

     1.CONVERT ACCELERATION FILE.
     2.PLOT TIME HISTORIES.
     3.PLOT RESPONSE SPECTRA.
     4.PLOT AMPLIFICATIONS/PSD FUNCTIONS.
     5.PLOT GENERAL X-Y GRAPHS.
     6.EXIT FROM THE PROGRAM.
6
```

```
     RUN OPTION   =    6
     IS THIS OPTION CORRECT...............(Y/N) ?
y
```

NODE 2, X-DIRECTION SPECTRAL ACCELERATION PLOT:

```
          ************************************************
          *                                              *
          *      C A R E S P L O T     S Y S T E M       *
          *                                              *
          *                (MODULE: SEISMIC)             *
          *  --GENERAL PLOTTING PROGRAM FOR CARES SYSTEM-- *
          *     PLOTTING OPTIONS:                        *
          *    1.CONVERTS INPUT ACCELERATION TIME HISTORY *
          *       DATA FILE TO CARES FORMAT              *
          *     2.PLOT TIME HISTORIES                    *
          *     3.PLOT RESPONSE SPECTRA                  *
          *    4.PLOT AMPLIFICATION/PSD FUNCTIONS        *
          *     5.PLOT GENERAL X-Y  GRAPHS               *
          *     6.EXIT FROM CARES                        *
          ************************************************

     SELECT AN OPT. YOU WISH TO EXECUTE...(1 thru 6)?

     1.CONVERT ACCELERATION FILE.
     2.PLOT TIME HISTORIES.
     3.PLOT RESPONSE SPECTRA.
     4.PLOT AMPLIFICATIONS/PSD FUNCTIONS.
     5.PLOT GENERAL X-Y GRAPHS.
     6.EXIT FROM THE PROGRAM.
3
     RUN OPTION   =    3
     IS THIS OPTION CORRECT...............(Y/N) ?
y
          ************************************************
          *                                              *
          *          C A R E S     S Y S T E M           *
          *                                              *
          *                                              *
          *                                              *
          *            RESPONSE SPECTRA PLOT             *
          *                                              *
          *    PLOT RESPONSE SPECTRA FOR  CARES SYSTEM   *
          *                                              *
          ************************************************



     # OF RESPONSE SPECTRA TO BE PLOTTED....(MAX 6)   ?

1

     FOR CURVE #1
     INPUT FILE NAME FOR SPECTRUM PLOT :   ?
spec2.1ou
```

```
     RESPONSE SPECTRUM FILE NAME TO BE PLOTTED = spec2.1ou
     IS THIS CORRECT (Y/N): ?
y
     X-AXIS IS IN LOG SCALE WITH MAX VALUE = 100 cps
     Y-AXIS IS IN ARITHMETIC SCALE
     PEAK RESPONSE SPECTRAL ACCELERATION VALUE OF PLOT =   1.352 g
     INPUT THE MAXIMUM VALUE OF THE Y AXIS THAT YOU WANT (g)
3.0
     INPUT INCREMENT FOR MAJOR TICK MARKS ON THE Y AXIS (g)
1.0
     INPUT INCREMENT FOR MINOR TICK MARKS ON THE Y AXIS (g)
0.2

     MAJOR TICK MARKS ARE AT 1.000 g INTERVALS AND
     THERE ARE  5 MINOR TICK INTERVALS PER MAJOR TICK INTERVAL

     IS THIS CORRECT (Y/N)
y
     ENTER THE PLOT TITLE (MAX 60 CHARACTERS)
NODE 2 (X-DIRECTION)

     TITLE FOR PLOT WILL BE:
     RESPONSE SPECTRA: NODE 2  (X-DIRECTION)
     IS THIS CORRECT (Y/N)
y

     ENTER LABEL FOR 1st DATA SET USING LESS THAN 10 CHARACTERS
node 2

     LABEL FOR CURVE 1: node 2
     IS THIS CORRECT (Y/N)
y

 Plotting on device 1

     SAVE PLOT TO A FILE (Y/N) ?
y
     FILE NAME TO SAVE PLOT
node2x.spplt

 Plotting on device 11, file = node2x.spplt

 **** VNI-HOOPS error in ac_Pause has severity 3.
 **** There was an unexpected Hoops internal error -
 **** Nothing to wait for - no events are enabled
 **** Traceback =======>
 ****              ac_Await_Event
 **** called from ac_Await_Event
 **** called from ac_Pause
 **** called from ac_plot
 **** called from ac_set

     SELECT AN OPT. YOU WISH TO EXECUTE...(1 thru 6)?

     1.CONVERT ACCELERATION FILE.
     2.PLOT TIME HISTORIES.
     3.PLOT RESPONSE SPECTRA.
```

```
     4.PLOT AMPLIFICATIONS/PSD FUNCTIONS.
     5.PLOT GENERAL X-Y GRAPHS.
     6.EXIT FROM THE PROGRAM.
6
     RUN OPTION    =    6

     IS THIS OPTION CORRECT................(Y/N) ?
Y
```

NODE 8, X-DIRECTION SPECTRAL ACCELERATION PLOT:

```
       ***********************************************
       *                                             *
       *     C A R E S P L O T       S Y S T E M     *
       *                                             *
       *                (MODULE: SEISMIC)            *
       *  --GENERAL PLOTTING PROGRAM FOR CARES SYSTEM-- *
       *     PLOTTING OPTIONS:                       *
       *    1.CONVERTS INPUT ACCELERATION TIME HISTORY *
       *       DATA FILE TO CARES FORMAT             *
       *     2.PLOT TIME HISTORIES                   *
       *     3.PLOT RESPONSE SPECTRA                 *
       *     4.PLOT AMPLIFICATION/PSD FUNCTIONS      *
       *     5.PLOT GENERAL X-Y  GRAPHS              *
       *     6.EXIT FROM CARES                       *
       ***********************************************

     SELECT AN OPT. YOU WISH TO EXECUTE...(1 thru 6)?

     1.CONVERT ACCELERATION FILE.
     2.PLOT TIME HISTORIES.
     3.PLOT RESPONSE SPECTRA.
     4.PLOT AMPLIFICATIONS/PSD FUNCTIONS.
     5.PLOT GENERAL X-Y GRAPHS.
     6.EXIT FROM THE PROGRAM.
3
     RUN OPTION    =    3
     IS THIS OPTION CORRECT................(Y/N) ?
Y
       ***********************************************
       *                                             *
       *         C A R E S       S Y S T E M         *
       *                                             *
       *                                             *
       *                                             *
       *            RESPONSE SPECTRA PLOT            *
       *                                             *
       *   PLOT RESPONSE SPECTRA FOR  CARES SYSTEM    *
       *                                             *
       ***********************************************


     # OF RESPONSE SPECTRA TO BE PLOTTED....(MAX 6)   ?
```

```
1
     FOR CURVE #1
     INPUT FILE NAME FOR SPECTRUM PLOT :   ?
spec8.1ou
     RESPONSE SPECTRUM FILE NAME TO BE PLOTTED = spec8.1ou
     IS THIS CORRECT (Y/N) : ?
y
     X-AXIS IS IN LOG SCALE WITH MAX VALUE = 100 cps
     Y-AXIS IS IN ARITHMETIC SCALE
     PEAK RESPONSE SPECTRAL ACCELERATION VALUE OF PLOT =   2.411 g
     INPUT THE MAXIMUM VALUE OF THE Y AXIS THAT YOU WANT (g)
3.0
     INPUT INCREMENT FOR MAJOR TICK MARKS ON THE Y AXIS (g)
1.0
     INPUT INCREMENT FOR MINOR TICK MARKS ON THE Y AXIS (g)
0.2

     MAJOR TICK MARKS ARE AT 1.000 g INTERVALS AND
     THERE ARE  5 MINOR TICK INTERVALS PER MAJOR TICK INTERVAL

     IS THIS CORRECT (Y/N)
y
     ENTER THE PLOT TITLE (MAX 60 CHARACTERS)
NODE 8 (X-DIRECTION)

     TITLE FOR PLOT WILL BE:
     RESPONSE SPECTRA: NODE 8  (X-DIRECTION)
     IS THIS CORRECT (Y/N)
y

     ENTER LABEL FOR 1st DATA SET USING LESS THAN 10 CHARACTERS
node 8

     LABEL FOR CURVE 1: node 8
     IS THIS CORRECT (Y/N)
y

 Plotting on device 1

     SAVE PLOT TO A FILE (Y/N) ?
y
     FILE NAME TO SAVE PLOT
node8x.spplt

 Plotting on device 11, file = node8x.spplt

 **** VNI-HOOPS error in ac_Pause has severity 3.
 **** There was an unexpected Hoops internal error -
 **** Nothing to wait for - no events are enabled
 **** Traceback =======>
 ****              ac_Await_Event
 **** called from ac_Await_Event
 **** called from ac_Pause
 **** called from ac_plot
 **** called from ac_set
```

```
     SELECT AN OPT. YOU WISH TO EXECUTE...(1 thru 6)?

     1.CONVERT ACCELERATION FILE.
     2.PLOT TIME HISTORIES.
     3.PLOT RESPONSE SPECTRA.
     4.PLOT AMPLIFICATIONS/PSD FUNCTIONS.
     5.PLOT GENERAL X-Y GRAPHS.
     6.EXIT FROM THE PROGRAM.
6
     RUN OPTION    =    6
     IS THIS OPTION CORRECT................(Y/N) ?
y
```

NODE 11, X-DIRECTION SPECTRAL ACCELERATION PLOT:

```
       ************************************************
       *                                              *
       *      C A R E S P L O T      S Y S T E M      *
       *                                              *
       *                (MODULE: SEISMIC)             *
       *  --GENERAL PLOTTING PROGRAM FOR CARES SYSTEM-- *
       *     PLOTTING OPTIONS:                        *
       *    1.CONVERTS INPUT ACCELERATION TIME HISTORY *
       *       DATA FILE TO CARES FORMAT              *
       *     2.PLOT TIME HISTORIES                    *
       *     3.PLOT RESPONSE SPECTRA                  *
       *    4.PLOT AMPLIFICATION/PSD FUNCTIONS        *
       *     5.PLOT GENERAL X-Y  GRAPHS               *
       *     6.EXIT FROM CARES                        *
       ************************************************

     SELECT AN OPT. YOU WISH TO EXECUTE...(1 thru 6)?

     1.CONVERT ACCELERATION FILE.
     2.PLOT TIME HISTORIES.
     3.PLOT RESPONSE SPECTRA.
     4.PLOT AMPLIFICATIONS/PSD FUNCTIONS.
     5.PLOT GENERAL X-Y GRAPHS.
     6.EXIT FROM THE PROGRAM.
3
     RUN OPTION    =    3
     IS THIS OPTION CORRECT................(Y/N) ?
y
       ************************************************
       *                                              *
       *         C A R E S       S Y S T E M          *
       *                                              *
       *                                              *
       *                                              *
       *            RESPONSE SPECTRA PLOT             *
       *                                              *
       *    PLOT RESPONSE SPECTRA FOR  CARES SYSTEM   *
       *                                              *
       ************************************************
```

```
     # OF RESPONSE SPECTRA TO BE PLOTTED....(MAX 6)   ?

1

     FOR CURVE #1
     INPUT FILE NAME FOR SPECTRUM PLOT :   ?
spec11.1ou
     RESPONSE SPECTRUM FILE NAME TO BE PLOTTED = spec11.1ou
     IS THIS CORRECT (Y/N): ?
y
     X-AXIS IS IN LOG SCALE WITH MAX VALUE = 100 cps
     Y-AXIS IS IN ARITHMETIC SCALE
     PEAK RESPONSE SPECTRAL ACCELERATION VALUE OF PLOT =  2.411 g
     INPUT THE MAXIMUM VALUE OF THE Y AXIS THAT YOU WANT (g)
3.0
     INPUT INCREMENT FOR MAJOR TICK MARKS ON THE Y AXIS (g)
1.0
     INPUT INCREMENT FOR MINOR TICK MARKS ON THE Y AXIS (g)
0.2

     MAJOR TICK MARKS ARE AT 1.000 g INTERVALS AND
     THERE ARE  5 MINOR TICK INTERVALS PER MAJOR TICK INTERVAL

     IS THIS CORRECT (Y/N)
y
     ENTER THE PLOT TITLE (MAX 60 CHARACTERS)
NODE 11 (X-DIRECTION)

     TITLE FOR PLOT WILL BE:
     RESPONSE SPECTRA: NODE 11 (X-DIRECTION)
     IS THIS CORRECT (Y/N)
y

     ENTER LABEL FOR 1st DATA SET USING LESS THAN 10 CHARACTERS
node 11

     LABEL FOR CURVE 1: node 11
     IS THIS CORRECT (Y/N)
y

 Plotting on device 1

     SAVE PLOT TO A FILE (Y/N) ?
y
     FILE NAME TO SAVE PLOT
node11x.spplt

 Plotting on device 11, file = node11x.spplt

 **** VNI-HOOPS error in ac_Pause has severity 3.
 **** There was an unexpected Hoops internal error -
 **** Nothing to wait for - no events are enabled
 **** Traceback =======>
 ****              ac_Await_Event
 **** called from ac_Await_Event
```

```
 **** called from ac_Pause
 **** called from ac_plot
 **** called from ac_set

     SELECT AN OPT. YOU WISH TO EXECUTE...(1 thru 6)?

     1.CONVERT ACCELERATION FILE.
     2.PLOT TIME HISTORIES.
     3.PLOT RESPONSE SPECTRA.
     4.PLOT AMPLIFICATIONS/PSD FUNCTIONS.
     5.PLOT GENERAL X-Y GRAPHS.
     6.EXIT FROM THE PROGRAM.
6
     RUN OPTION    =   6
     IS THIS OPTION CORRECT................(Y/N) ?
y
```

EXAMPLE 2. CARES.SOIL.ANALYSIS #2: GENERATE TIME HISTORY TO FIT TARGET RESPONSE SPECTRUM

```
***********************************************
***********************************************
*****           C A R E S (SOIL)          *****
***********************************************
***********************************************
* ANALYSIS #                                  *
*                                             *
* 1. CONVERTS INPUT ACCELERATION TIME HISTORY *
*    DATA FILE TO CARES FORMAT                *
*                                             *
* 2. GENERATES ACCELEROGRAM TO MATCH A GIVEN  *
*    TARGET RESPONSE SPECTRUM                 *
*                                             *
* 3. GENERATES FOURIER COMPONENTS FOR GIVEN   *
*   ACCELEROGRAM; USED AS INPUT TO SOIL COLUMN *
*    AND SSI ANALYSIS                         *
*                                             *
* 4. PERFORMS CONVOLUTION ANALYSIS OF A GIVEN *
*    SOIL COLUMN TO ACCELEROGRAM DEFINED IN   *
*    TERMS OF ITS FOURIER COMPONENTS          *
*                                             *
* 5. GENERATES TIME HISTORY OF ACCELEROGRAM   *
*    FOR A GIVEN FOURIER COMPONENT FILE       *
*                                             *
* 6. GENERATES ACCELERATION RESPONSE SPECTRUM *
*    FOR A GIVEN ACCELERATION TIME HISTORY    *
*                                             *
* 7. GENERATES POWER SPECTRAL DENSITY FUNCTION *
*    FOR A GIVEN FOURIER COMPONENT FILE       *
*                                             *
* 8. EXIT FROM CARES.SOIL                     *
***********************************************

     INPUT ITEM  FOR THE ANALYSIS..(1,2,3,4,5,6,7 or 8) ?
2
     ANALYSIS #  =   2

     IS THIS CORRECT (Y/N)
y

     SEISMOTION: ACCELERATION TIME HISTORY FOR A GIVEN SPECTRA

     DOES AN INPUT FILE FOR THE
     CARES MOTION PROGRAM EXIST (Y/N) ?
n
          INPUT INFORMATION:
```

```
     NAME OF THE INPUT FILE TO BE FORMED
motion.in
     TITLE FOR INPUT FILE(A80):  ?
GENERATE MOTION FROM TARGET RESPONSE SPECTRUM USING RANDOM PHASING


          INPUT FILE NAME         : motion.in
          TITLE                 : GENERATE MOTION FROM TARGET RESPONSE SPECTRUM
USING RANDOM PHASING

     IS THIS CORRECT (Y/N)...?
y
     OUTPUT SPECTRA FILE NAME (A20)............?
motion.sp
     OUTPUT ACC TIME HISTORY FILE NAME.........?
motion.acc
     OUTPUT VEL TIME HISTORY FILE NAME.........?
motion.vel
     OUTPUT DISPL TIME HISTORY FILE NAME.......?
motion.displ

     TITLE CARD:  GENERATE MOTION FROM TARGET RESPONSE SPECTRUM USING RANDOM P
          SPECTRA      FILE NAME : motion.sp
          ACCELERATION FILE NAME : motion.acc
          VELOCITY     FILE NAME : motion.vel
          DISPLACEMNT  FILE NAME : motion.displ

     IS THIS CORRECT (Y/N)...?
y

     NO. OF SPECTRA POINTS (LE.100)... ?
21
     TARGET SPECTRAL POINT   1
          FREQUENCY (HZ) ......?
0.13
          SPECTRAL VALUE (Gs)...?
0.006

   AT TARGET POINT  1
      FREQUENCY =                 0.1300 cps
      SPECTRAL ACCELERATION =     0.0060 g

   IS THIS DATA CORRECT (Y/N)...?

      TARGET SPECTRAL POINT   2
          FREQUENCY (HZ) ......?
0.2
          SPECTRAL VALUE (Gs)...?
0.012

   AT TARGET POINT  2
      FREQUENCY =                 0.2000 cps
      SPECTRAL ACCELERATION =     0.0120 g
```

```
  IS THIS DATA CORRECT (Y/N)...?
y
     TARGET SPECTRAL POINT   3
          FREQUENCY (HZ) ......?
0.25
          SPECTRAL VALUE (Gs)...?
0.016

  AT TARGET POINT  3
     FREQUENCY =                 0.2500 cps
     SPECTRAL ACCELERATION =   0.0160 g

  IS THIS DATA CORRECT (Y/N)...?
y
     TARGET SPECTRAL POINT   4
          FREQUENCY (HZ) ......?
0.33
          SPECTRAL VALUE (Gs)...?
0.025

  AT TARGET POINT  4
     FREQUENCY =                 0.3300 cps
     SPECTRAL ACCELERATION =   0.0250 g

  IS THIS DATA CORRECT (Y/N)...?
y
     TARGET SPECTRAL POINT   5
          FREQUENCY (HZ) ......?
0.50
          SPECTRAL VALUE (Gs)...?
0.042

  AT TARGET POINT  5
     FREQUENCY =                 0.5000 cps
     SPECTRAL ACCELERATION =   0.0420 g

  IS THIS DATA CORRECT (Y/N)...?
y
     TARGET SPECTRAL POINT   6
          FREQUENCY (HZ) ......?
0.67
          SPECTRAL VALUE (Gs)...?
0.058

  AT TARGET POINT  6
     FREQUENCY =                 0.6700 cps
     SPECTRAL ACCELERATION =   0.0580 g

  IS THIS DATA CORRECT (Y/N)...?
y
     TARGET SPECTRAL POINT   7
          FREQUENCY (HZ) ......?
1.00
          SPECTRAL VALUE (Gs)...?
0.088
```

```
  AT TARGET POINT  7
     FREQUENCY =                 1.0000 cps
     SPECTRAL ACCELERATION =   0.0880 g

  IS THIS DATA CORRECT (Y/N)...?
y
     TARGET SPECTRAL POINT   8
          FREQUENCY (HZ) ......?
1.33
          SPECTRAL VALUE (Gs)...?
0.111

  AT TARGET POINT  8
     FREQUENCY =                 1.3300 cps
     SPECTRAL ACCELERATION =   0.1110 g

  IS THIS DATA CORRECT (Y/N)...?
y
     TARGET SPECTRAL POINT   9
          FREQUENCY (HZ) ......?
2.00
          SPECTRAL VALUE (Gs)...?
0.151

  AT TARGET POINT  9
     FREQUENCY =                 2.0000 cps
     SPECTRAL ACCELERATION =   0.1510 g

  IS THIS DATA CORRECT (Y/N)...?
y
     TARGET SPECTRAL POINT  10
          FREQUENCY (HZ) ......?
2.50
          SPECTRAL VALUE (Gs)...?
0.173

  AT TARGET POINT 10
     FREQUENCY =                 2.5000 cps
     SPECTRAL ACCELERATION =   0.1730 g

  IS THIS DATA CORRECT (Y/N)...?
y
     TARGET SPECTRAL POINT  11
          FREQUENCY (HZ) ......?
3.33
          SPECTRAL VALUE (Gs)...?
0.193

  AT TARGET POINT 11
     FREQUENCY =                 3.3300 cps
     SPECTRAL ACCELERATION =   0.1930 g

  IS THIS DATA CORRECT (Y/N)...?
y
     TARGET SPECTRAL POINT  12
          FREQUENCY (HZ) ......?
4.17
```

```
          SPECTRAL VALUE (Gs)...?
0.199

  AT TARGET POINT 12
     FREQUENCY =                 4.1700 cps
     SPECTRAL ACCELERATION =  0.1990 g

  IS THIS DATA CORRECT (Y/N)...?
y
     TARGET SPECTRAL POINT  13
          FREQUENCY (HZ) ......?
5.00
          SPECTRAL VALUE (Gs)...?
0.198

  AT TARGET POINT 13
     FREQUENCY =                 5.0000 cps
     SPECTRAL ACCELERATION =  0.1980 g

  IS THIS DATA CORRECT (Y/N)...?
y
     TARGET SPECTRAL POINT  14
          FREQUENCY (HZ) ......?
5.88
          SPECTRAL VALUE (Gs)...?
0.192

  AT TARGET POINT 14
     FREQUENCY =                 5.8800 cps
     SPECTRAL ACCELERATION =  0.1920 g

  IS THIS DATA CORRECT (Y/N)...?
y
     TARGET SPECTRAL POINT  15
          FREQUENCY (HZ) ......?
6.67
          SPECTRAL VALUE (Gs)...?
0.186

  AT TARGET POINT 15
     FREQUENCY =                 6.6700 cps
     SPECTRAL ACCELERATION =  0.1860 g

  IS THIS DATA CORRECT (Y/N)...?
y
     TARGET SPECTRAL POINT  16
          FREQUENCY (HZ) ......?
7.14
          SPECTRAL VALUE (Gs)...?
0.180

  AT TARGET POINT 16
     FREQUENCY =                 7.1400 cps
     SPECTRAL ACCELERATION =  0.1800 g

  IS THIS DATA CORRECT (Y/N)...?
y
```

```
     TARGET SPECTRAL POINT  17
          FREQUENCY (HZ) ......?
8.33
          SPECTRAL VALUE (Gs)...?
0.165

  AT TARGET POINT 17
     FREQUENCY =                 8.3300 cps
     SPECTRAL ACCELERATION =   0.1650 g

  IS THIS DATA CORRECT (Y/N)...?
Y
     TARGET SPECTRAL POINT  18
          FREQUENCY (HZ) ......?
10.00
          SPECTRAL VALUE (Gs)...?
0.147

  AT TARGET POINT 18
     FREQUENCY =                10.0000 cps
     SPECTRAL ACCELERATION =   0.1470 g

  IS THIS DATA CORRECT (Y/N)...?
Y
     TARGET SPECTRAL POINT  19
          FREQUENCY (HZ) ......?
11.11
          SPECTRAL VALUE (Gs)...?
0.137

  AT TARGET POINT 19
     FREQUENCY =                11.1100 cps
     SPECTRAL ACCELERATION =   0.1370 g

  IS THIS DATA CORRECT (Y/N)...?
Y
     TARGET SPECTRAL POINT  20
          FREQUENCY (HZ) ......?
14.29
          SPECTRAL VALUE (Gs)...?
0.116

  AT TARGET POINT 20
     FREQUENCY =                14.2900 cps
     SPECTRAL ACCELERATION =   0.1160 g

  IS THIS DATA CORRECT (Y/N)...?
Y
     TARGET SPECTRAL POINT  21
          FREQUENCY (HZ) ......?
20.00
          SPECTRAL VALUE (Gs)...?
0.095

  AT TARGET POINT 21
     FREQUENCY =                20.0000 cps
     SPECTRAL ACCELERATION =   0.0950 g
```

```
  IS THIS DATA CORRECT (Y/N)...?
y
     PEAK ACCELERATION (Gs)..............?
0.085

  PEAK ACCELERATION =   0.0850 g

  IS THIS VALUE CORRECT (Y/N)...?
y

     EARTHQUAKE MAGNITUDE (FOR DURATION)..?
7.0
     EARTHQUE MAGNITUDE                =   7.00
     RISE TIME  (SEC)                  =   2.24
     STRONG MOTION DURATION (SEC)      =   9.74
     DECAY TIME  (SEC)                 =   6.71
     MINIMUM DURATION TIME  (SEC)      =  18.68


     ARE THESE PARAMETERS ACCEPTABLE (Y/N) ?

y
     DURATION TIME DESIRED (secs)..?
20.48
     M VALUE (# RECORDS = 2**M, M < 14)...?
11
     DAMPING VALUE (%)...................?
5.00
     NUMBER OF ITERATIONS (MINIMUM= 5)....?
10

     MAXIMUM DURATION TIME               =  20.48 sec
     NUMBER OF TIME HISTORY RECORDS   =   2048
     TARGET RESPONSE SPECTRUM DAMPING =   5.00 %
     NUMBER OF ITERATIONS (5 min)     =     10

     ARE THESE VALUES CORRECT (Y/N)
y

     METHOD USED TO GENERATED PHASE ANGLES:
     IF RANDOM  NUMBERS ARE USED TO GENERATE PHASE ANGLES       INPUT 1
     IF FOURIER COMPONENTS OF AN ACTUAL EARTHQUAKE ARE USED     INPUT 2
     IF A TIME HISTORY OF AN ACTUAL EARTHQUAKE IS USED          INPUT 3
     (FILES ARE ASSUMED TO BE IN CARES FORMAT)
1

  PHASE ANGLES ARE RANDOMLY GENERATED

     IS THIS CORRECT (Y/N)
y

     DO YOU WANT TO APPLY REG GUIDE CRITERIA TO THE
     GENERATED MOTION (Y/N)
       A) MAXIMUM OF 5 POINTS BELOW THE TARGET
       B) NO POINT LESS THAN 90% OF THE TARGET
n
```

REG GUIDE CRITERIA **WILL NOT BE APPLIED** TO THE GENERATED MOTION

IS THIS CORRECT (Y/N)

y

CHECK INPUT DATA:

NUMBER OF SPECTRA POINTS = 21

I	FREQ	SA
1	0.130	0.0060
2	0.200	0.0120
3	0.250	0.0160
4	0.330	0.0250
5	0.500	0.0420
6	0.670	0.0580
7	1.000	0.0880
8	1.330	0.1110
9	2.000	0.1510
10	2.500	0.1730
11	3.330	0.1930
12	4.170	0.1990
13	5.000	0.1980
14	5.880	0.1920
15	6.670	0.1860
16	7.140	0.1800
17	8.330	0.1650
18	10.000	0.1470
19	11.110	0.1370
20	14.290	0.1160
21	20.000	0.0950

```
PEAK ACCELERATION (Gs) =     0.085
EARTHQUAKE MAGNITUDE   =     7.000
DAMPING            (%) =     5.000
TIME INCREMENT  (Secs) =     0.010
NUMBER OF RECORDS      =      2048
NUMBER OF ITERATIONS   =        10
MAX   DURATION  (Secs) =    20.480
PULSE DURATION  (Secs) =    18.680
RISE   TIME     (Secs) =     2.238
STRONG MOTION   (Secs) =     9.737
DECAY  TIME     (Secs) =     6.706
```

PHASE ANGLES ARE RANDOMLY GENERATED

REG GUIDE CRITERIA **WILL NOT BE APPLIED** TO THE GENERATED MOTION

IS DATA CORRECT (Y/N)...?

y

DO YOU WANT TO ENTER AN INITIAL SEED # (Y/N)

n

NSEC= 52501

```
ITERATION # =   1

    NO. OF RECORDS IN DURATION TIME       =          1869
    RESIDUAL VELOCITY AT T DURATION       =        -2.263 in/sec
    NO. OF ADDITIONAL RECORDS ADDED       =             7
    TOTAL NO. OF RECORDS                  =          1876
    MAX. NO. OF RECORDS ALLOWED           =          8400
    ZEROED OUT FINAL VELOCITY             =         0.000 in/sec
    AT TIME                               =        18.750 sec


    RECORDS INPUT TO SPECTRA              =          2048
    MAXIMUM ACCELERATION    (in/sec**2) =      -0.332E+04
    MAXIMUM DISPLACEMENT     (in)        =      0.144E+02
    TIME INCREMENT OF DATA   (sec)       =         0.0100
    RESIDUAL VELOCITY        (in/sec)    =     -0.978E-05
    DAMPING RATIO FOR SPEC                =         0.050


    FINAL VELOCITY                        =          0.00 in/sec
    NO. OF ADDITIONAL RECORDS ADDED       =             0
    TOTAL NO. OF RECORDS FOR SPECTRA      =          2048
    MAX. NO. OF RECORDS ALLOWED           =          8400

ITERATION # =   2

    NO. OF RECORDS IN DURATION TIME       =          1869
    RESIDUAL VELOCITY AT T DURATION       =        -0.037 in/sec
    NO. OF ADDITIONAL RECORDS ADDED       =            11
    TOTAL NO. OF RECORDS                  =          1880
    MAX. NO. OF RECORDS ALLOWED           =          8400
    ZEROED OUT FINAL VELOCITY             =         0.000 in/sec
    AT TIME                               =        18.790 sec


    RECORDS INPUT TO SPECTRA              =          2048
    MAXIMUM ACCELERATION    (in/sec**2) =      -0.361E+02
    MAXIMUM DISPLACEMENT     (in)        =      0.734E+00
    TIME INCREMENT OF DATA   (sec)       =         0.0100
    RESIDUAL VELOCITY        (in/sec)    =     -0.432E-06
    DAMPING RATIO FOR SPEC                =         0.050


    FINAL VELOCITY                        =          0.00 in/sec
    NO. OF ADDITIONAL RECORDS ADDED       =             0
    TOTAL NO. OF RECORDS FOR SPECTRA      =          2048
    MAX. NO. OF RECORDS ALLOWED           =          8400

ITERATION # =   3

    NO. OF RECORDS IN DURATION TIME       =          1869
    RESIDUAL VELOCITY AT T DURATION       =        -0.043 in/sec
    NO. OF ADDITIONAL RECORDS ADDED       =            13
    TOTAL NO. OF RECORDS                  =          1882
    MAX. NO. OF RECORDS ALLOWED           =          8400
```

```
    ZEROED OUT FINAL VELOCITY                    =           0.000 in/sec
    AT TIME                                     =          18.810 sec


    RECORDS INPUT TO SPECTRA                     =          2048
    MAXIMUM ACCELERATION      (in/sec**2) =     -0.343E+02
    MAXIMUM DISPLACEMENT       (in)           =      0.122E+01
    TIME INCREMENT OF DATA     (sec)          =         0.0100
    RESIDUAL VELOCITY         (in/sec)        =     -0.279E-06
    DAMPING RATIO FOR SPEC                     =          0.050


    FINAL VELOCITY                              =            0.00 in/sec
    NO. OF ADDITIONAL RECORDS ADDED              =             0
    TOTAL NO. OF RECORDS FOR SPECTRA             =          2048
    MAX. NO. OF RECORDS ALLOWED                  =          8400

ITERATION # =    4

    NO. OF RECORDS IN DURATION TIME              =          1869
    RESIDUAL VELOCITY AT T DURATION              =        -0.069 in/sec
    NO. OF ADDITIONAL RECORDS ADDED              =            21
    TOTAL NO. OF RECORDS                         =          1890
    MAX. NO. OF RECORDS ALLOWED                  =          8400
    ZEROED OUT FINAL VELOCITY                    =         0.000 in/sec
    AT TIME                                     =        18.890 sec


    RECORDS INPUT TO SPECTRA                     =          2048
    MAXIMUM ACCELERATION      (in/sec**2) =     -0.336E+02
    MAXIMUM DISPLACEMENT       (in)           =      0.131E+01
    TIME INCREMENT OF DATA     (sec)          =         0.0100
    RESIDUAL VELOCITY         (in/sec)        =     -0.298E-06
    DAMPING RATIO FOR SPEC                     =          0.050


    FINAL VELOCITY                              =            0.00 in/sec
    NO. OF ADDITIONAL RECORDS ADDED              =             0
    TOTAL NO. OF RECORDS FOR SPECTRA             =          2048
    MAX. NO. OF RECORDS ALLOWED                  =          8400

ITERATION # =    5

    NO. OF RECORDS IN DURATION TIME              =          1869
    RESIDUAL VELOCITY AT T DURATION              =        -0.114 in/sec
    NO. OF ADDITIONAL RECORDS ADDED              =            35
    TOTAL NO. OF RECORDS                         =          1904
    MAX. NO. OF RECORDS ALLOWED                  =          8400
    ZEROED OUT FINAL VELOCITY                    =         0.000 in/sec
    AT TIME                                     =        19.030 sec

    RECORDS INPUT TO SPECTRA                     =          2048
    MAXIMUM ACCELERATION      (in/sec**2) =     -0.336E+02
    MAXIMUM DISPLACEMENT       (in)           =      0.127E+01
```

```
    TIME INCREMENT OF DATA   (sec)        =          0.0100
    RESIDUAL VELOCITY       (in/sec)      =      -0.499E-06
    DAMPING RATIO FOR SPEC                =           0.050


    FINAL VELOCITY                        =            0.00 in/sec
    NO. OF ADDITIONAL RECORDS ADDED        =              0
    TOTAL NO. OF RECORDS FOR SPECTRA       =           2048
    MAX. NO. OF RECORDS ALLOWED            =           8400

ITERATION # =   6

    NO. OF RECORDS IN DURATION TIME        =           1869
    RESIDUAL VELOCITY AT T DURATION        =         -0.198 in/sec
    NO. OF ADDITIONAL RECORDS ADDED        =             59
    TOTAL NO. OF RECORDS                  =            1928
    MAX. NO. OF RECORDS ALLOWED            =           8400
    ZEROED OUT FINAL VELOCITY              =          0.000 in/sec
    AT TIME                               =          19.270 sec


    RECORDS INPUT TO SPECTRA               =           2048
    MAXIMUM ACCELERATION    (in/sec**2) =      -0.337E+02
    MAXIMUM DISPLACEMENT     (in)         =      -0.107E+01
    TIME INCREMENT OF DATA   (sec)        =          0.0100
    RESIDUAL VELOCITY       (in/sec)      =       0.596E-07
    DAMPING RATIO FOR SPEC                =           0.050


    FINAL VELOCITY                        =            0.00 in/sec
    NO. OF ADDITIONAL RECORDS ADDED        =              0
    TOTAL NO. OF RECORDS FOR SPECTRA       =           2048
    MAX. NO. OF RECORDS ALLOWED            =           8400

ITERATION # =   7

    NO. OF RECORDS IN DURATION TIME        =           1869
    RESIDUAL VELOCITY AT T DURATION        =         -0.399 in/sec
    NO. OF ADDITIONAL RECORDS ADDED        =            119
    TOTAL NO. OF RECORDS                  =            1988
    MAX. NO. OF RECORDS ALLOWED            =           8400
    ZEROED OUT FINAL VELOCITY              =          0.000 in/sec
    AT TIME                               =          19.870 sec

    RECORDS INPUT TO SPECTRA               =           2048
    MAXIMUM ACCELERATION    (in/sec**2) =      -0.336E+02
    MAXIMUM DISPLACEMENT     (in)         =      -0.169E+01
    TIME INCREMENT OF DATA   (sec)        =          0.0100
    RESIDUAL VELOCITY       (in/sec)      =      -0.447E-06
    DAMPING RATIO FOR SPEC                =           0.050
```

```
    FINAL VELOCITY                              =          0.00 in/sec
    NO. OF ADDITIONAL RECORDS ADDED              =          0
    TOTAL NO. OF RECORDS FOR SPECTRA             =       2048
    MAX. NO. OF RECORDS ALLOWED                  =       8400

ITERATION # =   8

    NO. OF RECORDS IN DURATION TIME              =       1869
    RESIDUAL VELOCITY AT T DURATION              =     -0.630 in/sec
    NO. OF ADDITIONAL RECORDS ADDED              =        189
    TOTAL NO. OF RECORDS                         =       2058
    MAX. NO. OF RECORDS ALLOWED                  =       8400
    ZEROED OUT FINAL VELOCITY                    =      0.000 in/sec
    AT TIME                                      =     20.570 sec


    RECORDS INPUT TO SPECTRA                     =       2048
    MAXIMUM ACCELERATION     (in/sec**2) =     -0.333E+02
    MAXIMUM DISPLACEMENT      (in)           =     -0.242E+01
    TIME INCREMENT OF DATA    (sec)          =         0.0100
    RESIDUAL VELOCITY        (in/sec)        =     -0.333E-01
    DAMPING RATIO FOR SPEC                   =          0.050


    FINAL VELOCITY                              =         -0.03 in/sec
    NO. OF ADDITIONAL RECORDS ADDED              =          9
    TOTAL NO. OF RECORDS FOR SPECTRA             =       2057
    MAX. NO. OF RECORDS ALLOWED                  =       8400

ITERATION # =   9

    NO. OF RECORDS IN DURATION TIME              =       1869
    RESIDUAL VELOCITY AT T DURATION              =     -0.590 in/sec
    NO. OF ADDITIONAL RECORDS ADDED              =        181
    TOTAL NO. OF RECORDS                         =       2050
    MAX. NO. OF RECORDS ALLOWED                  =       8400
    ZEROED OUT FINAL VELOCITY                    =      0.000 in/sec
    AT TIME                                      =     20.490 sec


    RECORDS INPUT TO SPECTRA                     =       2048
    MAXIMUM ACCELERATION     (in/sec**2) =     -0.327E+02
    MAXIMUM DISPLACEMENT      (in)           =     -0.231E+01
    TIME INCREMENT OF DATA    (sec)          =         0.0100
    RESIDUAL VELOCITY        (in/sec)        =     -0.652E-02
    DAMPING RATIO FOR SPEC                   =          0.050


    FINAL VELOCITY                              =         -0.01 in/sec
    NO. OF ADDITIONAL RECORDS ADDED              =          1
    TOTAL NO. OF RECORDS FOR SPECTRA             =       2049
    MAX. NO. OF RECORDS ALLOWED                  =       8400
```

```
ITERATION # =   10

    NO. OF RECORDS IN DURATION TIME       =         1869
    RESIDUAL VELOCITY AT T DURATION       =       -0.555 in/sec
    NO. OF ADDITIONAL RECORDS ADDED       =          170
    TOTAL NO. OF RECORDS                  =         2039
    MAX. NO. OF RECORDS ALLOWED           =         8400
    ZEROED OUT FINAL VELOCITY             =        0.000 in/sec
    AT TIME                               =       20.380 sec


    RECORDS INPUT TO SPECTRA              =         2048
    MAXIMUM ACCELERATION    (in/sec**2)   =   -0.327E+02
    MAXIMUM DISPLACEMENT     (in)         =   -0.224E+01
    TIME INCREMENT OF DATA   (sec)        =       0.0100
    RESIDUAL VELOCITY       (in/sec)      =   -0.358E-06
    DAMPING RATIO FOR SPEC                =        0.050


    FINAL VELOCITY                        =         0.00 in/sec
    NO. OF ADDITIONAL RECORDS ADDED       =            0
    TOTAL NO. OF RECORDS FOR SPECTRA      =         2048
    MAX. NO. OF RECORDS ALLOWED           =         8400


    FINAL SPECTRAL ANALYSIS AT CARES FREQUENCIES


    RECORDS INPUT TO SPECTRA              =         2048
    MAXIMUM ACCELERATION    (in/sec**2)   =   -0.327E+02
    MAXIMUM DISPLACEMENT     (in)         =   -0.224E+01
    TIME INCREMENT OF DATA   (sec)        =       0.0100
    RESIDUAL VELOCITY       (in/sec)      =   -0.358E-06
    DAMPING RATIO FOR SPEC                =        0.050


    FINAL VELOCITY                        =         0.00 in/sec
    NO. OF ADDITIONAL RECORDS ADDED       =            0
    TOTAL NO. OF RECORDS FOR SPECTRA      =         2048
    MAX. NO. OF RECORDS ALLOWED           =         8400


    ************************************************
    ************************************************
    *****            C A R E S (SOIL)          *****
    ************************************************
    ************************************************
    * ANALYSIS #                                   *
    *                                              *
    * 1. CONVERTS INPUT ACCELERATION TIME HISTORY   *
    *    DATA FILE TO CARES FORMAT                  *
    *                                              *
    * 2. GENERATES ACCELEROGRAM TO MATCH A GIVEN    *
```

```
*    TARGET RESPONSE SPECTRUM                        *
*                                                    *
* 3. GENERATES FOURIER COMPONENTS FOR GIVEN          *
*   ACCELEROGRAM; USED AS INPUT TO SOIL COLUMN       *
*    AND SSI ANALYSIS                                *
*                                                    *
* 4. PERFORMS CONVOLUTION ANALYSIS OF A GIVEN        *
*    SOIL COLUMN TO ACCELEROGRAM DEFINED IN          *
*    TERMS OF ITS FOURIER COMPONENTS                 *
*                                                    *
* 5. GENERATES TIME HISTORY OF ACCELEROGRAM          *
*    FOR A GIVEN FOURIER COMPONENT FILE              *
*                                                    *
* 6. GENERATES ACCELERATION RESPONSE SPECTRUM        *
*    FOR A GIVEN ACCELERATION TIME HISTORY           *
*                                                    *
* 7. GENERATES POWER SPECTRAL DENSITY FUNCTION       *
*    FOR A GIVEN FOURIER COMPONENT FILE              *
*                                                    *
* 8. EXIT FROM CARES.SOIL                            *
******************************************************

     INPUT ITEM  FOR THE ANALYSIS..(1,2,3,4,5,6,7 or 8) ?
8
     ANALYSIS #  =   8

     IS THIS CORRECT (Y/N)
Y
```

file: motion.sp

```
CARES SOIL vs1.2.1 ( 6/14/95) : motion.sp
MOTION INPUT FILE :              motion.in
ACC SPECTRA (gs): GENERATE MOTION FROM TARGET RESPONSE SPECTRUM USING RANDOM P
DAMPING =  5.00 %
138
   0.1000    0.0055
   0.1047    0.0058
   0.1096    0.0062
   0.1148    0.0063
   0.1202    0.0064
   0.1259    0.0067
   0.1318    0.0069
   0.1380    0.0077
   0.1445    0.0082
   0.1514    0.0085
   0.1585    0.0084
   0.1660    0.0082
   0.1738    0.0087
   0.1820    0.0104
   0.1905    0.0115
   0.1995    0.0120
   0.2089    0.0120
       *
       *
       *
  38.0189    0.0973
  39.8107    0.0962
  41.6869    0.0965
  43.6516    0.0945
  45.7088    0.0936
  47.8630    0.0950
```

file: motion.acc

```
 CARES SOIL vs1.2.1 ( 6/14/95) : motion.acc
 MOTION INPUT FILE :              motion.in
    ACC TIME HIST (in/sec**2): GENERATE MOTION FROM TARGET RESPONSE SPECTRUM
USING RANDOM P
    MAXIMUM ACCELERATION =  -32.67 in/sec**2  INITIAL SEED (NSEC) = 52501
 2048  0.010000
  -1.4302   -1.4529   -1.4635   -1.5293   -1.6200   -1.7751   -1.7261        1
  -1.5940   -1.5125   -1.0110   -0.7183   -0.6191   -0.2312   -0.2543        2
   0.2417    0.5154    1.2236    1.4981    1.0442    1.2206    0.3421        3
   0.3938   -0.3254   -0.5039   -0.7951   -0.8909   -0.0351    0.4649        4
   0.7137    0.8334    0.1665    0.0020    0.1066   -0.0438   -0.5834        5
  -1.3753   -1.3984   -3.0697   -3.6010   -3.9904   -3.4926   -2.9416        6
  -2.0759   -0.8792   -1.8470   -2.8203   -2.6207   -2.7807   -3.6077        7
  -2.8072   -3.5098   -2.3001   -2.3437    0.6862    0.3796    1.0738        8
   3.1852    2.8328    4.7726    5.5126    7.1440    6.7961    5.8879        9
```

5.0629	2.6937	1.1227	1.3478	-0.7759	0.5657	-2.2691	10
-2.9639	-4.8705	-6.9459	-6.0293	-7.9579	-6.3302	-6.4918	11

*
*
*

0.3265	0.3265	0.3265	0.3265	0.3265	0.3265	0.3265	283
0.3265	0.3265	0.3265	0.3265	0.3265	0.3265	0.3265	284
0.3265	0.3265	0.3265	0.3265	0.3265	0.3265	0.3265	285
0.3265	0.3265	0.3265	0.3265	0.3265	0.3265	0.3265	286
0.3265	0.3265	0.3265	0.3265	0.3265	0.3265	0.3265	287
0.3265	0.3265	0.3265	0.3265	0.3265	0.3265	0.3265	288
0.3265	0.3265	0.3265	0.3265	0.3265	0.3265	0.3265	289
0.3265	0.3265	0.3265	0.3265	0.3265	0.3265	0.3265	290
0.3265	0.3265	0.3265	0.3265	0.3265	0.3265	0.3265	291
0.3265	0.3265	0.0000	0.0000	0.0000	0.0000	0.0000	292
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	293

file: motion.vel

CARES SOIL vs1.2.1 (6/14/95) : motion.vel
MOTION INPUT FILE : motion.in
VELOCITY TIME HIST (in/sec): GENERATE MOTION FROM TARGET RESPONSE SPECTRUM USING RANDOM P
MAXIMUM VELOCITY = 2.81 in/sec INITIAL SEED (NSEC) = 52501
2048 0.010000

0.0000	-0.0144	-0.0290	-0.0440	-0.0597	-0.0767	-0.0942	1
-0.1108	-0.1263	-0.1389	-0.1476	-0.1543	-0.1585	-0.1610	2
-0.1610	-0.1572	-0.1485	-0.1349	-0.1222	-0.1109	-0.1031	3
-0.0994	-0.0991	-0.1032	-0.1097	-0.1181	-0.1228	-0.1206	4
-0.1147	-0.1070	-0.1020	-0.1011	-0.1006	-0.1003	-0.1034	5
-0.1132	-0.1271	-0.1494	-0.1828	-0.2207	-0.2581	-0.2903	6
-0.3154	-0.3302	-0.3438	-0.3671	-0.3944	-0.4214	-0.4533	7
-0.4854	-0.5170	-0.5460	-0.5692	-0.5775	-0.5722	-0.5649	8
-0.5436	-0.5135	-0.4755	-0.4241	-0.3608	-0.2911	-0.2277	9
-0.1729	-0.1341	-0.1151	-0.1027	-0.0998	-0.1009	-0.1094	10
-0.1356	-0.1748	-0.2338	-0.2987	-0.3686	-0.4401	-0.5042	11

*
*
*

-0.2090	-0.2057	-0.2024	-0.1992	-0.1959	-0.1926	-0.1894	283
-0.1861	-0.1829	-0.1796	-0.1763	-0.1731	-0.1698	-0.1665	284
-0.1633	-0.1600	-0.1567	-0.1535	-0.1502	-0.1469	-0.1437	285
-0.1404	-0.1371	-0.1339	-0.1306	-0.1273	-0.1241	-0.1208	286
-0.1175	-0.1143	-0.1110	-0.1078	-0.1045	-0.1012	-0.0980	287
-0.0947	-0.0914	-0.0882	-0.0849	-0.0816	-0.0784	-0.0751	288
-0.0718	-0.0686	-0.0653	-0.0620	-0.0588	-0.0555	-0.0522	289
-0.0490	-0.0457	-0.0424	-0.0392	-0.0359	-0.0327	-0.0294	290
-0.0261	-0.0229	-0.0196	-0.0163	-0.0131	-0.0098	-0.0065	291
-0.0033	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	292
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	293

file: motion.displ

```
  CARES SOIL vs1.2.1 ( 6/14/95) : motion.displ
  MOTION INPUT FILE :           motion.in
     DISPLACEMENT TIME HIST (in): GENERATE MOTION FROM TARGET RESPONSE SPECTRUM
USING RANDOM P
     MAXIMUM DISPLACEMENT =    -2.24 in        INITIAL SEED (NSEC) = 52501
 2048  0.010000
    0.0000   -0.0001   -0.0003   -0.0007   -0.0012   -0.0019   -0.0027         1
   -0.0037   -0.0049   -0.0062   -0.0077   -0.0092   -0.0108   -0.0124         2
   -0.0140   -0.0156   -0.0171   -0.0185   -0.0198   -0.0210   -0.0220         3
   -0.0230   -0.0240   -0.0250   -0.0261   -0.0272   -0.0285   -0.0297         4
   -0.0309   -0.0320   -0.0330   -0.0340   -0.0350   -0.0360   -0.0370         5
   -0.0381   -0.0393   -0.0407   -0.0423   -0.0444   -0.0468   -0.0495         6
   -0.0525   -0.0558   -0.0591   -0.0627   -0.0665   -0.0706   -0.0749         7
   -0.0796   -0.0846   -0.0900   -0.0955   -0.1013   -0.1071   -0.1127         8
   -0.1183   -0.1236   -0.1285   -0.1331   -0.1370   -0.1402   -0.1428         9
   -0.1448   -0.1463   -0.1476   -0.1487   -0.1497   -0.1507   -0.1517        10
   -0.1529   -0.1545   -0.1565   -0.1592   -0.1625   -0.1665   -0.1713        11
                                 *
                                 *
                                 *
   -1.0299   -1.0320   -1.0340   -1.0360   -1.0380   -1.0399   -1.0419       283
   -1.0437   -1.0456   -1.0474   -1.0492   -1.0509   -1.0526   -1.0543       284
   -1.0560   -1.0576   -1.0592   -1.0607   -1.0622   -1.0637   -1.0652       285
   -1.0666   -1.0680   -1.0693   -1.0707   -1.0719   -1.0732   -1.0744       286
   -1.0756   -1.0768   -1.0779   -1.0790   -1.0801   -1.0811   -1.0821       287
   -1.0831   -1.0840   -1.0849   -1.0857   -1.0866   -1.0874   -1.0881       288
   -1.0889   -1.0896   -1.0903   -1.0909   -1.0915   -1.0921   -1.0926       289
   -1.0931   -1.0936   -1.0940   -1.0944   -1.0948   -1.0951   -1.0955       290
   -1.0957   -1.0960   -1.0962   -1.0964   -1.0965   -1.0966   -1.0967       291
   -1.0968   -1.0968   -1.0968   -1.0968   -1.0968   -1.0968   -1.0968       292
   -1.0968   -1.0968   -1.0968   -1.0968    0.0000    0.0000    0.0000       293
```

The structures portion of sample problem 1 is redone using 3 simultaneous motions. Since the convolution of the two additional motions is similar to what has already been discussed, only the input portion for the structures module is printed. The input file for the structural description is contained on "ssi3d.in". Spectral acceleration plots of nodes 3, 8, and 11 are also included.

```
     ************************************************
     ************************************************
     *****        C A R E S (STRUCTURE)        *****
     ************************************************
     ************************************************
     * ANALYSIS #                                     *
     *                                                *
     * 1. GENERATES THE FOURIER COEFFICIENTS FOR A    *
     *    GIVEN ACCELEROGRAM                          *
     *                                                *
     * 2. FORMS THE DATA FILE REQUIRED AS INPUT TO    *
     *    STRUCTURAL RESPONSE SSI ANALYSIS            *
     *                                                *
     * 3. PERFORMS THE SSI ANALYSIS                   *
     *                                                *
     *                                                *
     * 4. EXIT FROM CARES                             *
     ************************************************

     INPUT ITEM FOR THE ANALYSIS..(1,2,3,or 4) ?
2
     ANALYSIS #  =   2

     IS THIS CORRECT (Y/N)
Y

        ************************************************
        *                                              *
        *                                              *
        *       C A R E S       S Y S T E M            *
        *                                              *
        *         (MODULE: SEISMIC/STRUCTURES)         *
        *                                              *
        *                                              *
        *    STRUCTURES ARE MODELED USING TWO OR THREE *
        *    DIMENSIONAL BEAM AND SPRING ELEMENTS WITH *
        *    INPUT MOTION APPLIED TO THE MODEL.        *
        *    THE NODAL SEQUENCE SHOULD BE SELECTED TO  *
        *    GIVE SMALL BANDWIDTH                      *
        *                                              *
        ************************************************
```

```
               ENTER NAME FOR THE FILE STORING INPUT DATA......?
ssi3d.in
               SSI ANALYSIS DATA FILE      = ssi3d.in
     IS THIS NAME CORRECT.........................(Y/N) ?
y
     ENTER TITLE FOR THE PROBLEM :
TYPICAL SSI STRUCTURE INPUT DATA

     ENTER CONTROL CARD  :

     NOD  NSTIF1   NSTIF2   NSTIF3    IANAL

     NOD       = NUMBER OF NODES ( <=500)
     NSTIF1    = NUMBER OF BEAM ELEMENTS
     NSTIF2    = NUMBER OF SPRING ELEMENTS
     NSTIF3    = NUMBER OF SHEAR WALL ELEMENTS
     IANAL
               = 0   FREQUENCY DOMAIN SHAKER
               = 1   FREQUENCY DOMAIN TIME HISTORY

12  5  0  0  1

     CONTROL PARAMETERS  :

     NUMBER OF NODES                              =    12
     NUMBER OF BEAM ELEMENTS                      =     5
     NUMBER OF SPRING ELEMENTS                    =     0
     NUMBER OF SHEAR WALL ELEMENTS                =     0
     ANALYSIS TYPE                                =     1


     IS THE CONTROL CARD OK..................(Y/N) ?
Y
     ENTER NODAL COORDINATES AND LUMPED WEIGHTS    :


     INPUT NUMBER =     1

     NODE NO. X-COORD. Y-COORD. Z-COORD. WEIGHT      :
        N     (FT)       (FT)      (FT)      (KIP)
        1    0.000      0.000     0.000     689.90
     INPUT NUMBER =     2

     NODE NO. X-COORD. Y-COORD. Z-COORD. WEIGHT      :
        N     (FT)       (FT)      (FT)      (KIP)
        2    0.000      0.000     9.840     741.70
     INPUT NUMBER =     3

     NODE NO. X-COORD. Y-COORD. Z-COORD. WEIGHT      :
        N     (FT)       (FT)      (FT)      (KIP)
        3    0.000      0.000    16.400     101.20
     INPUT NUMBER =     4

     NODE NO. X-COORD. Y-COORD. Z-COORD. WEIGHT      :
        N     (FT)       (FT)      (FT)      (KIP)
        4    0.000      0.000    22.600     988.20
     INPUT NUMBER =     5
```

```
NODE NO. X-COORD. Y-COORD. Z-COORD. WEIGHT      :
   N     (FT)       (FT)      (FT)     (KIP)
   5    0.000      0.000    28.920    131.80
INPUT NUMBER =      6

NODE NO. X-COORD. Y-COORD. Z-COORD. WEIGHT      :
   N     (FT)       (FT)      (FT)     (KIP)
   6    0.000      0.000    39.360    150.60
INPUT NUMBER =      7

NODE NO. X-COORD. Y-COORD. Z-COORD. WEIGHT      :
   N     (FT)       (FT)      (FT)     (KIP)
   7    0.000      0.000    48.000    618.60
INPUT NUMBER =      8

NODE NO. X-COORD. Y-COORD. Z-COORD. WEIGHT      :
   N     (FT)       (FT)      (FT)     (KIP)
   8    0.000      0.000    52.920    550.40
INPUT NUMBER =      9

NODE NO. X-COORD. Y-COORD. Z-COORD. WEIGHT      :
   N     (FT)       (FT)      (FT)     (KIP)
   9   15.250      0.000     9.840      0.00
INPUT NUMBER =     10

NODE NO. X-COORD. Y-COORD. Z-COORD. WEIGHT      :
   N     (FT)       (FT)      (FT)     (KIP)
  10   15.250      0.000    28.920      0.00
INPUT NUMBER =     11

NODE NO. X-COORD. Y-COORD. Z-COORD. WEIGHT      :
   N     (FT)       (FT)      (FT)     (KIP)
  11   20.750      0.000    52.920      0.00
INPUT NUMBER =     12

NODE NO. X-COORD. Y-COORD. Z-COORD. WEIGHT      :
   N     (FT)       (FT)      (FT)     (KIP)
  12    0.000     50.000     0.000      0.00

ENTER NO. OF NODAL ROTARY AND TORSIONAL INERTIAS:
24
NO. OF NODAL ROTATY AND TORSIONAL INERTIAS = ,   24

IS THIS NUMBER OK .........................(Y/N) ?
Y
INPUT NUMBER  =    1

NODE NO. DIR.(4-X,5-Y,6-Z) INERTIA(KIP*FT*SEC**2)
   1            4         3534.00
INPUT NUMBER  =    2

NODE NO. DIR.(4-X,5-Y,6-Z) INERTIA(KIP*FT*SEC**2)
   1            5         1767.00
INPUT NUMBER  =    3

NODE NO. DIR.(4-X,5-Y,6-Z) INERTIA(KIP*FT*SEC**2)
```

```
    1              6         1767.00
INPUT NUMBER  =    4

NODE NO. DIR.(4-X,5-Y,6-Z) INERTIA(KIP*FT*SEC**2)
    2              4         4376.00
INPUT NUMBER  =    5

NODE NO. DIR.(4-X,5-Y,6-Z) INERTIA(KIP*FT*SEC**2)
    2              5         2188.00
INPUT NUMBER  =    6

NODE NO. DIR.(4-X,5-Y,6-Z) INERTIA(KIP*FT*SEC**2)
    2              6         2188.00
INPUT NUMBER  =    7

NODE NO. DIR.(4-X,5-Y,6-Z) INERTIA(KIP*FT*SEC**2)
    3              4        1645.20
INPUT NUMBER  =    8

NODE NO. DIR.(4-X,5-Y,6-Z) INERTIA(KIP*FT*SEC**2)
    3              5          822.60
INPUT NUMBER  =    9

NODE NO. DIR.(4-X,5-Y,6-Z) INERTIA(KIP*FT*SEC**2)
    3              6          822.60
INPUT NUMBER  =   10

NODE NO. DIR.(4-X,5-Y,6-Z) INERTIA(KIP*FT*SEC**2)
    4              4         1606.60
INPUT NUMBER  =   11

NODE NO. DIR.(4-X,5-Y,6-Z) INERTIA(KIP*FT*SEC**2)
    4              5          803.30
INPUT NUMBER  =   12

NODE NO. DIR.(4-X,5-Y,6-Z) INERTIA(KIP*FT*SEC**2)
    4              6          803.30
INPUT NUMBER  =   13

NODE NO. DIR.(4-X,5-Y,6-Z) INERTIA(KIP*FT*SEC**2)
    5              4         2144.00
INPUT NUMBER  =   14

NODE NO. DIR.(4-X,5-Y,6-Z) INERTIA(KIP*FT*SEC**2)
    5              5         1072.00
INPUT NUMBER  =   15

NODE NO. DIR.(4-X,5-Y,6-Z) INERTIA(KIP*FT*SEC**2)
    5              6         1072.00
INPUT NUMBER  =   16

NODE NO. DIR.(4-X,5-Y,6-Z) INERTIA(KIP*FT*SEC**2)
    6              4         2448.00
INPUT NUMBER  =   17

NODE NO. DIR.(4-X,5-Y,6-Z) INERTIA(KIP*FT*SEC**2)
    6              5         1224.00
```

```
     INPUT NUMBER  =   18

     NODE NO. DIR.(4-X,5-Y,6-Z) INERTIA(KIP*FT*SEC**2)
         6           6         1224.00
     INPUT NUMBER  =   19

     NODE NO. DIR.(4-X,5-Y,6-Z) INERTIA(KIP*FT*SEC**2)
         7           4         5236.00
     INPUT NUMBER  =   20

     NODE NO. DIR.(4-X,5-Y,6-Z) INERTIA(KIP*FT*SEC**2)
         7           5         2618.00
     INPUT NUMBER  =   21

     NODE NO. DIR.(4-X,5-Y,6-Z) INERTIA(KIP*FT*SEC**2)
         7           6         2618.00
     INPUT NUMBER  =   22

     NODE NO. DIR.(4-X,5-Y,6-Z) INERTIA(KIP*FT*SEC**2)
         8           4         4128.00
     INPUT NUMBER  =   23

     NODE NO. DIR.(4-X,5-Y,6-Z) INERTIA(KIP*FT*SEC**2)
         8           5         2064.00
     INPUT NUMBER  =   24

     NODE NO. DIR.(4-X,5-Y,6-Z) INERTIA(KIP*FT*SEC**2)
         8           6         2064.00
     ENTER NO. OF COUPLED DEGREES OF FREEDOM (<200) :
0
     NO. OF COUPLED DEGREES OF FREEDOM =     0

     IS THIS NUMBER OK .................(Y/N) ?
Y

     ADDITIONAL DOF RESTRAINTS CAN BE GIVEN IN 3 WAYS:
                NREST1 = # INDIVIDUAL RESTRAINTS - SPEC NODE AND DOF
                NREST2 = # NODES WITH ALL DOF RESTRAINED - SPEC NODES
                NREST3 = # DOF RESTRAINED AT ALL NODES - SPEC DOF

6  0  0
     INDIVIUAL RESTRAINT   1NODE  DOF # ?

12  1
     INDIVIUAL RESTRAINT   2NODE  DOF # ?

12  2
     INDIVIUAL RESTRAINT   3NODE  DOF # ?

12  3
     INDIVIUAL RESTRAINT   4NODE  DOF # ?

12  4
     INDIVIUAL RESTRAINT   5NODE  DOF # ?

12  5
     INDIVIUAL RESTRAINT   6NODE  DOF # ?
```

```
12  6

      ENTER NO.OF RIGID LINKS CONNECTING SLAVE TO MASTER NODES:

LIMITATIONS SSI NODE CANNOT BE SLAVE
          SLAVE NODE CANNOT BE MASTER TO ANOTHER NODE

5
      NO. OF RIGID LINKS =     5

      IS THIS CORRECT ?
Y
      INPUT NUMBER  =     1

      MASTER NODE AT END OF LINK...SLAVE AT END OF LINK
1  2
      INPUT NUMBER  =     2

      MASTER NODE AT END OF LINK...SLAVE AT END OF LINK
1  9
      INPUT NUMBER  =     3

      MASTER NODE AT END OF LINK...SLAVE AT END OF LINK
5 10
      INPUT NUMBER  =     4

      MASTER NODE AT END OF LINK...SLAVE AT END OF LINK
8  7
      INPUT NUMBER  =     5

      MASTER NODE AT END OF LINK...SLAVE AT END OF LINK
8 11

      HOW MANY OUTPUT NODES DO YOU WANT FOR POST PROCESSING  ?
         FILE WILL BE SAVED CONTAINING FOURIER COMPONENTS
          OF RESPONSE AT EACH DOF FOR EACH NODE

6
      NO. OF NODES FOR POST-PROCESSING  =    6

      IS THIS NUMBER OK.....................(Y/N)  ?
Y

      SPECIFY NODE NUMBERS FOR POST-PROCESS :
2  5  8  9  10  11

      B E A M   E L E M E N T   D A T A  :


      ENTER NUMBER OF MATERIAL GROUPS (<200) :
2

      FOR MATERIAL GROUP NUMBER =   1

      ENTER: E(YOUNG,S MOD) G(SHEAR MOD) DAMPING:
```

```
                (KSF)           (KSF)       (%)
             518400.00       216000.00    2.00

 YOUNG,S MODULUS (ksf)                 =   0.5184E+06
 SHEAR   MODULUS (ksf)                 =   0.2160E+06
 DAMPING (%)                           =    2.000


FOR MATERIAL GROUP NUMBER =    2

ENTER: E(YOUNG,S MOD) G(SHEAR MOD) DAMPING:
              (KSF)           (KSF)       (%)
       5184000000.00  216000000.00   2.00

 YOUNG,S MODULUS (ksf)                 =   0.5184E+10
 SHEAR   MODULUS (ksf)                 =   0.2160E+09
 DAMPING (%)                           =    2.000

ENTER NUMBER OF SECTION PROP GROUPS (<200) :
   LOCAL AXES: X-AXIS OF MEMBER; Y-IN IS IK NODES PLANE

1

FOR SECTION PROPERTY GROUP NUMBER =    1
ENTER: AREA; SH AREA-Y; SH AREA-Z;   IY;     IZ;     J
        ------ SQ FEET-----------     --------FT**4-----

       105.2    52.6     52.6     14800.0  14800.0  100000.00
FOR BEAM  NUMBER  =     1
ENTER: START , END , K-NODE(ON LOC.X-Z PL , MAT# , SECT#)
2  3  12  1  1
FOR BEAM  NUMBER  =     2
ENTER: START , END , K-NODE(ON LOC.X-Z PL , MAT# , SECT#)
3  4  12  1  1
FOR BEAM  NUMBER  =     3
ENTER: START , END , K-NODE(ON LOC.X-Z PL , MAT# , SECT#)
4  5  12  1  1
FOR BEAM  NUMBER  =     4
ENTER: START , END , K-NODE(ON LOC.X-Z PL , MAT# , SECT#)
5  6  12  1  1
FOR BEAM  NUMBER  =     5
ENTER: START , END , K-NODE(ON LOC.X-Z PL , MAT# , SECT#)
6  7  12  1  1


          SELECT SSI MODEL..ITYPE:
      IF CIRCULAR FOUNDATION (1, 2 , OR 3)
1.FREQUENCY INDEPENDENT PARAMETER MODEL
2.BEREDUGO NOVAK MODEL
3.KAUSEL MODEL

      IF RECTANGULAR FOUNDATION (5, 6, OR 7)
5.FOR ENTIRE RECT FOUNDATION
6.FOR UNIT WIDTH IN X-DIRECTION
7.FOR UNIT WIDTH IN Y-DIRECTION
```

```
       NODE AT WHICH SSI DATA IS APPLIED = INODE

            ITYPE = ?, INODE = ?
  1  1

      ENTER SOIL PROPERTIES AND GEOMETRY FOR CIRC FOUNDATION:

          SOIL BENEATH FOUNDATION
      G   =  SHEAR MODULUS  (KSF)
      MU  =  POISSON RATIO
      DEN =  SOIL DENSITY (KIPS/FT**3)
          SOIL TO SIDE OF FOUNDATION
      GS   =  SHEAR MODULUS  (KSF)
      MUS  =  POISSON RATIO
      DENS =  SOIL DENSITY (KIPS/FT**3)
      H    =  DEPTH OF BURIAL  (FT)
      R    =  RADIUS OF FOUNDATION  (FT)
      BETA =  SOIL DAMPING  (%)


  4509.00  0.47  0.120  4509.00  0.47  0.120  0.00  17.25  0.00


      INPUT STRUCTURAL DAMPING TYPE:
      1.  READ IN MASS AND STIFFNESS MATRIX MULT
      2.  CONSTANT RATIO BASED ON FIRST 2 MODES
      3.  COMPOSITE
  3

      FREE FIELD PULSE SPECIFICATION :

      IDENTIFY THE PULSE DIRECTIONS:   (X) ,   (Y) ,   (Z)
      IN SEQUENCE ON ONE LINE ( 1=X , 2=Y , 3=Z ) .
      REPLACE WITH ZERO IF NO PULSE IN THAT DIR.
  1  2  3

      FOR PULSE NO. =     1 , ENTER THE FILE NAME :
  g1ch1.sfc

      ENTER SCALE FACTOR     :
  0.0833

      FOR PULSE NO. =     2 , ENTER THE FILE NAME :
  g1ch3.sfc

      ENTER SCALE FACTOR     :
  0.0833

      FOR PULSE NO. =     3 , ENTER THE FILE NAME :
  g1ch2.sfc

      ENTER SCALE FACTOR     :
  0.0833
         DO YOU WANT TO MAKE ANOTHER MODEL.........(Y/N) ?
  n
```

Appendix B

FILE CONTENTS FOR SAMPLE PROBLEM #1

File : rock.fc

CARES SOIL vs1.2.1 (6/13/95) : rock.fc
INPUT TIME HISTORY FILE : rock.th
FOURIER COMPONENTS : FOURIER COMPONENTS OF ROCK TIME HISTORY

MAX. RECORD TIME (SEC)	=	0.40960E+02
RECORD TIME INCREMENT (SEC)	=	0.20000E-01
NO. OF RECORDS IN INPUT	=	2048
NO. OF MODE COMPONENTS	=	1025
FREQUENCY INTERVAL (CPS)	=	0.24414E-01
MAXIMUM FREQUENCY (CPS)	=	0.25000E+02
MAX. ACCEPTABLE FREQ. (CPS)	=	0.25000E+02
PEAK ACCELERATION (IPS2)	=	0.17071E+03

MODE (N)	OMEGA (1/SEC) (N*PI/TMAX)	FREQ (CPS) (OM/2*PI)	COS. COEF (IN/SEC2)	SIN. COEF (IN/SEC2)	SUM COEF (IN/SEC2)	LAG TIME (SEC)
0	0.0000E+00	0.0000E+00	-0.3305E-02	0.0000E+00	0.3305E-02	
1	0.1534E+00	0.2441E-01	-0.5321E-02	-0.3745E-02	0.6506E-02	0.2672E+02
2	0.3068E+00	0.4883E-01	-0.9643E-03	-0.5992E-02	0.6069E-02	0.1076E+02
3	0.4602E+00	0.7324E-01	0.2589E-02	-0.2031E-01	0.2048E-01	0.6551E+01
4	0.6136E+00	0.9766E-01	0.6219E-01	-0.5446E-01	0.8267E-01	0.3732E+01
5	0.7670E+00	0.1221E+00	0.1588E+00	0.7238E-01	0.1745E+00	0.1490E+01
6	0.9204E+00	0.1465E+00	0.8819E-01	0.1373E+00	0.1632E+00	0.6202E+00
7	0.1074E+01	0.1709E+00	-0.1090E-01	0.1143E+00	0.1148E+00	0.5763E+01
8	0.1227E+01	0.1953E+00	-0.2425E-01	0.1995E+00	0.2010E+00	0.5021E+01
9	0.1381E+01	0.2197E+00	-0.2561E+00	0.1836E+00	0.3151E+00	0.3864E+01
10	0.1534E+01	0.2441E+00	-0.2827E+00	0.1183E+00	0.3065E+00	0.3330E+01
11	0.1687E+01	0.2686E+00	-0.4351E+00	-0.2121E+00	0.4841E+00	0.2524E+01
12	0.1841E+01	0.2930E+00	-0.4284E+00	-0.3785E+00	0.5716E+00	0.2167E+01
13	0.1994E+01	0.3174E+00	-0.4738E-01	-0.7703E+00	0.7718E+00	0.1606E+01
14	0.2148E+01	0.3418E+00	0.6048E+00	-0.3094E+00	0.6794E+00	0.9516E+00
15	0.2301E+01	0.3662E+00	0.5064E+00	0.3265E-01	0.5075E+00	0.6547E+00
*						
*						
*						
1010	0.1549E+03	0.2466E+02	0.1161E-01	0.1268E-01	0.1719E-01	0.4784E-02
1011	0.1551E+03	0.2468E+02	0.6499E-02	0.1215E-01	0.1378E-01	0.3167E-02
1012	0.1552E+03	0.2471E+02	0.5051E-02	0.1472E-01	0.1557E-01	0.2129E-02
1013	0.1554E+03	0.2473E+02	-0.3577E-03	0.1776E-01	0.1776E-01	0.4030E-01
1014	0.1555E+03	0.2476E+02	-0.6547E-02	0.1796E-01	0.1912E-01	0.3815E-01
1015	0.1557E+03	0.2478E+02	-0.1227E-01	0.1431E-01	0.1885E-01	0.3580E-01
1016	0.1559E+03	0.2480E+02	-0.1712E-01	0.9765E-02	0.1971E-01	0.3356E-01
1017	0.1560E+03	0.2483E+02	-0.1737E-01	0.4345E-03	0.1738E-01	0.3037E-01
1018	0.1562E+03	0.2485E+02	-0.1200E-01	-0.1574E-02	0.1211E-01	0.2934E-01
1019	0.1563E+03	0.2488E+02	-0.1141E-01	-0.4538E-02	0.1228E-01	0.2772E-01
1020	0.1565E+03	0.2490E+02	-0.5262E-02	-0.7592E-02	0.9237E-02	0.2395E-01
1021	0.1566E+03	0.2493E+02	0.7824E-03	-0.5198E-02	0.5256E-02	0.1910E-01
1022	0.1568E+03	0.2495E+02	0.2511E-02	0.2553E-02	0.3581E-02	0.4957E-02
1023	0.1569E+03	0.2498E+02	-0.4909E-02	0.4085E-02	0.6386E-02	0.3445E-01
1024	0.1571E+03	0.2500E+02	-0.8611E-02	0.6774E-14	0.8611E-02	0.3000E-01

File : soil.degr

```
CARES SOIL vs1.2.1 (11/17/94) : soil.degr
STOKOE SOIL DEGRADATION FOR 8 SOIL LAYERS
   SOIL DEGRADATION MODEL (5): OTHER

 11    # OF STRAIN VALUES
```

	STRAIN (%)								
	0.0001	0.0003	0.0010	0.0030	0.0100	0.0300	0.1000	0.3000	1.0000

SHEAR MODULUS RATIO CURVES

LAYER									
1	1.000	1.000	1.000	0.980	0.860	0.630	0.360	0.180	0.080
2	1.000	1.000	1.000	0.980	0.930	0.760	0.490	0.260	0.120
3	1.000	1.000	0.990	0.940	0.810	0.600	0.380	0.200	0.100
4	1.000	1.000	1.000	0.980	0.920	0.730	0.300	0.120	0.090
5	1.000	1.000	0.990	0.960	0.870	0.650	0.440	0.250	0.130
6	1.000	0.990	0.980	0.930	0.830	0.660	0.480	0.330	0.220
7	1.000	0.990	0.980	0.930	0.830	0.660	0.480	0.330	0.220
8	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000

DAMPING(%) CURVES

LAYER									
1	1.400	1.400	1.400	1.800	2.800	6.500	11.600	17.600	22.400
2	1.400	1.400	1.400	1.700	2.600	4.300	8.500	13.200	18.700
3	1.200	1.200	1.200	2.000	4.000	9.200	16.000	21.800	24.300
4	1.000	1.000	1.000	1.100	2.000	5.200	10.000	15.100	20.200
5	0.800	0.900	1.000	1.300	2.600	5.200	8.500	11.600	14.100
6	1.800	1.800	1.900	2.300	3.700	5.500	7.300	9.400	11.200
7	1.800	1.800	1.800	1.800	1.800	1.800	3.500	4.500	6.000
8	1.667	1.667	1.667	1.667	1.667	1.667	1.667	1.667	1.667

File : soil.final

```
CARES SOIL vs1.2.1 ( 6/13/95) : soil.final
  CONVOLVE ROCK OUTCROP MOTION TO SURFACE

      INPUT FOURIER COMPONENT FILE =    rock.fc
      INPUT MOTION IS SPECIFIED AT OUTCROP
           MAX. RECORD TIME          =   40.960 sec
           RECORD TIME INCREMENT     =    0.020 sec
           NO. OF RECORDS IN INPUT   =    2048
           NO. OF MODE COMPONENTS    =    1025
           FREQUENCY INTERVAL        =    0.024 cps
           MAXIMUM FREQUENCY         =   25.000 cps
           CUT-OFF FREQUENCY         =   25.000 cps
           MAX. STRAIN CALC. ERROR   =    2.000 %
           PEAK ACCELERATION         =  170.710 in/sec2

      INPUT SOIL DEGRADATION FILE  =    soil.degr

      OUTPUT FOURIER COMPONENT FILES:
          DEPTH 1 =    0.00 ft          surface.fc

      STRAIN CALCULATION IS PERFORMED IN THE FREQUENCY DOMAIN

      GROUND WATER IS NOT CONSIDERED IN THIS PROBLEM

      NUMBER OF ITERATIONS =  8
```

SOIL COLUMN DEPTHS (ft)

LAYER	THICKNESS (ft)	TOP of LAYER (ft)	BOTT of LAYER (ft)	CENTER of LAYER (ft)
1	16.40	0.00	16.40	8.20
2	23.00	16.40	39.40	27.90
3	29.50	39.40	68.90	54.15
4	31.20	68.90	100.10	84.50
5	31.10	100.10	131.20	115.65
6	98.40	131.20	229.60	180.40
7	82.00	229.60	311.60	270.60
8	238.30	311.60	549.90	430.75

INITIAL SOIL PROPERTIES

LAYER	DEPTH to CENTER (ft)	UNIT WT. (kcf)	INT. SHEAR MOD (ksf)	INT. SHEAR VEL (fps)
1	8.20	0.125	1070.0	525.0
2	27.90	0.125	4550.6	1082.7
3	54.15	0.125	4550.6	1082.7
4	84.50	0.125	4550.6	1082.7
5	115.65	0.125	4550.6	1082.7
6	180.40	0.125	16585.8	2067.0

7	270.60	0.125	10447.4	1640.5
8	430.75	0.165	40799.0	2821.7
rock		0.165	55162.1	3281.0

SOIL DEGRADATION

SOIL DEGRADATION MODEL: OTHER

11 # OF STRAIN VALUES

STRAIN (%)

0.0001	0.0003	0.0010	0.0030	0.0100	0.0300	0.1000	0.3000	1.0000

SHEAR MODULUS RATIO CURVES

LAYER									
1	1.000	1.000	1.000	0.980	0.860	0.630	0.360	0.180	0.080
2	1.000	1.000	1.000	0.980	0.930	0.760	0.490	0.260	0.120
3	1.000	1.000	0.990	0.940	0.810	0.600	0.380	0.200	0.100
4	1.000	1.000	1.000	0.980	0.920	0.730	0.300	0.120	0.090
5	1.000	1.000	0.990	0.960	0.870	0.650	0.440	0.250	0.130
6	1.000	0.990	0.980	0.930	0.830	0.660	0.480	0.330	0.220
7	1.000	0.990	0.980	0.930	0.830	0.660	0.480	0.330	0.220
8	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000

DAMPING(%) CURVES

LAYER									
1	1.400	1.400	1.400	1.800	2.800	6.500	11.600	17.600	22.400
2	1.400	1.400	1.400	1.700	2.600	4.300	8.500	13.200	18.700
3	1.200	1.200	1.200	2.000	4.000	9.200	16.000	21.800	24.300
4	1.000	1.000	1.000	1.100	2.000	5.200	10.000	15.100	20.200
5	0.800	0.900	1.000	1.300	2.600	5.200	8.500	11.600	14.100
6	1.800	1.800	1.900	2.300	3.700	5.500	7.300	9.400	11.200
7	1.800	1.800	1.800	1.800	1.800	1.800	3.500	4.500	6.000
8	1.667	1.667	1.667	1.667	1.667	1.667	1.667	1.667	1.667

FINAL SOIL PROPERTIES

LAYER	DEPTH to CENTER (ft)	EFF. SHEAR STRAIN (%)	DAMPING (%)	FINAL SHEAR MOD (ksf)	FINAL SHEAR VEL (fps)
1	8.20	0.0447	8.19	578.4	386.0
2	27.90	0.0227	3.87	3656.1	970.5
3	54.15	0.0715	14.10	2008.4	719.3
4	84.50	0.3619	15.90	524.8	367.7
5	115.65	0.1298	9.24	1796.9	680.4
6	180.40	0.0320	5.60	10786.8	1666.9
7	270.60	0.0846	3.26	5275.2	1165.7
8	430.75	0.0148	1.67	40799.0	2821.7
rock			1.67	55162.1	3281.0

FINAL STRESSES

LAYER	DEPTH to CENTER (ft)	SHEAR STRESS (ksf)	EFF. OVERBURDEN STRESS (ksf)	TAU(zy)/ SIGMA(zz)

1	8.20	0.259	1.025	0.252
2	27.90	0.828	3.487	0.238
3	54.15	1.436	6.769	0.212
4	84.50	1.899	10.562	0.180
5	115.65	2.333	14.456	0.161
6	180.40	3.451	22.550	0.153
7	270.60	4.465	33.825	0.132
8	430.75	6.027	58.610	0.103

File : surface.fc

```
CARES SOIL vs1.2.1 ( 6/13/95) : surface.fc
INPUT SOIL FILE :              soilcol.in
CONVOLVED MOTION:   CONVOLVE ROCK OUTCROP MOTION TO SURFACE

   MAX. RECORD TIME (SEC)      =   0.40960E+02
   RECORD TIME INCREMENT (SEC) =   0.20000E-01
   NO. OF RECORDS IN INPUT     =     2048
   NO. OF MODE COMPONENTS      =     1025
   FREQUENCY INTERVAL (CPS)    =   0.24414E-01
   MAXIMUM FREQUENCY (CPS)     =   0.25000E+02
   CUT-OFF FREQUENCY (CPS)     =   0.25000E+02
   PEAK ACCELERATION (IPS2)    =   0.17512E+03
```

DEPTH 1			0.00 FT			
MODE (N)	OMEGA (1/SEC) (N*PI/TMAX)	FREQ (CPS) (OM/2*PI)	COS. COEF (IN/SEC2)	SIN. COEF (IN/SEC2)	SUM COEF (IN/SEC2)	LAG TIME (SEC)
0	0.0000E+00	0.0000E+00	-0.3305E-02	0.0000E+00	0.3305E-02	
1	0.1534E+00	0.2441E-01	-0.5240E-02	-0.3867E-02	0.6512E-02	0.2658E+02
2	0.3068E+00	0.4883E-01	-0.6947E-03	-0.6055E-02	0.6095E-02	0.1061E+02
3	0.4602E+00	0.7324E-01	0.4019E-02	-0.2029E-01	0.2068E-01	0.6402E+01
4	0.6136E+00	0.9766E-01	0.6821E-01	-0.4935E-01	0.8419E-01	0.3581E+01
5	0.7672E+00	0.1221E+00	0.1536E+00	0.9319E-01	0.1797E+00	0.1337E+01
6	0.9205E+00	0.1465E+00	0.7063E-01	0.1549E+00	0.1702E+00	0.4647E+00
7	0.1074E+01	0.1709E+00	-0.3183E-01	0.1175E+00	0.1217E+00	0.5605E+01
8	0.1227E+01	0.1953E+00	-0.6780E-01	0.2061E+00	0.2170E+00	0.4861E+01
9	0.1380E+01	0.2197E+00	-0.3205E+00	0.1344E+00	0.3476E+00	0.3701E+01
10	0.1534E+01	0.2441E+00	-0.3427E+00	0.4896E-01	0.3462E+00	0.3165E+01
11	0.1688E+01	0.2686E+00	-0.4153E+00	-0.3783E+00	0.5617E+00	0.2354E+01
12	0.1841E+01	0.2930E+00	-0.3454E+00	-0.5897E+00	0.6833E+00	0.1994E+01
13	0.1994E+01	0.3174E+00	0.2722E+00	-0.9135E+00	0.9532E+00	0.1430E+01
14	0.2148E+01	0.3418E+00	0.8664E+00	-0.7499E-01	0.8696E+00	0.7716E+00
15	0.2301E+01	0.3662E+00	0.5964E+00	0.3169E+00	0.6754E+00	0.4704E+00
*						
*						
*						
1010	0.1549E+03	0.2466E+02	0.1233E-03	0.1179E-03	0.1706E-03	0.5213E-02
1011	0.1551E+03	0.2468E+02	0.6559E-04	0.1194E-03	0.1363E-03	0.3239E-02
1012	0.1553E+03	0.2471E+02	0.3915E-04	0.1481E-03	0.1532E-03	0.1665E-02
1013	0.1554E+03	0.2473E+02	-0.2563E-04	0.1724E-03	0.1743E-03	0.3949E-01
1014	0.1556E+03	0.2476E+02	-0.9915E-04	0.1581E-03	0.1866E-03	0.3679E-01
1015	0.1557E+03	0.2478E+02	-0.1518E-03	0.1029E-03	0.1834E-03	0.3409E-01
1016	0.1558E+03	0.2480E+02	-0.1874E-03	0.3738E-04	0.1911E-03	0.3151E-01
1017	0.1560E+03	0.2483E+02	-0.1557E-03	-0.6215E-04	0.1677E-03	0.2777E-01
1018	0.1561E+03	0.2485E+02	-0.9667E-04	-0.6482E-04	0.1164E-03	0.2640E-01
1019	0.1563E+03	0.2488E+02	-0.7099E-04	-0.9362E-04	0.1175E-03	0.2425E-01
1020	0.1565E+03	0.2490E+02	-0.6218E-06	-0.8808E-04	0.8808E-04	0.2013E-01
1021	0.1566E+03	0.2493E+02	0.3686E-04	-0.3359E-04	0.4987E-04	0.1475E-01
1022	0.1568E+03	0.2495E+02	0.1329E-05	0.3383E-04	0.3385E-04	0.2504E-03
1023	0.1570E+03	0.2498E+02	-0.5958E-04	-0.7614E-05	0.6006E-04	0.2921E-01
1024	0.1571E+03	0.2500E+02	-0.5163E-04	-0.6203E-04	0.8070E-04	0.2442E-01

File : surface.th

```
CARES SOIL vs1.2.1 ( 6/13/95) : surface.th
INPUT FOURIER COMPONENT FILE :  surface.fc
  CONVOLVED MOTION:    CONVOLVE ROCK OUTCROP MOTION TO SURFACE
  PEAK ACCEL = 175.12007in/sec2  AT RECORD  219
2048  0.020000
   0.4556     0.4306     0.4121     0.3827     0.3432     0.3086     0.2688          1
   0.2292     0.1834     0.1305     0.0807     0.0367    -0.0157    -0.0744          2
  -0.1441    -0.2193    -0.3141    -0.4318    -0.6026    -0.8791    -1.3908          3
  -2.3797    -3.6582    -3.3779    -1.5307    -0.7018    -0.8663    -0.8250          4
  -1.4352    -2.3773    -2.4735    -2.3076    -2.3171    -1.8244    -0.4789          5
  -0.0029    -0.4939    -0.3823    -0.2362    -0.9084    -1.0452     0.0553          6
   1.0676     1.7316     2.1346     1.9654     1.7240     2.8472     4.3523          7
   3.7192     0.8113    -2.0018    -2.1513     0.4017     3.8332     5.3175          8
   3.5628     1.2112    -0.0260    -0.8102    -1.4775    -1.9766    -3.0046          9
  -5.1231    -6.3067    -4.6525    -2.0900    -0.4367     0.4011    -0.4380         10
  -2.3772    -2.7292    -2.2346    -2.8132    -2.2676    -1.1108    -2.3982         11
  -2.2417     1.8476     3.4688     1.7797     1.2447     3.5347     6.3457         12
   6.6934     6.1067     6.0094     9.0251    12.4009    10.0113     0.6488         13
  -5.4665    -3.5604    -2.2440    -2.7488    -2.7187    -2.4294     0.1740         14
   7.9296    13.5406    11.7214     4.2984    -1.5065    -2.3279    -3.7488         15
  -4.0463    -3.2667    -4.7316   -10.2696   -12.4193    -6.2382     0.1420         16
   6.4669    11.8517     7.8506    -4.0737    -8.1113    -6.5580   -10.5340         17
 -12.9810   -11.1988    -7.7606    -7.1056    -9.7792   -11.6120   -11.0558         18
  -7.3625    -4.2034    -6.8108   -10.4609    -5.2265     1.2613     0.2763         19
  -3.8897    -5.9431    -8.8753   -11.8439    -9.0760    -3.6174     0.0489         20
                                            *
                                            *
                                            *
  -0.5951    -0.4300    -0.1070     0.2039     0.4785     0.6481     0.6276        280
   0.3453    -0.0383    -0.2741    -0.2581     0.0060     0.3473     0.6410        281
   0.9223     1.2778     1.5573     1.6220     1.6457     1.6102     1.4086        282
   1.2461     1.2037     1.1777     1.1521     1.2140     1.3558     1.4151        283
   1.5275     1.8124     2.0462     2.1177     2.1055     1.9962     1.7917        284
   1.5613     1.3420     1.1526     0.9681     0.7598     0.5355     0.3506        285
   0.2232     0.1236     0.0635    -0.0294    -0.2215    -0.4172    -0.5156        286
  -0.4920    -0.4453    -0.4179    -0.4562    -0.7103    -1.0282    -1.2154        287
  -1.2823    -1.1877    -0.9873    -0.8705    -0.9231    -1.0215    -1.0647        288
  -1.0914    -1.0335    -0.8906    -0.7558    -0.6313    -0.5176    -0.5015        289
  -0.5291    -0.5215    -0.4666    -0.3466    -0.1908    -0.0540     0.0383        290
   0.0954     0.1390     0.1781     0.2139     0.2465     0.2882     0.3354        291
   0.3839     0.4185     0.4380     0.4669     0.4945     0.4964     0.5047        292
   0.5147     0.5089     0.4994     0.4856     0.0000     0.0000     0.0000        293
```

File : surface.sp

```
CARES SOIL vs1.2.1 ( 6/13/95) : surface.sp
INPUT TIME HISTORY FILE :      surface.th
RESPONSE SPECTRUM - CONVOLVED MOTION:  CONVOLVE ROCK OUTCROP MOTION TO SURFACE
DAMPING =  5.00 %
123
  0.1000   0.0081
  0.1047   0.0086
  0.1096   0.0092
  0.1148   0.0099
  0.1202   0.0107
  0.1259   0.0116
  0.1318   0.0125
  0.1380   0.0137
  0.1445   0.0149
  0.1514   0.0162
  0.1585   0.0176
  0.1660   0.0192
  0.1738   0.0210
  0.1820   0.0230
  0.1905   0.0253
  0.1995   0.0276
  0.2089   0.0297
  0.2188   0.0321
  0.2291   0.0348
  0.2399   0.0378
  0.2512   0.0410
     *
     *
     *
 10.0000   0.5421
 10.4713   0.5083
 10.9648   0.4940
 11.4815   0.4840
 12.0226   0.4642
 12.5893   0.4741
 13.1826   0.4760
 13.8038   0.4810
 14.4544   0.4893
 15.1356   0.4843
 15.8489   0.4778
 16.5959   0.4797
 17.3780   0.4734
 18.1970   0.4667
 19.0546   0.4655
 19.9526   0.4637
 20.8930   0.4618
 21.8776   0.4618
 22.9087   0.4613
 23.9883   0.4608
 25.0000   0.4603
```

File : surface.psd

```
CARES SOIL vs1.2.1 ( 6/13/95) : surface.psd
INPUT FOURIER COMPONENT FILE :  surface.fc
PSD (in2/(sec3*cycle)) : CONVOLVE ROCK OUTCROP MOTION TO SURFACE
DURATION TIME =   40.96 sec
1025    NUMBER OF FREQUENCIES
FREQ(cps)  PSD(in2/(sec3*cycle))
   0.0000  0.109230E-04
   0.0244  0.212056E-04
   0.0488  0.185728E-04
   0.0732  0.213918E-03
   0.0977  0.354401E-02
   0.1221  0.161387E-01
   0.1465  0.144913E-01
   0.1709  0.740970E-02
   0.1953  0.235370E-01
   0.2197  0.603918E-01
   0.2441  0.599202E-01
   0.2686  0.157793E+00
   0.2930  0.233524E+00
   0.3174  0.454288E+00
   0.3418  0.378136E+00
   0.3662  0.228059E+00
   0.3906  0.150947E-01
   0.4150  0.450804E-01
   0.4395  0.117533E+00
   0.4639  0.248230E+00
   0.4883  0.315978E+00
      *
      *
      *
  24.6826  0.927920E-08
  24.7070  0.117332E-07
  24.7314  0.151893E-07
  24.7559  0.174132E-07
  24.7803  0.168158E-07
  24.8047  0.182580E-07
  24.8291  0.140526E-07
  24.8535  0.677336E-08
  24.8779  0.690214E-08
  24.9023  0.387924E-08
  24.9268  0.124347E-08
  24.9512  0.573118E-09
  24.9756  0.180387E-08
  25.0000  0.325669E-08
```

Appendix C

DATA FOR STRUCTURAL VERIFICATION PROBLEMS

VALIDATION PROBLEM S.1

The following input file is used to execute Option 5 of CARES Version 1.0 for validation problem S.1:

```
        SAMPLE S.1 VERSION 1.0
   3    1    0    1    0
   1 0.0        0.0         0.0         100.
   2 0.0        0.          100.        100.
   3 0.         10.           0.          0.
   0
   0
   6
   3    1
   3    2
   3    3
   3    4
   3    5
   3    6
   2
   1    2
  1
10000.              5000.
  1
   1    2    3 10.        100000.     100000.     100.        50.         20.
.04         20.         40.
   1    1
1000.       0.33        100.        0.          50.         1000.
1000.       0.
  -3    2    1 1.
5.          2.
```

The following input data file is used to execute Analysis 3 of the structures module in CARES Version 1.2:

```
  CARES STRC vs1.2.1 ( 6/20/95) : s1v1.2.in
SAMPLE S.1 VERSION 1.2
   3    1    0    0    0
   1  0.0000E+00  0.0000E+00  0.0000E+00    0.1000E+03
   2  0.0000E+00  0.0000E+00  0.1000E+03    0.1000E+03
   3  0.0000E+00  0.1000E+02  0.0000E+00    0.0000E+00
   0
   0
   6    0    0
   3    1
   3    2
   3    3
   3    4
   3    5
   3    6
   0
   2
```

```
   1    2
  1
        0.1000E+05        0.5000E+04        0.4000E+01
  1
    0.100E+03     0.100E+06     0.100E+06     0.500E+02     0.100E+03
0.200E+02
   1    2    3    1    1
   1    1
   0.1000E+04    0.3300E+00    0.1000E+03
   0.1000E+04    0.3300E+00    0.1000E+03
   0.000    50.000    0.000
   1
   0.1070E+01    0.1330E-02
   3    2    1     1.0000
   5.000     7.000     9.000
```

Solutions are obtained with both codes and the hard copy output is essentially the same. The output obtained from the Version 1.2 run follows.

```
1
SAMPLE S.1 VERSION 1.2

     CONTROL PARAMETERS :

     NUMBER OF NODES                          =     3
     NUMBER OF BEAM ELEMENTS                  =     1
     NUMBER OF SPRING ELEMENTS                =     0
     NUMBER OF SHEAR WALLS                    =     0
     ANALYSIS OPTION                          =     0
     OUTPUT FILE NAME                = s1v1.2.ou


     NODE       X-COORD(1)     Y-COORD(2)     Z-COORD(3)     WEIGHT (KIP)
        1          0.000          0.000          0.000          100.000
        2          0.000          0.000        100.000          100.000
        3          0.000         10.000          0.000            0.000

     NO ROTARY INERTIA OR TORSIONAL INERTIA


     CENTER OF GRAVITY DATA :
        TOTAL MASS =    0.621E+01  KIP SEC**2/FT
        X CG =      0.000  FT
        Y CG =      0.000  FT
        Z CG =     50.000  FT


     NO COUPLED DEGREES OF FREEDOM
```

6 INDIVIDUALLY REST DOF

NODE	DIRECTION
3	1
3	2
3	3
3	4
3	5
3	6

NO RIGID LINKS

EQUATION NUMBERS

NODE	DOF-1	DOF-2	DOF-3	DOF-4	DOF-5	DOF-6
1	1	2	3	4	5	6
2	7	8	9	10	11	12
3	0	0	0	0	0	0

1 B E A M D A T A

NUMBER OF MATERIAL GROUPS = 1

NUMBER	YOUNG MODULUS	SHEAR MODULUS	DAMPING RATIO
1	0.100E+05	0.500E+04	4.000

NUMBER OF SECTION PROPERTY GROUPS = 1

NO		AREAS		MOMENTS OF INERTIA		
	SECTION	SHEAR-Y	SHEAR-Z	ABOUT Y	ABOUT Z	TORSION
1	0.100E+03	0.100E+06	0.100E+06	0.500E+02	0.100E+03	0.200E+02

BEAM ELEMENT PROPERTIES

NO	MATERIAL	SECTION	NODE-A	NODE-B	NODE-K
1	1	1	1	2	3

I N T E R A C T I O N D A T A

NODE = 1

FREQUENCY INDEPENDENT SSI PARAMETER MODEL :

SOIL PROPERTIES (BELOW FOUNDATION):

SHEAR MODULUS	=	1000.0000
POISSON RATIO	=	0.3300
SOIL DENSITY	=	100.0000
SOIL PROPERTIES (SIDEWALL):		
SHEAR MODULUS	=	1000.0000
POISSON RATIO	=	0.3300
SOIL DENSITY	=	100.0000
DEPTH OF BURIAL	=	0.0000
RADIUS OF BASE	=	50.0000
SOIL DAMPING RATIO	=	0.0000
TORSIONAL INERTIA	=	0.0000

```
    MAXIMUM BANDWIDTH IN K MATRIX =    12
    ELEMENT NUMBER    BANDWIDTH

              1                12

  DAMPING VALUES READ IN
         DAMPING MATRIX =  0.107E+01 * M +  0.133E-02 * K


    S H A K E R   A N A L Y S I S
         LOAD APPLIED TO NODE     2
         IN DIRECTION             1
         LOAD MAGNITUDE =      1.000
```

The output file "s1v1.2.ou" contains the Fourier components of the response at the specified nodes. These files are identical for both versions of the code and contain the following data:

```
  CARES STRC vs1.2.1 ( 6/20/95) : s1v1.2.ou
  INPUT SIM CODE FILE :           s1v1.2.in
SAMPLE S.1 VERSION 1.2
    3   12
    1    2    3    4    5    6
    7    8    9   10   11   12
    0    0    0    0    0    0
    3
     5.000      7.000      9.000
    1    1
      0.796E-10    -0.748E-11
      0.290E-10    -0.278E-11
      0.137E-10    -0.142E-11
    1    2
      0.000E+00     0.000E+00
      0.000E+00     0.000E+00
      0.000E+00     0.000E+00
    1    3
      0.000E+00     0.000E+00
      0.000E+00     0.000E+00
      0.000E+00     0.000E+00
    1    4
      0.000E+00     0.000E+00
      0.000E+00     0.000E+00
      0.000E+00     0.000E+00
    1    5
      0.149E-10    -0.204E-11
      0.543E-11    -0.689E-12
      0.256E-11    -0.329E-12
    1    6
      0.000E+00     0.000E+00
      0.000E+00     0.000E+00
      0.000E+00     0.000E+00
    2    1
     -0.112E-04    -0.327E-03
     -0.406E-05    -0.167E-03
```

```
 -0.191E-05    -0.101E-03
2    2
  0.000E+00     0.000E+00
  0.000E+00     0.000E+00
  0.000E+00     0.000E+00
2    3
  0.000E+00     0.000E+00
  0.000E+00     0.000E+00
  0.000E+00     0.000E+00
2    4
  0.000E+00     0.000E+00
  0.000E+00     0.000E+00
  0.000E+00     0.000E+00
2    5
 -0.167E-06    -0.490E-05
 -0.609E-07    -0.250E-05
 -0.287E-07    -0.151E-05
2    6
  0.000E+00     0.000E+00
  0.000E+00     0.000E+00
  0.000E+00     0.000E+00
0
```

VALIDATION PROBLEM S.2

The following input file is used to execute Analysis 3 of CARES Version 1.1 with the beam from node 2 to 4 modeled as a rigid link:

```
  CARES STRC vs1.2.1 ( 6/21/95) : s2av1.2.in
PROBLEM S.2A
    5    2    0    0    0
    1  0.0000E+00  0.0000E+00  0.0000E+00    0.1000E+03
    2  0.0000E+00  0.0000E+00  0.1000E+03    0.1000E+03
    3  0.0000E+00  0.1000E+02  0.0000E+00    0.0000E+00
    4  0.5000E+02  0.0000E+00  0.1000E+03    0.0000E+00
    5  0.5000E+02  0.0000E+00  0.2000E+03    0.1000E+03
    0
    0
   15    0    0
    1    2
    1    4
    1    6
    2    2
    2    4
    2    6
    3    1
    3    2
    3    3
    3    4
    3    5
    3    6
    5    2
    5    4
    5    6
    1
    2    4
    4
    1    2    4    5
   1
         0.1000E+05          0.5000E+04          0.4000E+01
   1
       0.100E+02      0.100E+06      0.100E+06      0.100E+03      0.100E+03
0.200E+02
    1    2    3    1    1
    4    5    3    1    1
    1    1
     0.1000E+04     0.3300E+00     0.1000E+03
     0.1000E+04     0.3300E+00     0.1000E+03
     0.000     50.000     0.000
    1
     0.1070E+01     0.1330E-02
    3    2    1     1.0000
     5.000     7.000     9.000
```

The following input file is used to execute Analysis 3 of CARES Version 1.2 with the beam from node 2 to 4 modeled as a stiff beam:

```
  CARES STRC vs1.2.1 ( 6/21/95) : s2bv1.2.in
PROBLEM S.2B
    5    3    0    0    0
    1  0.0000E+00  0.0000E+00  0.0000E+00    0.1000E+03
    2  0.0000E+00  0.0000E+00  0.1000E+03    0.1000E+03
    3  0.0000E+00  0.1000E+02  0.0000E+00    0.0000E+00
    4  0.5000E+02  0.0000E+00  0.1000E+03    0.0000E+00
    5  0.5000E+02  0.0000E+00  0.2000E+03    0.1000E+03
    0
    0
   18    0    0
    1    2
    1    4
    1    6
    2    2
    2    4
    2    6
    3    1
    3    2
    3    3
    3    4
    3    5
    3    6
    4    2
    4    4
    4    6
    5    2
    5    4
    5    6
    0
    4
    1    2    4    5
   2
        0.1000E+05          0.5000E+04          0.4000E+01
        0.1000E+09          0.5000E+08          0.4000E-01
   1
      0.100E+02      0.100E+06      0.100E+06      0.100E+03      0.100E+03
0.200E+02
    1    2    3    1    1
    4    5    3    1    1
    2    4    3    2    1
    1    1
     0.1000E+04    0.3300E+00    0.1000E+03
     0.1000E+04    0.3300E+00    0.1000E+03
     0.000    50.000    0.000
    1
     0.1070E+01    0.1330E-02
    3    2    1     1.0000
     5.000    7.000    9.000
```

The following output (file "SSI.RUN") is obtained from the rigid link run (very similar output is obtained from the stiff beam run and is not repeated here):

```
1
PROBLEM S.2A

      CONTROL PARAMETERS :

      NUMBER OF NODES                          =    5
      NUMBER OF BEAM ELEMENTS                  =    2
      NUMBER OF SPRING ELEMENTS                =    0
      NUMBER OF SHEAR WALLS                    =    0
      ANALYSIS OPTION                          =    0
      OUTPUT FILE NAME                = s2av1.2.ou


      NODE     X-COORD(1)    Y-COORD(2)    Z-COORD(3)    WEIGHT (KIP)
        1        0.000         0.000         0.000        100.000
        2        0.000         0.000       100.000        100.000
        3        0.000        10.000         0.000          0.000
        4       50.000         0.000       100.000          0.000
        5       50.000         0.000       200.000        100.000

      NO ROTARY INERTIA OR TORSIONAL INERTIA

      CENTER OF GRAVITY DATA :
         TOTAL MASS =    0.932E+01  KIP SEC**2/FT
         X CG =    16.667  FT
         Y CG =     0.000  FT
         Z CG =   100.000  FT

      NO COUPLED DEGREES OF FREEDOM

         15  INDIVIDUALLY REST DOF
           NODE  DIRECTION
             1         2
             1         4
             1         6
             2         2
             2         4
             2         6
             3         1
             3         2
             3         3
             3         4
             3         5
             3         6
             5         2
             5         4
```

5 6

RIGID LINKS

MASTER	SLAVE
2	4

EQUATION NUMBERS

NODE	DOF-1	DOF-2	DOF-3	DOF-4	DOF-5	DOF-6
1	1	0	2	0	3	0
2	4	0	5	0	6	0
3	0	0	0	0	0	0
4	32	32	32	32	32	32
5	7	0	8	0	9	0

1 B E A M D A T A

NUMBER OF MATERIAL GROUPS = 1

NUMBER	YOUNG MODULUS	SHEAR MODULUS	DAMPING RATIO
1	0.100E+05	0.500E+04	4.000

NUMBER OF SECTION PROPERTY GROUPS = 1

NO	AREAS			MOMENTS OF INERTIA		
	SECTION	SHEAR-Y	SHEAR-Z	ABOUT Y	ABOUT Z	TORSION
1	0.100E+02	0.100E+06	0.100E+06	0.100E+03	0.100E+03	0.200E+02

BEAM ELEMENT PROPERTIES

NO	MATERIAL	SECTION	NODE-A	NODE-B	NODE-K
1	1	1	1	2	3
2	1	1	4	5	3

I N T E R A C T I O N D A T A

NODE = 1

FREQUENCY INDEPENDENT SSI PARAMETER MODEL :

SOIL PROPERTIES (BELOW FOUNDATION):

SHEAR MODULUS = 1000.0000
POISSON RATIO = 0.3300
SOIL DENSITY = 100.0000

SOIL PROPERTIES (SIDEWALL):

SHEAR MODULUS = 1000.0000
POISSON RATIO = 0.3300
SOIL DENSITY = 100.0000
DEPTH OF BURIAL = 0.0000
RADIUS OF BASE = 50.0000
SOIL DAMPING RATIO = 0.0000
TORSIONAL INERTIA = 7763.9751

MAXIMUM BANDWIDTH IN K MATRIX = 6

ELEMENT NUMBER BANDWIDTH

```
             1                 6
             2                 6

  DAMPING VALUES READ IN
         DAMPING MATRIX =  0.107E+01 * M +  0.133E-02 * K


     S H A K E R   A N A L Y S I S
         LOAD APPLIED TO NODE    2
         IN DIRECTION            1
         LOAD MAGNITUDE =      1.000
```

The following file (s2av1.2.ou) contains the Fourier components of the beams response obtained from the rigid link solution:

```
  CARES STRC vs1.2.1 ( 6/21/95) : s2av1.2.ou
  INPUT SIM CODE FILE :           s2av1.2.in
PROBLEM S.2A
    5    9
    1    0    2    0    3    0
    4    0    5    0    6    0
    0    0    0    0    0    0
   32   32   32   32   32   32
    7    0    8    0    9    0
    3
     5.000     7.000     9.000
    1    1
      0.319E-09    -0.303E-10
      0.116E-09    -0.111E-10
      0.545E-10    -0.568E-11
    1    3
     -0.418E-10     0.865E-11
     -0.623E-11     0.121E-11
     -0.163E-11     0.342E-12
    1    5
      0.298E-10    -0.412E-11
      0.109E-10    -0.138E-11
      0.511E-11    -0.657E-12
    2    1
     -0.113E-04    -0.328E-03
     -0.410E-05    -0.167E-03
     -0.192E-05    -0.101E-03
    2    3
      0.141E-06     0.936E-06
      0.245E-07     0.195E-06
      0.824E-08     0.660E-07
    2    5
      0.281E-08    -0.766E-08
      0.344E-09    -0.125E-07
      0.680E-10    -0.933E-08
    4    1
     -0.113E-04    -0.328E-03
     -0.410E-05    -0.167E-03
     -0.192E-05    -0.101E-03
```

```
   4     2
     0.000E+00      0.000E+00
     0.000E+00      0.000E+00
     0.000E+00      0.000E+00
   4     3
    -0.132E-09      0.132E-05
     0.730E-08      0.820E-06
     0.484E-08      0.533E-06
   4     4
     0.000E+00      0.000E+00
     0.000E+00      0.000E+00
     0.000E+00      0.000E+00
   4     5
     0.281E-08     -0.766E-08
     0.344E-09     -0.125E-07
     0.680E-10     -0.933E-08
   4     6
     0.000E+00      0.000E+00
     0.000E+00      0.000E+00
     0.000E+00      0.000E+00
   5     1
     0.352E-07      0.321E-06
     0.899E-08      0.838E-07
     0.348E-08      0.307E-07
   5     3
    -0.716E-07     -0.635E-06
    -0.177E-07     -0.163E-06
    -0.679E-08     -0.595E-07
   5     5
     0.169E-06      0.493E-05
     0.614E-07      0.251E-05
     0.289E-07      0.152E-05
   0
```

The following file (s2bv1.2.ou) contains the Fourier components of the beams response obtained from the stiff beam model of the rigid link solution:

```
  CARES STRC vs1.2.1 ( 6/21/95) : s2bv1.2.ou
  INPUT SIM CODE FILE :          s2bv1.2.in
PROBLEM S.2B

   5   12
   1    0    2    0    3    0
   4    0    5    0    6    0
   0    0    0    0    0    0
   7    0    8    0    9    0
  10    0   11    0   12    0
   3
    5.000     7.000     9.000
   1     1
     0.320E-09     -0.303E-10
     0.116E-09     -0.111E-10
     0.545E-10     -0.567E-11
   1     3
```

```
 -0.420E-10     0.862E-11
 -0.633E-11     0.123E-11
 -0.167E-11     0.348E-12

1    5
  0.298E-10    -0.412E-11
  0.109E-10    -0.138E-11
  0.511E-11    -0.657E-12
2    1
 -0.113E-04    -0.328E-03
 -0.410E-05    -0.167E-03
 -0.192E-05    -0.101E-03
2    3
  0.139E-06     0.942E-06
  0.247E-07     0.199E-06
  0.837E-08     0.674E-07
2    5
  0.283E-08    -0.811E-08
  0.356E-09    -0.129E-07
  0.721E-10    -0.965E-08
4    1
 -0.113E-04    -0.328E-03
 -0.410E-05    -0.167E-03
 -0.192E-05    -0.101E-03
4    3
 -0.286E-08     0.133E-05
  0.669E-08     0.834E-06
  0.465E-08     0.544E-06
4    5
  0.286E-08    -0.737E-08
  0.365E-09    -0.125E-07
  0.764E-10    -0.942E-08
5    1
  0.352E-07     0.321E-06
  0.899E-08     0.838E-07
  0.348E-08     0.307E-07
5    3
 -0.707E-07    -0.639E-06
 -0.179E-07    -0.166E-06
 -0.689E-08    -0.607E-07
5    5
  0.169E-06     0.493E-05
  0.614E-07     0.251E-05
  0.289E-07     0.152E-05
0
```

VALIDATION PROBLEM S.3

The following input file is used to execute Analysis 3 of CARES Version 1.2. The purpose of this problem is to verify the composite damping addition to CARES.

```
  CARES STRC vs1.2.1 ( 6/21/95) : s3v1.2.in
TEST OF COMPSITE DAMPING
   12   10    0    0    0
    1  0.0000E+00  0.0000E+00  0.0000E+00    0.1610E+04
    2  0.0000E+00  0.0000E+00  0.1000E+02    0.3220E+04
    3  0.0000E+00  0.0000E+00  0.2000E+02    0.3220E+04
    4  0.0000E+00  0.0000E+00  0.3000E+02    0.3220E+04
    5  0.0000E+00  0.0000E+00  0.4000E+02    0.3220E+04
    6  0.0000E+00  0.0000E+00  0.5000E+02    0.3220E+04
    7  0.0000E+00  0.0000E+00  0.6000E+02    0.3220E+04
    8  0.0000E+00  0.0000E+00  0.7000E+02    0.3220E+04
    9  0.0000E+00  0.0000E+00  0.8000E+02    0.3220E+04
   10  0.0000E+00  0.0000E+00  0.9000E+02    0.3220E+04
   11  0.0000E+00  0.0000E+00  0.1000E+03    0.1610E+04
   12  0.0000E+00  0.5000E+02  0.0000E+00    0.0000E+00
    0
    0
    6    0    0
   12    1
   12    2
   12    3
   12    4
   12    5
   12    6
    0
    1
    1
   2
          0.1000E+05          0.5000E+09          0.7000E+01
          0.1000E+05          0.5000E+09          0.2000E+01
   1
      0.100E+03      0.100E+06      0.100E+06      0.200E+06      0.200E+06
0.200E+06
    1    2   12    1    1
    2    3   12    1    1
    3    4   12    1    1
    4    5   12    1    1
    5    6   12    1    1
    6    7   12    2    1
    7    8   12    2    1
    8    9   12    2    1
    9   10   12    2    1
   10   11   12    2    1
    1    1
     0.1000E+04    0.3300E+00    0.1000E+00
     0.1000E+04    0.3300E+00    0.1000E+00
     0.000     50.000     0.000
    3
```

```
3   11    1      1.0000
 5.000     7.000 .   9.000
```

The following output file ("SSI.RUN") is obtained from the run.

```
1
TEST OF COMPSITE DAMPING

     CONTROL PARAMETERS :

     NUMBER OF NODES                           =    12
     NUMBER OF BEAM ELEMENTS                   =    10
     NUMBER OF SPRING ELEMENTS                 =     0
     NUMBER OF SHEAR WALLS                     =     0
     ANALYSIS OPTION                           =     0
     OUTPUT FILE NAME                     = s3v1.2.ou
```

NODE	X-COORD(1)	Y-COORD(2)	Z-COORD(3)	WEIGHT (KIP)
1	0.000	0.000	0.000	1610.000
2	0.000	0.000	10.000	3220.000
3	0.000	0.000	20.000	3220.000
4	0.000	0.000	30.000	3220.000
5	0.000	0.000	40.000	3220.000
6	0.000	0.000	50.000	3220.000
7	0.000	0.000	60.000	3220.000
8	0.000	0.000	70.000	3220.000
9	0.000	0.000	80.000	3220.000
10	0.000	0.000	90.000	3220.000
11	0.000	0.000	100.000	1610.000
12	0.000	50.000	0.000	0.000

```
NO ROTARY INERTIA OR TORSIONAL INERTIA

CENTER OF GRAVITY DATA :
   TOTAL MASS =    0.100E+04  KIP SEC**2/FT
   X CG =      0.000  FT
   Y CG =      0.000  FT
   Z CG =     50.000  FT

NO COUPLED DEGREES OF FREEDOM

     6  INDIVIDUALLY REST DOF
      NODE  DIRECTION
        12        1
        12        2
        12        3
        12        4
        12        5
```

12 6

NO RIGID LINKS

EQUATION NUMBERS

NODE	DOF-1	DOF-2	DOF-3	DOF-4	DOF-5	DOF-6
1	1	2	3	4	5	6
2	7	8	9	10	11	12
3	13	14	15	16	17	18
4	19	20	21	22	23	24
5	25	26	27	28	29	30
6	31	32	33	34	35	36
7	37	38	39	40	41	42
8	43	44	45	46	47	48
9	49	50	51	52	53	54
10	55	56	57	58	59	60
11	61	62	63	64	65	66
12	0	0	0	0	0	0

1 B E A M D A T A

NUMBER OF MATERIAL GROUPS = 2

NUMBER	YOUNG MODULUS	SHEAR MODULUS	DAMPING RATIO
1	0.100E+05	0.500E+09	7.000
2	0.100E+05	0.500E+09	2.000

NUMBER OF SECTION PROPERTY GROUPS = 1

NO		AREAS		MOMENTS OF INERTIA		
	SECTION	SHEAR-Y	SHEAR-Z	ABOUT Y	ABOUT Z	TORSION
1	0.100E+03	0.100E+06	0.100E+06	0.200E+06	0.200E+06	0.200E+06

BEAM ELEMENT PROPERTIES

NO	MATERIAL	SECTION	NODE-A	NODE-B	NODE-K
1	1	1	1	2	12
2	1	1	2	3	12
3	1	1	3	4	12
4	1	1	4	5	12
5	1	1	5	6	12
6	2	1	6	7	12
7	2	1	7	8	12
8	2	1	8	9	12
9	2	1	9	10	12
10	2	1	10	11	12

I N T E R A C T I O N D A T A

NODE = 1

FREQUENCY INDEPENDENT SSI PARAMETER MODEL :

SOIL PROPERTIES (BELOW FOUNDATION):

SHEAR MODULUS = 1000.0000
POISSON RATIO = 0.3300
SOIL DENSITY = 0.1000

SOIL PROPERTIES (SIDEWALL):

SHEAR MODULUS	=	1000.0000
POISSON RATIO	=	0.3300
SOIL DENSITY	=	0.1000
DEPTH OF BURIAL	=	0.0000
RADIUS OF BASE	=	50.0000
SOIL DAMPING RATIO	=	0.0000
TORSIONAL INERTIA	=	0.0000

MAXIMUM BANDWIDTH IN K MATRIX = 12

ELEMENT NUMBER	BANDWIDTH
1	12
2	12
3	12
4	12
5	12
6	12
7	12
8	12
9	12
10	12

MODE SHAPE MODE 1

0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
0.105E-02	0.000E+00	0.000E+00	0.000E+00	0.206E-03	0.000E+00
0.401E-02	0.000E+00	0.000E+00	0.000E+00	0.381E-03	0.000E+00
0.858E-02	0.000E+00	0.000E+00	0.000E+00	0.527E-03	0.000E+00
0.145E-01	0.000E+00	0.000E+00	0.000E+00	0.643E-03	0.000E+00
0.214E-01	0.000E+00	0.000E+00	0.000E+00	0.732E-03	0.000E+00
0.290E-01	0.000E+00	0.000E+00	0.000E+00	0.795E-03	0.000E+00
0.372E-01	0.000E+00	0.000E+00	0.000E+00	0.836E-03	0.000E+00
0.457E-01	0.000E+00	0.000E+00	0.000E+00	0.859E-03	0.000E+00
0.543E-01	0.000E+00	0.000E+00	0.000E+00	0.868E-03	0.000E+00
0.630E-01	0.000E+00	0.000E+00	0.000E+00	0.870E-03	0.000E+00

MODE SHAPE MODE 2

0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
0.573E-02	0.000E+00	0.000E+00	0.000E+00	0.104E-02	0.000E+00
0.187E-01	0.000E+00	0.000E+00	0.000E+00	0.144E-02	0.000E+00
0.327E-01	0.000E+00	0.000E+00	0.000E+00	0.127E-02	0.000E+00
0.426E-01	0.000E+00	0.000E+00	0.000E+00	0.651E-03	0.000E+00
0.448E-01	0.000E+00	0.000E+00	0.000E+00	-0.250E-03	0.000E+00
0.374E-01	0.000E+00	0.000E+00	0.000E+00	-0.122E-02	0.000E+00
0.208E-01	0.000E+00	0.000E+00	0.000E+00	-0.207E-02	0.000E+00
-0.316E-02	0.000E+00	0.000E+00	0.000E+00	-0.266E-02	0.000E+00
-0.315E-01	0.000E+00	0.000E+00	0.000E+00	-0.295E-02	0.000E+00
-0.615E-01	0.000E+00	0.000E+00	0.000E+00	-0.303E-02	0.000E+00

COMPOSITE DAMPING MATRIX

OMIGA1 = 4.950 P1 = 0.0674

OMIGA2 = 30.674 P2 = 0.0474

DAMPING MATRIX = 0.607E+00 * M + 0.244E-02 * K

S H A K E R   A N A L Y S I S

LOAD APPLIED TO NODE 11

IN DIRECTION 1

LOAD MAGNITUDE = 1.000

VALIDATION PROBLEM S.4

The following input file is used for problem S.4A where the structure is taken to be rigid and the SSI model is flexible:

```
  CARES STRC vs1.2.1 ( 6/22/95) : s4av1.2.in
AMPLIFICATION WITH RIGID STRUCTURE
    3    1    0    0    0
    1  0.0000E+00  0.0000E+00  0.0000E+00    0.3220E+04
    2  0.0000E+00  0.0000E+00  0.1000E+03    0.0000E+00
    3  0.0000E+00  0.5000E+02  0.0000E+00    0.0000E+00
    0
    0
    6    0    0
    3    1
    3    2
    3    3
    3    4
    3    5
    3    6
    0
    1
    2
   1
          0.1800E+08        0.9000E+07        0.5000E+01
   1
      0.100E+02     0.100E+03     0.100E+03     0.100E+04     0.100E+04
0.100E+04
    1    2    3    1    1
    1    1
     0.1000E+04    0.3300E+00    0.1000E+00
     0.1000E+04    0.3300E+00    0.1000E+00
     0.000     2.650     0.000
    1
     0.0000E+00    0.0000E+00
  -20    1    3      1.0000
      0.0000     0.2500
```

The following is the "SSI.RUN" file for problem S.4A:

```
1
AMPLIFICATION WITH RIGID STRUCTURE

     CONTROL PARAMETERS :

     NUMBER OF NODES                            =     3
     NUMBER OF BEAM ELEMENTS                    =     1
     NUMBER OF SPRING ELEMENTS                  =     0
     NUMBER OF SHEAR WALLS                      =     0
     ANALYSIS OPTION                            =     0
     OUTPUT FILE NAME                   = s4av1.2.ou
```

NODE	X-COORD(1)	Y-COORD(2)	Z-COORD(3)	WEIGHT (KIP)
1	0.000	0.000	0.000	3220.000
2	0.000	0.000	100.000	0.000
3	0.000	50.000	0.000	0.000

NO ROTARY INERTIA OR TORSIONAL INERTIA

CENTER OF GRAVITY DATA :
TOTAL MASS = 0.100E+03 KIP SEC**2/FT
X CG = 0.000 FT
Y CG = 0.000 FT
Z CG = 0.000 FT

NO COUPLED DEGREES OF FREEDOM

6 INDIVIDUALLY REST DOF

NODE	DIRECTION
3	1
3	2
3	3
3	4
3	5
3	6

NO RIGID LINKS

EQUATION NUMBERS

NODE	DOF-1	DOF-2	DOF-3	DOF-4	DOF-5	DOF-6
1	1	2	3	4	5	6
2	7	8	9	10	11	12
3	0	0	0	0	0	0

1 B E A M D A T A

NUMBER OF MATERIAL GROUPS = 1

NUMBER	YOUNG MODULUS	SHEAR MODULUS	DAMPING RATIO
1	0.180E+08	0.900E+07	5.000

NUMBER OF SECTION PROPERTY GROUPS = 1

NO		AREAS		MOMENTS OF INERTIA		
	SECTION	SHEAR-Y	SHEAR-Z	ABOUT Y	ABOUT Z	TORSION
1	0.100E+02	0.100E+03	0.100E+03	0.100E+04	0.100E+04	0.100E+04

BEAM ELEMENT PROPERTIES

```
NO  MATERIAL  SECTION  NODE-A  NODE-B  NODE-K

 1      1        1        1       2       3

      I N T E R A C T I O N   D A T A

   NODE =     1
   FREQUENCY INDEPENDENT SSI PARAMETER MODEL :

   SOIL PROPERTIES (BELOW FOUNDATION):
               SHEAR   MODULUS         =    1000.0000
               POISSON   RATIO         =       0.3300
               SOIL    DENSITY         =       0.1000
               SOIL PROPERTIES (SIDEWALL):
               SHEAR   MODULUS         =    1000.0000
               POISSON   RATIO         =       0.3300
               SOIL    DENSITY         =       0.1000
               DEPTH OF BURIAL         =       0.0000
               RADIUS OF  BASE         =       2.6500
               SOIL DAMPING RATIO      =       0.0000
               TORSIONAL INERTIA       =       0.0000

   MAXIMUM BANDWIDTH IN K MATRIX =   12
   ELEMENT NUMBER    BANDWIDTH

            1               12

 DAMPING VALUES READ IN
        DAMPING MATRIX =  0.000E+00 * M +  0.000E+00 * K


   S H A K E R   A N A L Y S I S
        LOAD APPLIED TO NODE     1
        IN DIRECTION             3
        LOAD MAGNITUDE =     1.000
```

The following is the file ("s4av1.2.ou") containing the Fourier components of the deformations of node 2 (and also node 1 since the structure is rigid):

```
  CARES STRC vs1.2.1 ( 6/22/95) : s4av1.2.ou
  INPUT SIM CODE FILE :          s4av1.2.in
AMPLIFICATION WITH RIGID STRUCTURE
    3   12
    1    2    3    4    5    6
    7    8    9   10   11   12
    0    0    0    0    0    0
   20
     0.000     0.250     0.500     0.750     1.000     1.250
     1.500     1.750     2.000     2.250     2.500     2.750
     3.000     3.250     3.500     3.750     4.000     4.250
     4.500     4.750
    2    1
     0.000E+00     0.000E+00
     0.000E+00     0.000E+00
     0.000E+00     0.000E+00
```

0.000E+00	0.000E+00
0.000E+00	0.000E+00
0.000E+00	0.000E+00
0.000E+00	0.000E+00
0.000E+00	0.000E+00
0.000E+00	0.000E+00
0.000E+00	0.000E+00
0.000E+00	0.000E+00
0.000E+00	0.000E+00
0.000E+00	0.000E+00
0.000E+00	0.000E+00
0.000E+00	0.000E+00
0.000E+00	0.000E+00
0.000E+00	0.000E+00
0.000E+00	0.000E+00
0.000E+00	0.000E+00
0.000E+00	0.000E+00
2 2	
0.000E+00	0.000E+00
0.000E+00	0.000E+00
0.000E+00	0.000E+00
0.000E+00	0.000E+00
0.000E+00	0.000E+00
0.000E+00	0.000E+00
0.000E+00	0.000E+00
0.000E+00	0.000E+00
0.000E+00	0.000E+00
0.000E+00	0.000E+00
0.000E+00	0.000E+00
0.000E+00	0.000E+00
0.000E+00	0.000E+00
0.000E+00	0.000E+00
0.000E+00	0.000E+00
0.000E+00	0.000E+00
0.000E+00	0.000E+00
0.000E+00	0.000E+00
0.000E+00	0.000E+00
0.000E+00	0.000E+00
2 3	
0.000E+00	0.632E-04
-0.406E-06	0.642E-04
-0.896E-06	0.674E-04
-0.160E-05	0.735E-04
-0.279E-05	0.841E-04
-0.527E-05	0.103E-03
-0.122E-04	0.143E-03
-0.476E-04	0.258E-03
-0.126E-02	0.729E-04
-0.494E-04	-0.231E-03
-0.125E-04	-0.112E-03
-0.550E-05	-0.710E-04
-0.305E-05	-0.506E-04
-0.192E-05	-0.386E-04
-0.131E-05	-0.307E-04
-0.940E-06	-0.252E-04
-0.705E-06	-0.211E-04
-0.545E-06	-0.180E-04

```
 -0.432E-06   -0.156E-04
 -0.350E-06   -0.137E-04
2    4
  0.000E+00    0.000E+00
  0.000E+00    0.000E+00
  0.000E+00    0.000E+00
  0.000E+00    0.000E+00
  0.000E+00    0.000E+00
  0.000E+00    0.000E+00
  0.000E+00    0.000E+00
  0.000E+00    0.000E+00
  0.000E+00    0.000E+00
  0.000E+00    0.000E+00
  0.000E+00    0.000E+00
  0.000E+00    0.000E+00
  0.000E+00    0.000E+00
  0.000E+00    0.000E+00
  0.000E+00    0.000E+00
  0.000E+00    0.000E+00
  0.000E+00    0.000E+00
  0.000E+00    0.000E+00
  0.000E+00    0.000E+00
  0.000E+00    0.000E+00
2    5
  0.000E+00    0.000E+00
  0.000E+00    0.000E+00
  0.000E+00    0.000E+00
  0.000E+00    0.000E+00
  0.000E+00    0.000E+00
  0.000E+00    0.000E+00
  0.000E+00    0.000E+00
  0.000E+00    0.000E+00
  0.000E+00    0.000E+00
  0.000E+00    0.000E+00
  0.000E+00    0.000E+00
  0.000E+00    0.000E+00
  0.000E+00    0.000E+00
  0.000E+00    0.000E+00
  0.000E+00    0.000E+00
  0.000E+00    0.000E+00
  0.000E+00    0.000E+00
  0.000E+00    0.000E+00
  0.000E+00    0.000E+00
  0.000E+00    0.000E+00
2    6
  0.000E+00    0.000E+00
  0.000E+00    0.000E+00
  0.000E+00    0.000E+00
  0.000E+00    0.000E+00
  0.000E+00    0.000E+00
  0.000E+00    0.000E+00
  0.000E+00    0.000E+00
  0.000E+00    0.000E+00
  0.000E+00    0.000E+00
  0.000E+00    0.000E+00
  0.000E+00    0.000E+00
  0.000E+00    0.000E+00
```

```
      0.000E+00      0.000E+00
      0.000E+00      0.000E+00
      0.000E+00      0.000E+00
      0.000E+00      0.000E+00
      0.000E+00      0.000E+00
      0.000E+00      0.000E+00
      0.000E+00      0.000E+00
      0.000E+00      0.000E+00
    0
```

The following input file is used for problem S.4B where the structure is taken to be flexible and the SSI model is rigid:

```
  CARES STRC vs1.2.1 ( 6/22/95) : s4bv1.2.in
AMPLIFICATION WITH RIGID SSI
    3    1    0    0    0
    1  0.0000E+00  0.0000E+00  0.0000E+00    0.1610E+04
    2  0.0000E+00  0.0000E+00  0.1000E+03    0.1610E+04
    3  0.0000E+00  0.5000E+02  0.0000E+00    0.0000E+00
    0
    0
    6    0    0
    3    1
    3    2
    3    3
    3    4
    3    5
    3    6
    0
    1
    2
   1
         0.7900E+05         0.9000E+07         0.5000E+01
   1
     0.100E+02     0.100E+03     0.100E+03     0.100E+04     0.100E+04
0.100E+04
    1    2    3    1    1
    1    1
     0.1000E+04    0.3300E+00    0.1000E+00
     0.1000E+04    0.3300E+00    0.1000E+00
     0.000   297.600    0.000
    1
     0.1260E+01    0.0000E+00
  -20    2    3     1.0000
      0.0000      0.2500
```

The follwoing is the "SSI.RUN" file for problem S.4B:

```
1
AMPLIFICATION WITH RIGID SSI


     CONTROL PARAMETERS :
```

```
NUMBER OF NODES                      =    3
NUMBER OF BEAM ELEMENTS              =    1
NUMBER OF SPRING ELEMENTS            =    0
NUMBER OF SHEAR WALLS                =    0
ANALYSIS OPTION                      =    0
OUTPUT FILE NAME                = s4bv1.2.ou
```

NODE	X-COORD(1)	Y-COORD(2)	Z-COORD(3)	WEIGHT (KIP)
1	0.000	0.000	0.000	1610.000
2	0.000	0.000	100.000	1610.000
3	0.000	50.000	0.000	0.000

NO ROTARY INERTIA OR TORSIONAL INERTIA

```
CENTER OF GRAVITY DATA :
   TOTAL MASS =    0.100E+03  KIP SEC**2/FT
   X CG =      0.000  FT
   Y CG =      0.000  FT
   Z CG =     50.000  FT
```

NO COUPLED DEGREES OF FREEDOM

6 INDIVIDUALLY REST DOF

NODE	DIRECTION
3	1
3	2
3	3
3	4
3	5
3	6

NO RIGID LINKS

EQUATION NUMBERS

NODE	DOF-1	DOF-2	DOF-3	DOF-4	DOF-5	DOF-6
1	1	2	3	4	5	6
2	7	8	9	10	11	12
3	0	0	0	0	0	0

1 B E A M D A T A

NUMBER OF MATERIAL GROUPS =   1

NUMBER	YOUNG MODULUS	SHEAR MODULUS	DAMPING RATIO
1	0.790E+05	0.900E+07	5.000

NUMBER OF SECTION PROPERTY GROUPS =   1

NO   AREAS   MOMENTS OF INERTIA

SECTION	SHEAR-Y	SHEAR-Z	ABOUT Y	ABOUT Z	TORSION
1 0.100E+02	0.100E+03	0.100E+03	0.100E+04	0.100E+04	0.100E+04

BEAM ELEMENT PROPERTIES

NO	MATERIAL	SECTION	NODE-A	NODE-B	NODE-K
1	1	1	1	2	3

I N T E R A C T I O N   D A T A

```
NODE =      1
FREQUENCY INDEPENDENT SSI PARAMETER MODEL :

SOIL PROPERTIES (BELOW FOUNDATION):
          SHEAR   MODULUS         =   1000.0000
          POISSON   RATIO         =      0.3300
          SOIL    DENSITY         =      0.1000
          SOIL PROPERTIES (SIDEWALL):
          SHEAR   MODULUS         =   1000.0000
          POISSON   RATIO         =      0.3300
          SOIL    DENSITY         =      0.1000
          DEPTH OF BURIAL         =      0.0000
          RADIUS OF  BASE         =    297.6000
          SOIL DAMPING RATIO      =      0.0000
          TORSIONAL INERTIA       =      0.0000

MAXIMUM BANDWIDTH IN K MATRIX =   12
ELEMENT NUMBER    BANDWIDTH

          1                12

DAMPING VALUES READ IN
      DAMPING MATRIX =  0.126E+01 * M +  0.000E+00 * K


S H A K E R   A N A L Y S I S
      LOAD APPLIED TO NODE     2
      IN DIRECTION             3
      LOAD MAGNITUDE =      1.000
```

The following is the file ("s4bv1.2.ou") containing the Fourier components of the deformations of node 2:

```
  CARES STRC vs1.2.1 ( 6/22/95) : s4bv1.2.ou
  INPUT SIM CODE FILE :           s4bv1.2.in
AMPLIFICATION WITH RIGID SSI
    3   12
    1    2    3    4    5    6
    7    8    9   10   11   12
    0    0    0    0    0    0
   20
     0.000      0.250      0.500      0.750      1.000      1.250
     1.500      1.750      2.000      2.250      2.500      2.750
```

```
 3.000     3.250     3.500     3.750     4.000     4.250
 4.500     4.750
2    1
  0.000E+00     0.000E+00
  0.000E+00     0.000E+00
  0.000E+00     0.000E+00
  0.000E+00     0.000E+00
  0.000E+00     0.000E+00
  0.000E+00     0.000E+00
  0.000E+00     0.000E+00
  0.000E+00     0.000E+00
  0.000E+00     0.000E+00
  0.000E+00     0.000E+00
  0.000E+00     0.000E+00
  0.000E+00     0.000E+00
  0.000E+00     0.000E+00
  0.000E+00     0.000E+00
  0.000E+00     0.000E+00
  0.000E+00     0.000E+00
  0.000E+00     0.000E+00
  0.000E+00     0.000E+00
  0.000E+00     0.000E+00
  0.000E+00     0.000E+00
2    2
  0.000E+00     0.000E+00
  0.000E+00     0.000E+00
  0.000E+00     0.000E+00
  0.000E+00     0.000E+00
  0.000E+00     0.000E+00
  0.000E+00     0.000E+00
  0.000E+00     0.000E+00
  0.000E+00     0.000E+00
  0.000E+00     0.000E+00
  0.000E+00     0.000E+00
  0.000E+00     0.000E+00
  0.000E+00     0.000E+00
  0.000E+00     0.000E+00
  0.000E+00     0.000E+00
  0.000E+00     0.000E+00
  0.000E+00     0.000E+00
  0.000E+00     0.000E+00
  0.000E+00     0.000E+00
  0.000E+00     0.000E+00
  0.000E+00     0.000E+00
2    3
  0.000E+00     0.127E-03
 -0.192E-05     0.129E-03
 -0.392E-05     0.135E-03
 -0.673E-05     0.147E-03
 -0.115E-04     0.168E-03
 -0.215E-04     0.205E-03
 -0.487E-04     0.280E-03
 -0.177E-03     0.471E-03
 -0.125E-02     0.177E-04
 -0.174E-03    -0.405E-03
 -0.483E-04    -0.215E-03
 -0.217E-04    -0.139E-03
```

-0.121E-04	-0.100E-03
-0.764E-05	-0.766E-04
-0.522E-05	-0.611E-04
-0.376E-05	-0.501E-04
-0.282E-05	-0.421E-04
-0.218E-05	-0.359E-04
-0.173E-05	-0.311E-04
-0.140E-05	-0.273E-04
2	4
0.000E+00	0.000E+00
0.000E+00	0.000E+00
0.000E+00	0.000E+00
0.000E+00	0.000E+00
0.000E+00	0.000E+00
0.000E+00	0.000E+00
0.000E+00	0.000E+00
0.000E+00	0.000E+00
0.000E+00	0.000E+00
0.000E+00	0.000E+00
0.000E+00	0.000E+00
0.000E+00	0.000E+00
0.000E+00	0.000E+00
0.000E+00	0.000E+00
0.000E+00	0.000E+00
0.000E+00	0.000E+00
0.000E+00	0.000E+00
0.000E+00	0.000E+00
0.000E+00	0.000E+00
0.000E+00	0.000E+00
2	5
0.000E+00	0.000E+00
0.000E+00	0.000E+00
0.000E+00	0.000E+00
0.000E+00	0.000E+00
0.000E+00	0.000E+00
0.000E+00	0.000E+00
0.000E+00	0.000E+00
0.000E+00	0.000E+00
0.000E+00	0.000E+00
0.000E+00	0.000E+00
0.000E+00	0.000E+00
0.000E+00	0.000E+00
0.000E+00	0.000E+00
0.000E+00	0.000E+00
0.000E+00	0.000E+00
0.000E+00	0.000E+00
0.000E+00	0.000E+00
0.000E+00	0.000E+00
0.000E+00	0.000E+00
0.000E+00	0.000E+00
2	6
0.000E+00	0.000E+00
0.000E+00	0.000E+00
0.000E+00	0.000E+00
0.000E+00	0.000E+00
0.000E+00	0.000E+00
0.000E+00	0.000E+00

0.000E+00	0.000E+00
0.000E+00	0.000E+00
0.000E+00	0.000E+00
0.000E+00	0.000E+00
0.000E+00	0.000E+00
0.000E+00	0.000E+00
0.000E+00	0.000E+00
0.000E+00	0.000E+00
0.000E+00	0.000E+00
0.000E+00	0.000E+00
0.000E+00	0.000E+00
0.000E+00	0.000E+00
0.000E+00	0.000E+00
0.000E+00	0.000E+00

0

VALIDATION PROBLEM S.5

The following input file is used for problem S.5:

```
   CARES STRC vs1.2.1 ( 9/ 5/95) : SHRWLTST
test of 3 shear walls
   9    0    0    3    0
   1  0.0000E+00  0.0000E+00  0.0000E+00    0.0000E+00
   2 -0.2500E+02  0.0000E+00  0.0000E+00    0.0000E+00
   3  0.2500E+02  0.0000E+00  0.0000E+00    0.0000E+00
   4 -0.2500E+02  0.0000E+00  0.5000E+02    0.0000E+00
   5  0.2500E+02  0.0000E+00  0.5000E+02    0.0000E+00
   6 -0.2500E+02  0.0000E+00  0.1000E+03    0.0000E+00
   7  0.2500E+02  0.0000E+00  0.1000E+03    0.0000E+00
   8 -0.2500E+02  0.0000E+00  0.1500E+03    0.4310E+03
   9  0.2500E+02  0.0000E+00  0.1500E+03    0.4310E+03
   0
   0
   0    0    5
   2    3    4    5    6
   1
   1    2
   2
   8    9
  1
         0.4000E+06         0.0000E+00          0.2000E+01
   1    1.0000    2    3    5    4
   1    1.0000    4    5    7    6
   1    1.0000    6    7    9    8
   1    1
    0.1000E+06    0.0000E+00    0.1100E+00
    0.1000E+06    0.0000E+00    0.1100E+00
     .000   100.000      .000
   2
0.02
  -50    8    1      1.0000
      .2500       .2500
```

The following is the output contained on file SSI.RUN:

```
test of 3 shear walls

     CONTROL PARAMETERS :

     NUMBER OF NODES                              =    9
     NUMBER OF BEAM ELEMENTS                      =    0
     NUMBER OF SPRING ELEMENTS                    =    0
     NUMBER OF SHEAR WALLS                        =    3
     ANALYSIS OPTION                              =    0
     OUTPUT FILE NAME                     = shrwlout
```

NODE	X-COORD(1)	Y-COORD(2)	Z-COORD(3)	WEIGHT (KIP)
1	.000	.000	.000	.000
2	-25.000	.000	.000	.000
3	25.000	.000	.000	.000
4	-25.000	.000	50.000	.000
5	25.000	.000	50.000	.000
6	-25.000	.000	100.000	.000
7	25.000	.000	100.000	.000
8	-25.000	.000	150.000	431.000
9	25.000	.000	150.000	431.000

NO ROTARY INERTIA OR TORSIONAL INERTIA

CENTER OF GRAVITY DATA :
TOTAL MASS = 0.268E+02 KIP SEC**2/FT
X CG = .000 FT
Y CG = .000 FT
Z CG = 150.000 FT

NO COUPLED DEGREES OF FREEDOM

FOLLOWING DOF RESTRAINED AT ALL NODES:

2 3 4 5 6

RIGID LINKS

MASTER	SLAVE
1	2

EQUATION NUMBERS

NODE	DOF-1	DOF-2	DOF-3	DOF-4	DOF-5	DOF-6
1	1	0	0	0	0	0
2	55	0	0	0	0	0
3	2	0	0	0	0	0
4	3	0	0	0	0	0
5	4	0	0	0	0	0
6	5	0	0	0	0	0
7	6	0	0	0	0	0
8	7	0	0	0	0	0
9	8	0	0	0	0	0

S H E A R W A L L D A T A

NUMBER OF MATERIAL GROUPS = 1

MATERIAL PROPERTIES

GROUP YOUNGS MODULUS POISSONS RATIO DAMPING RATIO

1 0.4000E+06 .000 2.000

ELEMENT	MATERIAL	THICKNESS	NODE-I	NODE-J	NODE-K	NODE-L
1	1	1.000	2	3	5	4
2	1	1.000	4	5	7	6
3	1	1.000	6	7	9	8

I N T E R A C T I O N   D A T A

NODE = 1
FREQUENCY INDEPENDENT SSI PARAMETER MODEL :

SOIL PROPERTIES (BELOW FOUNDATION):
SHEAR MODULUS = 100000.0000
POISSON RATIO = .0000
SOIL DENSITY = .1100
SOIL PROPERTIES (SIDEWALL):
SHEAR MODULUS = 100000.0000
POISSON RATIO = .0000
SOIL DENSITY = .1100
DEPTH OF BURIAL = .0000
RADIUS OF BASE = 100.0000
SOIL DAMPING RATIO = .0000
TORSIONAL INERTIA = 16731.3700

MAXIMUM BANDWIDTH IN K MATRIX = 4

ELEMENT NUMBER	BANDWIDTH
1	4
2	4
3	4

MODE SHAPE MODE 1
0.000E+00 0.408E-01 0.815E-01 0.745E-01 0.135E+00 0.136E+00
0.194E+00 0.193E+00
MODE SHAPE MODE 2
0.000E+00 0.344E-02 0.688E-02 -0.475E-02 -0.328E-01 0.336E-01
0.193E+00 -0.194E+00

DAMPING MATRIX DETERMINED FROM FIRST TWO EIGENVALUES AND DAMP RATIO =
.020
DAMPING MATRIX = 0.143E+01 * M + 0.208E-03 * K

S H A K E R   A N A L Y S I S
LOAD APPLIED TO NODE 8
IN DIRECTION 1
LOAD MAGNITUDE = 1.000

Appendix D

SSI.RUN File for AP 600 Model

1

AP 600 3-D 7-7-95 SASSI MODEL H2 DECONV INPT IN Y DIR

CONTROL PARAMETERS :

NUMBER OF NODES	=	247
NUMBER OF BEAM ELEMENTS	=	41
NUMBER OF SPRING ELEMENTS	=	17
NUMBER OF SHEAR WALLS	=	0
ANALYSIS OPTION	=	1
OUTPUT FILE NAME	=	AP600H2.OUT

NODE	X-COORD(1)	Y-COORD(2)	Z-COORD(3)	WEIGHT (KIP)
1	-8.640	-12.100	66.500	25220.000
2	-10.170	-18.240	82.500	39360.000
3	-22.610	-29.290	100.000	22200.000
4	-10.400	-31.960	117.500	17530.000
5	-8.570	-34.510	135.300	15200.000
6	9.050	-30.730	153.500	7869.000
7	-34.240	-28.220	161.500	5151.000
8	-38.310	-16.410	180.200	6114.000
9	.100	-.140	200.000	3990.000
10	.000	.000	220.000	4089.000
11	.000	.000	241.000	6291.000
12	.000	.000	246.000	3812.000
13	.000	.000	272.400	4143.000
14	.000	.000	284.400	3405.000
15	.000	.000	297.100	1538.000
16	.000	.000	306.300	1674.000
17	.000	.000	276.100	4540.000
18	.000	.000	272.400	401.500
19	-3.000	-22.700	60.500	28360.000
20	1000.000	.000	20.000	.000
21	-5.030	-3.585	66.500	.000
22	-23.230	-55.020	82.500	.000
23	-31.780	-26.050	100.000	.000
24	-24.250	-27.800	117.500	.000
25	-15.280	-20.460	135.300	.000
26	-13.000	-30.790	153.500	.000
27	-39.910	-11.200	161.500	.000
28	.277	.156	180.200	.000
29	1000.000	.000	29.000	.000
30	1000.000	.000	30.000	.000
31	-5.030	-3.585	82.500	.000
32	-23.230	-55.020	100.000	.000
33	-31.780	-26.050	117.500	.000
34	-24.250	-27.800	135.300	.000
35	-15.280	-20.460	153.500	.000
36	-13.000	-30.790	161.500	.000
37	-39.910	-11.200	180.200	.000
38	-.277	-.156	200.000	.000
39	1000.000	.000	39.000	.000

40	1000.000	.000	40.000	.000
41	-5.940	-5.730	66.500	.000
42	-22.640	-39.570	82.500	.000
43	-24.780	-26.590	100.000	.000
44	-21.890	-28.360	117.500	.000
45	5.630	-23.470	135.300	.000
46	-16.800	-26.000	153.500	.000
47	-35.960	-14.690	161.500	.000
48	-.020	.000	180.200	.000
49	1000.000	.000	180.200	.000
50	1000.000	.000	50.000	.000
51	-5.940	-5.730	82.500	.000
52	-22.640	-39.570	100.000	.000
53	-24.780	-26.590	117.500	.000
54	-21.890	-28.360	135.300	.000
55	-5.630	-23.470	153.500	.000
56	-16.800	-26.000	161.500	.000
57	-35.960	-14.690	180.200	.000
58	-.020	.000	200.000	.000
59	1000.000	.000	59.000	.000
60	-137.000	-87.500	66.500	.000
61	-71.000	-87.500	66.500	.000
62	-2.880	-87.500	66.500	.000
63	65.250	-87.500	66.500	.000
64	117.000	-87.500	66.500	.000
65	117.000	28.000	66.500	.000
66	65.250	28.000	66.500	.000
67	55.250	44.590	66.500	.000
68	-32.550	63.010	66.500	.000
69	-71.000	.000	66.500	.000
70	-137.000	.000	66.500	.000
71	1000.000	-3.585	66.500	.000
72	1000.000	-55.020	82.500	.000
73	1000.000	-26.050	100.000	.000
74	1000.000	-27.800	117.500	.000
75	1000.000	-20.480	135.300	.000
76	1000.000	-30.790	153.500	.000
77	1000.000	-11.200	161.500	.000
78	1000.000	.000	180.200	.000
79	1000.000	.000	79.000	.000
80	1000.000	.000	80.000	.000
81	117.000	-6.270	82.500	.000
82	-3.060	-87.500	82.500	.000
83	-137.000	-6.270	82.500	.000
84	117.000	-28.230	100.000	.000
85	-20.250	-87.500	100.000	.000
86	-137.000	-28.230	100.000	.000
87	117.000	-28.530	117.500	.000
88	117.000	-27.910	135.300	.000
89	117.000	-27.910	135.300	.000
90	-27.930	-87.500	135.300	.000
91	-137.000	-27.910	135.300	.000
92	117.000	-27.580	153.000	.000
93	117.000	-27.580	153.000	.000
94	-30.930	-87.500	160.500	.000
95	-137.000	-11.510	180.000	.000

96	-.968	14.150	135.300	.000
97	-63.000	12.300	135.300	.000
98	.000	.000	200.000	.000
99	1000.000	.000	99.000	.000
100	1000.000	.000	100.000	.000
101	.000	.000	100.000	55.930
102	.000	.000	104.100	182.700
103	.000	.000	112.500	221.400
104	.000	.000	116.900	272.500
105	.000	.000	132.300	525.800
106	.000	.000	144.500	464.300
107	.000	.000	162.000	484.400
108	.000	.000	170.000	562.200
109	.000	.000	190.000	613.900
110	.000	.000	205.300	878.200
111	.000	.000	218.700	378.600
112	.000	.000	229.500	362.700
113	.000	.000	240.300	349.700
114	.000	.000	248.300	324.000
115	.000	.000	256.300	180.700
116	.000	.000	205.300	634.000
117	46.170	.000	205.300	204.500
118	1000.000	.000	118.000	.000
119	9.000	.000	100.000	.000
120	1000.000	.000	120.000	.000
121	.000	.000	138.600	.000
122	.000	.000	110.500	.000
123	24.320	-57.290	144.500	126.500
124	-21.460	-70.190	138.600	50.550
125	-37.460	-51.560	112.500	42.180
126	-21.460	-70.190	110.500	50.550
127	1000.000	.000	127.000	.000
128	1000.000	.000	128.000	.000
129	1000.000	.000	129.000	.000
130	1000.000	.000	130.000	.000
131	-63.000	-10.280	107.200	.000
132	63.000	-10.280	107.200	.000
133	4.483	-63.000	107.200	.000
134	4.483	63.000	107.200	.000
135	-63.000	9.831	135.300	.000
136	63.000	9.831	135.300	.000
137	-11.240	-63.000	135.300	.000
138	-11.240	63.000	135.300	.000
139	1000.000	.000	139.000	.000
140	1000.000	.000	140.000	.000
141	65.000	.000	116.900	.000
142	65.000	.000	162.000	.000
143	65.000	.000	205.300	.000
144	65.000	.000	240.300	.000
145	1000.000	.000	145.000	.000
146	1000.000	.000	146.000	.000
147	1000.000	.000	147.000	.000
148	1000.000	.000	148.000	.000
149	1000.000	.000	149.000	.000
150	1000.000	.000	150.000	.000
151	.000	65.000	116.900	.000

152	.000	65.000	162.000	.000
153	.000	65.000	205.300	.000
154	.000	65.000	240.300	.000
155	1000.000	.000	155.000	.000
156	1000.000	.000	156.000	.000
157	1000.000	.000	157.000	.000
158	1000.000	.000	158.000	.000
159	1000.000	.000	159.000	.000
160	1000.000	.000	160.000	.000
161	117.000	-3.585	82.500	.000
162	117.000	-55.020	100.000	.000
163	117.000	-26.050	117.500	.000
164	117.000	-27.800	135.300	.000
165	117.000	-20.460	153.000	.000
166	71.000	.000	161.500	.000
167	71.000	.000	180.000	.000
168	71.000	.000	200.000	.000
169	71.000	.000	220.000	.000
170	1000.000	.000	170.000	.000
171	-5.030	-87.500	82.500	.000
172	-23.230	-87.500	100.000	.000
173	-31.780	-87.500	117.500	.000
174	-24.250	-87.500	135.300	.000
175	-15.280	-87.500	153.000	.000
176	-13.000	-87.500	161.500	.000
177	-39.910	-87.500	180.200	.000
178	.000	-71.000	200.000	.000
179	.000	-71.000	220.000	.000
180	1000.000	.000	180.000	.000
181	-137.000	-3.585	82.500	.000
182	-137.000	-55.020	100.000	.000
183	-137.000	-26.050	117.500	.000
184	-137.000	-27.990	135.300	.000
185	-137.000	-20.460	153.500	.000
186	-137.000	-30.790	161.500	.000
187	-137.000	-11.200	180.200	.000
188	-71.000	.000	200.000	.000
189	-71.000	.000	220.000	.000
190	1000.000	.000	190.000	.000
191	.000	71.000	82.500	.000
192	.000	71.000	100.000	.000
193	.000	71.000	117.500	.000
194	.000	71.000	135.300	.000
195	.000	71.000	153.000	.000
196	.000	71.000	161.500	.000
197	.000	71.000	180.200	.000
198	.000	71.000	200.000	.000
199	.000	71.000	220.000	.000
200	1.380	-.535	82.500	3621.000
201	-.862	4.115	98.100	9339.000
202	1.965	3.645	103.000	4394.000
203	-4.149	4.091	107.200	9807.000
204	-2.363	16.120	135.300	8318.000
205	-7.465	-33.490	148.000	405.700
206	1.135	33.910	148.000	691.700
207	12.550	31.600	158.000	185.200

208	-1.523	-.654	87.500	10520.000
209	1000.000	.000	209.000	.000
210	1000.000	.000	210.000	.000
211	-2.527	3.387	82.500	.000
212	2.138	8.785	98.100	.000
213	4.483	-10.280	103.000	.000
214	-11.240	9.831	107.200	.000
215	-8.542	-30.010	135.300	.000
216	-1.034	31.160	135.300	.000
217	13.620	32.330	148.000	.000
218	-2.527	3.387	87.500	.000
219	2.138	8.785	100.000	.000
220	1000.000	.000	220.000	.000
221	-2.527	3.387	98.100	.000
222	2.138	8.785	103.000	.000
223	4.483	-10.280	107.200	.000
224	-11.240	9.831	135.300	.000
225	-8.542	-30.090	148.000	.000
226	-1.034	31.160	148.000	.000
227	13.620	32.320	158.000	.000
228	-11.240	9.280	121.500	.000
229	13.620	32.320	153.600	.000
230	1000.000	.000	230.000	.000
231	-1.828	2.591	82.500	.000
232	.279	6.548	98.100	.000
233	3.544	-6.615	103.000	.000
234	-10.160	7.026	107.200	.000
235	-7.148	-30.080	135.300	.000
236	.187	31.670	135.300	.000
237	13.570	32.690	148.000	.000
238	-1.828	2.591	87.500	.000
239	1000.000	.000	239.000	.000
240	1000.000	.000	240.000	.000
241	-1.828	2.591	98.100	.000
242	.279	6.548	103.000	.000
243	3.544	-6.615	107.200	.000
244	-10.610	7.026	135.300	.000
245	-7.148	-30.080	148.000	.000
246	.187	31.670	148.000	.000
247	13.570	32.690	158.000	.000

NODE	DIRECTION	ROTARY INERTIA(KIP FT SEC**2)
1	4	0.127E+07
1	5	0.266E+07
1	6	0.394E+07
2	4	0.224E+07
2	5	0.545E+07
2	6	0.752E+07
3	4	0.127E+07
3	5	0.466E+07
3	6	0.583E+07
4	4	0.896E+06
4	5	0.369E+07
4	6	0.479E+07
5	4	0.865E+06

5	5	0.322E+07
5	6	0.419E+07
6	4	0.552E+06
6	5	0.161E+07
6	6	0.262E+07
7	4	0.418E+06
7	5	0.629E+06
7	6	0.105E+07
8	4	0.450E+06
8	5	0.838E+06
8	6	0.129E+07
9	4	0.314E+06
9	5	0.311E+06
9	6	0.625E+06
10	4	0.320E+06
10	5	0.320E+06
10	6	0.640E+06
11	4	0.357E+06
11	5	0.357E+06
11	6	0.716E+06
12	4	0.161E+06
12	5	0.161E+06
12	6	0.320E+06
13	4	0.163E+06
13	5	0.163E+06
13	6	0.338E+06
14	4	0.108E+06
14	5	0.108E+06
14	6	0.251E+06
15	4	0.308E+05
15	5	0.308E+05
15	6	0.789E+05
16	4	0.287E+05
16	5	0.287E+05
16	6	0.574E+05
19	4	0.113E+07
19	5	0.478E+07
19	6	0.117E+07
200	4	0.119E+06
200	5	0.137E+06
200	6	0.256E+06
201	4	0.345E+06
201	5	0.374E+06
201	6	0.719E+06
202	4	0.355E+06
202	5	0.342E+06
202	6	0.352E+06
203	4	0.210E+06
203	5	0.248E+06
203	6	0.606E+06
204	4	0.189E+06
204	5	0.172E+06
204	6	0.499E+06
205	4	0.178E+04
205	5	0.133E+04
205	6	0.311E+04

206	4	0.242E+04
206	5	0.423E+04
206	6	0.665E+04
207	4	0.288E+03
207	5	0.354E+03
207	6	0.642E+03
101	4	0.363E+04
101	5	0.363E+04
101	6	0.727E+04
102	4	0.120E+05
102	5	0.120E+05
102	6	0.240E+05
103	4	0.145E+05
103	5	0.145E+05
103	6	0.290E+05
104	4	0.179E+05
104	5	0.179E+05
104	6	0.358E+05
105	4	0.346E+05
105	5	0.346E+05
105	6	0.691E+05
106	4	0.305E+05
106	5	0.305E+05
106	6	0.611E+05
107	4	0.318E+05
107	5	0.318E+05
107	6	0.637E+05
108	4	0.370E+05
108	5	0.370E+05
108	6	0.739E+05
109	4	0.404E+05
109	5	0.404E+05
109	6	0.807E+05
110	4	0.577E+05
110	5	0.577E+05
110	6	0.115E+06
111	4	0.249E+05
111	5	0.249E+05
111	6	0.498E+05
112	4	0.219E+05
112	5	0.219E+05
112	6	0.438E+05
113	4	0.154E+05
113	5	0.154E+05
113	6	0.308E+05
114	4	0.814E+04
114	5	0.814E+04
114	6	0.163E+05

```
CENTER OF GRAVITY DATA :
   TOTAL MASS =    0.792E+04  KIP SEC**2/FT
   X CG =    -7.520  FT
   Y CG =   -14.388  FT
   Z CG =   121.226  FT
```

NO COUPLED DEGREES OF FREEDOM

3 INDIVIDUALLY REST DOF

NODE	DIRECTION
116	4
116	5
116	6

FOLLOWING NODES HAVE ALL DOF RESTRAINED:

12	18	20	29	30	39	40	49	50	59	60	61	62	63
64	65	66	67	68	69	70	71	72	73	74	75	76	77
78	79	80	81	82	83	84	85	86	87	88	89	90	91
92	93	94	95	96	97	99	100	118	119	120	127	128	129
130	139	140	145	146	147	148	149	150	155	156	157	158	159
160	170	180	190	209	210	220	230	239	240				

RIGID LINKS

MASTER	SLAVE
11	17
19	1
19	2
19	3
19	21
19	41
19	31
19	32
4	33
5	34
6	35
7	36
8	37
9	38
19	22
19	23
4	24
5	25
6	26
7	27
8	28
19	51
19	52
4	53
5	54
6	55
7	56
8	57
9	58
19	42
19	43

4	44
5	45
6	46
7	47
8	48
9	98
201	221
201	241
201	212
201	232
202	222
202	242
202	213
202	233
203	223
203	243
203	214
203	234
204	224
204	244
204	215
204	235
204	216
204	236
205	225
205	245
206	226
206	246
206	217
206	237
207	227
207	247
208	218
208	238
110	117
106	123
121	124
103	125
122	126
19	161
19	171
19	181
19	191
19	162
19	172
19	182
19	192
4	163
4	173
4	183
4	193
5	164
5	174
5	184
5	194
6	165

6	175
6	185
6	195
7	166
7	176
7	186
7	196
8	167
8	177
8	187
8	197
9	168
9	178
9	188
9	198
10	169
10	179
10	189
10	199
203	131
203	132
203	133
203	134
204	135
204	136
204	137
204	138
104	141
107	142
110	143
113	144
104	151
107	152
110	153
113	154
19	200
19	211
19	231
19	101
19	219

EQUATION NUMBERS

NODE	DOF-1	DOF-2	DOF-3	DOF-4	DOF-5	DOF-6
1	1501	1501	1501	1501	1501	1501
2	1501	1501	1501	1501	1501	1501
3	1501	1501	1501	1501	1501	1501
4	1	2	3	4	5	6
5	7	8	9	10	11	12
6	13	14	15	16	17	18
7	19	20	21	22	23	24
8	25	26	27	28	29	30
9	31	32	33	34	35	36
10	37	38	39	40	41	42
11	43	44	45	46	47	48
12	0	0	0	0	0	0

13	49	50	51	52	53	54
14	55	56	57	58	59	60
15	61	62	63	64	65	66
16	67	68	69	70	71	72
17	1493	1493	1493	1493	1493	1493
18	0	0	0	0	0	0
19	73	74	75	76	77	78
20	0	0	0	0	0	0
21	1501	1501	1501	1501	1501	1501
22	1501	1501	1501	1501	1501	1501
23	1501	1501	1501	1501	1501	1501
24	1486	1486	1486	1486	1486	1486
25	1487	1487	1487	1487	1487	1487
26	1488	1488	1488	1488	1488	1488
27	1489	1489	1489	1489	1489	1489
28	1490	1490	1490	1490	1490	1490
29	0	0	0	0	0	0
30	0	0	0	0	0	0
31	1501	1501	1501	1501	1501	1501
32	1501	1501	1501	1501	1501	1501
33	1486	1486	1486	1486	1486	1486
34	1487	1487	1487	1487	1487	1487
35	1488	1488	1488	1488	1488	1488
36	1489	1489	1489	1489	1489	1489
37	1490	1490	1490	1490	1490	1490
38	1491	1491	1491	1491	1491	1491
39	0	0	0	0	0	0
40	0	0	0	0	0	0
41	1501	1501	1501	1501	1501	1501
42	1501	1501	1501	1501	1501	1501
43	1501	1501	1501	1501	1501	1501
44	1486	1486	1486	1486	1486	1486
45	1487	1487	1487	1487	1487	1487
46	1488	1488	1488	1488	1488	1488
47	1489	1489	1489	1489	1489	1489
48	1490	1490	1490	1490	1490	1490
49	0	0	0	0	0	0
50	0	0	0	0	0	0
51	1501	1501	1501	1501	1501	1501
52	1501	1501	1501	1501	1501	1501
53	1486	1486	1486	1486	1486	1486
54	1487	1487	1487	1487	1487	1487
55	1488	1488	1488	1488	1488	1488
56	1489	1489	1489	1489	1489	1489
57	1490	1490	1490	1490	1490	1490
58	1491	1491	1491	1491	1491	1491
59	0	0	0	0	0	0
60	0	0	0	0	0	0
61	0	0	0	0	0	0
62	0	0	0	0	0	0
63	0	0	0	0	0	0
64	0	0	0	0	0	0
65	0	0	0	0	0	0
66	0	0	0	0	0	0
67	0	0	0	0	0	0
68	0	0	0	0	0	0

69	0	0	0	0	0	0
70	0	0	0	0	0	0
71	0	0	0	0	0	0
72	0	0	0	0	0	0
73	0	0	0	0	0	0
74	0	0	0	0	0	0
75	0	0	0	0	0	0
76	0	0	0	0	0	0
77	0	0	0	0	0	0
78	0	0	0	0	0	0
79	0	0	0	0	0	0
80	0	0	0	0	0	0
81	0	0	0	0	0	0
82	0	0	0	0	0	0
83	0	0	0	0	0	0
84	0	0	0	0	0	0
85	0	0	0	0	0	0
86	0	0	0	0	0	0
87	0	0	0	0	0	0
88	0	0	0	0	0	0
89	0	0	0	0	0	0
90	0	0	0	0	0	0
91	0	0	0	0	0	0
92	0	0	0	0	0	0
93	0	0	0	0	0	0
94	0	0	0	0	0	0
95	0	0	0	0	0	0
96	0	0	0	0	0	0
97	0	0	0	0	0	0
98	1491	1491	1491	1491	1491	1491
99	0	0	0	0	0	0
100	0	0	0	0	0	0
101	1501	1501	1501	1501	1501	1501
102	79	80	81	82	83	84
103	85	86	87	88	89	90
104	91	92	93	94	95	96
105	97	98	99	100	101	102
106	103	104	105	106	107	108
107	109	110	111	112	113	114
108	115	116	117	118	119	120
109	121	122	123	124	125	126
110	127	128	129	130	131	132
111	133	134	135	136	137	138
112	139	140	141	142	143	144
113	145	146	147	148	149	150
114	151	152	153	154	155	156
115	157	158	159	160	161	162
116	163	164	165	0	0	0
117	1592	1592	1592	1592	1592	1592
118	0	0	0	0	0	0
119	0	0	0	0	0	0
120	0	0	0	0	0	0
121	166	167	168	169	170	171
122	172	173	174	175	176	177
123	1588	1588	1588	1588	1588	1588
124	1603	1603	1603	1603	1603	1603

125	1585	1585	1585	1585	1585	1585
126	1604	1604	1604	1604	1604	1604
127	0	0	0	0	0	0
128	0	0	0	0	0	0
129	0	0	0	0	0	0
130	0	0	0	0	0	0
131	1685	1685	1685	1685	1685	1685
132	1685	1685	1685	1685	1685	1685
133	1685	1685	1685	1685	1685	1685
134	1685	1685	1685	1685	1685	1685
135	1686	1686	1686	1686	1686	1686
136	1686	1686	1686	1686	1686	1686
137	1686	1686	1686	1686	1686	1686
138	1686	1686	1686	1686	1686	1686
139	0	0	0	0	0	0
140	0	0	0	0	0	0
141	1586	1586	1586	1586	1586	1586
142	1589	1589	1589	1589	1589	1589
143	1592	1592	1592	1592	1592	1592
144	1595	1595	1595	1595	1595	1595
145	0	0	0	0	0	0
146	0	0	0	0	0	0
147	0	0	0	0	0	0
148	0	0	0	0	0	0
149	0	0	0	0	0	0
150	0	0	0	0	0	0
151	1586	1586	1586	1586	1586	1586
152	1589	1589	1589	1589	1589	1589
153	1592	1592	1592	1592	1592	1592
154	1595	1595	1595	1595	1595	1595
155	0	0	0	0	0	0
156	0	0	0	0	0	0
157	0	0	0	0	0	0
158	0	0	0	0	0	0
159	0	0	0	0	0	0
160	0	0	0	0	0	0
161	1501	1501	1501	1501	1501	1501
162	1501	1501	1501	1501	1501	1501
163	1486	1486	1486	1486	1486	1486
164	1487	1487	1487	1487	1487	1487
165	1488	1488	1488	1488	1488	1488
166	1489	1489	1489	1489	1489	1489
167	1490	1490	1490	1490	1490	1490
168	1491	1491	1491	1491	1491	1491
169	1492	1492	1492	1492	1492	1492
170	0	0	0	0	0	0
171	1501	1501	1501	1501	1501	1501
172	1501	1501	1501	1501	1501	1501
173	1486	1486	1486	1486	1486	1486
174	1487	1487	1487	1487	1487	1487
175	1488	1488	1488	1488	1488	1488
176	1489	1489	1489	1489	1489	1489
177	1490	1490	1490	1490	1490	1490
178	1491	1491	1491	1491	1491	1491
179	1492	1492	1492	1492	1492	1492
180	0	0	0	0	0	0

181	1501	1501	1501	1501	1501	1501
182	1501	1501	1501	1501	1501	1501
183	1486	1486	1486	1486	1486	1486
184	1487	1487	1487	1487	1487	1487
185	1488	1488	1488	1488	1488	1488
186	1489	1489	1489	1489	1489	1489
187	1490	1490	1490	1490	1490	1490
188	1491	1491	1491	1491	1491	1491
189	1492	1492	1492	1492	1492	1492
190	0	0	0	0	0	0
191	1501	1501	1501	1501	1501	1501
192	1501	1501	1501	1501	1501	1501
193	1486	1486	1486	1486	1486	1486
194	1487	1487	1487	1487	1487	1487
195	1488	1488	1488	1488	1488	1488
196	1489	1489	1489	1489	1489	1489
197	1490	1490	1490	1490	1490	1490
198	1491	1491	1491	1491	1491	1491
199	1492	1492	1492	1492	1492	1492
200	1501	1501	1501	1501	1501	1501
201	178	179	180	181	182	183
202	184	185	186	187	188	189
203	190	191	192	193	194	195
204	196	197	198	199	200	201
205	202	203	204	205	206	207
206	208	209	210	211	212	213
207	214	215	216	217	218	219
208	220	221	222	223	224	225
209	0	0	0	0	0	0
210	0	0	0	0	0	0
211	1501	1501	1501	1501	1501	1501
212	1683	1683	1683	1683	1683	1683
213	1684	1684	1684	1684	1684	1684
214	1685	1685	1685	1685	1685	1685
215	1686	1686	1686	1686	1686	1686
216	1686	1686	1686	1686	1686	1686
217	1688	1688	1688	1688	1688	1688
218	1690	1690	1690	1690	1690	1690
219	1501	1501	1501	1501	1501	1501
220	0	0	0	0	0	0
221	1683	1683	1683	1683	1683	1683
222	1684	1684	1684	1684	1684	1684
223	1685	1685	1685	1685	1685	1685
224	1686	1686	1686	1686	1686	1686
225	1687	1687	1687	1687	1687	1687
226	1688	1688	1688	1688	1688	1688
227	1689	1689	1689	1689	1689	1689
228	226	227	228	229	230	231
229	232	233	234	235	236	237
230	0	0	0	0	0	0
231	1501	1501	1501	1501	1501	1501
232	1683	1683	1683	1683	1683	1683
233	1684	1684	1684	1684	1684	1684
234	1685	1685	1685	1685	1685	1685
235	1686	1686	1686	1686	1686	1686
236	1686	1686	1686	1686	1686	1686

237	1688	1688	1688	1688	1688	1688
238	1690	1690	1690	1690	1690	1690
239	0	0	0	0	0	0
240	0	0	0	0	0	0
241	1683	1683	1683	1683	1683	1683
242	1684	1684	1684	1684	1684	1684
243	1685	1685	1685	1685	1685	1685
244	1686	1686	1686	1686	1686	1686
245	1687	1687	1687	1687	1687	1687
246	1688	1688	1688	1688	1688	1688
247	1689	1689	1689	1689	1689	1689

1 B E A M D A T A

NUMBER OF MATERIAL GROUPS = 3

NUMBER	YOUNG MODULUS	SHEAR MODULUS	DAMPING RATIO
1	0.519E+06	0.222E+06	7.000
2	0.519E+06	0.222E+06	5.000
3	0.425E+07	0.163E+07	4.000

NUMBER OF SECTION PROPERTY GROUPS = 29

NO		AREAS		MOMENTS OF INERTIA		
	SECTION	SHEAR-Y	SHEAR-Z	ABOUT Y	ABOUT Z	TORSION
1	0.100E-02	0.120E+05	0.129E+05	0.196E+08	0.252E+08	0.346E+08
2	0.100E-02	0.107E+04	0.115E+04	0.500E+06	0.123E+07	0.195E+07
3	0.100E-02	0.190E+04	0.144E+04	0.685E+07	0.239E+08	0.160E+08
4	0.100E-02	0.175E+04	0.149E+04	0.725E+07	0.256E+08	0.173E+08
5	0.100E-02	0.111E+04	0.974E+03	0.619E+07	0.148E+08	0.121E+08
6	0.100E-02	0.899E+03	0.878E+03	0.507E+07	0.701E+07	0.915E+07
7	0.100E-02	0.663E+03	0.773E+03	0.414E+07	0.673E+07	0.785E+07
8	0.100E-02	0.454E+03	0.478E+03	0.269E+07	0.250E+07	0.495E+07
9	0.137E+04	0.447E+03	0.474E+03	0.271E+07	0.252E+07	0.498E+07
10	0.136E+04	0.429E+03	0.458E+03	0.272E+07	0.252E+07	0.501E+07
11	0.133E+04	0.666E+04	0.666E+04	0.335E+07	0.335E+07	0.669E+07
12	0.694E+08	0.694E+08	0.694E+08	0.868E+13	0.868E+13	0.868E+13
13	0.831E+03	0.416E+03	0.416E+03	0.498E+06	0.498E+06	0.996E+06
14	0.730E+03	0.365E+03	0.365E+03	0.397E+06	0.397E+06	0.794E+06
15	0.627E+01	0.392E+02	0.392E+02	0.110E+05	0.110E+05	0.191E+06
16	0.100E-03	0.438E+04	0.447E+04	0.673E+07	0.726E+07	0.127E+08
17	0.100E-03	0.321E+04	0.321E+04	0.577E+07	0.585E+07	0.975E+07
18	0.100E-03	0.221E+04	0.218E+04	0.353E+07	0.447E+07	0.645E+07
19	0.100E-03	0.459E+03	0.338E+03	0.839E+06	0.913E+06	0.660E+06
20	0.100E-03	0.670E+02	0.750E+02	0.323E+05	0.253E+05	0.370E+05
21	0.100E-03	0.116E+03	0.104E+03	0.442E+05	0.679E+05	0.618E+05
22	0.100E-03	0.430E+02	0.380E+02	0.619E+04	0.748E+04	0.101E+05
23	0.143E+02	0.257E+02	0.257E+02	0.283E+05	0.283E+05	0.230E+06
24	0.596E+02	0.298E+02	0.298E+02	0.126E+06	0.126E+06	0.252E+06
25	0.554E+02	0.277E+02	0.277E+02	0.117E+06	0.117E+06	0.234E+06
26	0.123E+02	0.271E+02	0.271E+02	0.110E+06	0.110E+06	0.220E+06
27	0.389E+01	0.246E+02	0.246E+02	0.837E+05	0.837E+05	0.167E+06
28	0.232E+01	0.199E+02	0.199E+02	0.460E+05	0.460E+05	0.921E+05
29	0.520E+00	0.858E+01	0.858E+01	0.139E+05	0.139E+05	0.277E+05

BEAM ELEMENT PROPERTIES

NO	MATERIAL	SECTION	NODE-A	NODE-B	NODE-K
1	1	1	21	31	71
2	1	2	22	32	72
3	1	3	23	33	73
4	1	4	24	34	74
5	1	5	25	35	75
6	1	6	26	36	76
7	1	7	27	37	77
8	1	8	28	38	78
9	1	9	98	10	79
10	1	10	10	11	80
11	1	13	13	14	80
12	1	14	14	15	80
13	1	14	15	16	80
14	1	15	13	17	80
15	1	16	211	218	208
16	1	16	218	221	208
17	1	17	212	219	209
18	1	17	219	222	209
19	1	18	213	223	210
20	2	19	214	228	218
21	2	19	228	224	218
22	2	20	215	225	219
23	2	21	216	226	220
24	2	22	217	229	230
25	2	22	229	227	230
26	3	23	101	102	119
27	3	24	102	122	119
28	3	24	103	104	119
29	3	25	104	105	119
30	3	25	105	121	119
31	3	25	106	107	119
32	3	25	107	108	119
33	3	25	108	109	119
34	3	25	109	110	119
35	3	25	110	111	119
36	3	26	111	112	119
37	3	27	112	113	119
38	3	28	113	114	119
39	3	29	114	115	119
40	3	24	122	103	119
41	3	25	121	106	119

S P R I N G   D A T A

SPRING NO. 1 START ,END ,K-NODE : 41 51 48
LATERAL KX, KY, KZ(Z-DIR. OF AXIAL) : 0.6250E+09 0.0000E+00
0.0000E+00
ROTARY MX, MY, MZ : 0.0000E+00 0.0000E+00
0.0000E+00
COUPLING STIFFNESS: MX-KX, MY-KX, MZ-KX, MY-KY, MZ-KY,MZ-KZ
0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00
0.0000E+00
SPRING NO. 2 START ,END ,K-NODE : 42 52 49
LATERAL KX, KY, KZ(Z-DIR. OF AXIAL) : 0.1331E+09 0.0000E+00
0.0000E+00
ROTARY MX, MY, MZ : 0.0000E+00 0.0000E+00

```
0.0000E+00
     COUPLING STIFFNESS: MX-KX, MY-KX, MZ-KX, MY-KY, MZ-KY,MZ-KZ
       0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00
0.0000E+00
  SPRING NO.     3 START ,END ,K-NODE : 43   53   50
     LATERAL KX, KY, KZ(Z-DIR. OF AXIAL) :  0.1434E+09   0.0000E+00
0.0000E+00
     ROTARY  MX, MY, MZ                   :  0.0000E+00   0.0000E+00
0.0000E+00
     COUPLING STIFFNESS: MX-KX, MY-KX, MZ-KX, MY-KY, MZ-KY,MZ-KZ
       0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00
0.0000E+00
  SPRING NO.     4 START ,END ,K-NODE : 44   54   58
     LATERAL KX, KY, KZ(Z-DIR. OF AXIAL) :  0.1484E+09   0.0000E+00
0.0000E+00
     ROTARY  MX, MY, MZ                   :  0.0000E+00   0.0000E+00
0.0000E+00
     COUPLING STIFFNESS: MX-KX, MY-KX, MZ-KX, MY-KY, MZ-KY,MZ-KZ
       0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00
0.0000E+00
  SPRING NO.     5 START ,END ,K-NODE : 45   55   59
     LATERAL KX, KY, KZ(Z-DIR. OF AXIAL) :  0.8943E+08   0.0000E+00
0.0000E+00
     ROTARY  MX, MY, MZ                   :  0.0000E+00   0.0000E+00
0.0000E+00
     COUPLING STIFFNESS: MX-KX, MY-KX, MZ-KX, MY-KY, MZ-KY,MZ-KZ
       0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00
0.0000E+00
  SPRING NO.     6 START ,END ,K-NODE : 46   56   98
     LATERAL KX, KY, KZ(Z-DIR. OF AXIAL) :  0.1526E+09   0.0000E+00
0.0000E+00
     ROTARY  MX, MY, MZ                   :  0.0000E+00   0.0000E+00
0.0000E+00
     COUPLING STIFFNESS: MX-KX, MY-KX, MZ-KX, MY-KY, MZ-KY,MZ-KZ
       0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00
0.0000E+00
  SPRING NO.     7 START ,END ,K-NODE : 47   57   99
     LATERAL KX, KY, KZ(Z-DIR. OF AXIAL) :  0.5935E+08   0.0000E+00
0.0000E+00
     ROTARY  MX, MY, MZ                   :  0.0000E+00   0.0000E+00
0.0000E+00
     COUPLING STIFFNESS: MX-KX, MY-KX, MZ-KX, MY-KY, MZ-KY,MZ-KZ
       0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00
0.0000E+00
  SPRING NO.     8 START ,END ,K-NODE : 48   58   99
     LATERAL KX, KY, KZ(Z-DIR. OF AXIAL) :  0.3731E+08   0.0000E+00
0.0000E+00
     ROTARY  MX, MY, MZ                   :  0.0000E+00   0.0000E+00
0.0000E+00
     COUPLING STIFFNESS: MX-KX, MY-KX, MZ-KX, MY-KY, MZ-KY,MZ-KZ
       0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00
0.0000E+00
  SPRING NO.     9 START ,END ,K-NODE :231  238  140
     LATERAL KX, KY, KZ(Z-DIR. OF AXIAL) :  0.1074E+10   0.0000E+00
0.0000E+00
     ROTARY  MX, MY, MZ                   :  0.0000E+00   0.0000E+00
```

```
0.0000E+00
    COUPLING STIFFNESS: MX-KX, MY-KX, MZ-KX, MY-KY, MZ-KY,MZ-KZ
      0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00
0.0000E+00
  SPRING NO.    10 START ,END ,K-NODE :238  241  140
    LATERAL KX, KY, KZ(Z-DIR. OF AXIAL) :  0.4558E+09   0.0000E+00
0.0000E+00
    ROTARY  MX, MY, MZ                  :  0.0000E+00   0.0000E+00
0.0000E+00
    COUPLING STIFFNESS: MX-KX, MY-KX, MZ-KX, MY-KY, MZ-KY,MZ-KZ
      0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00
0.0000E+00
  SPRING NO.    11 START ,END ,K-NODE :232  242  146
    LATERAL KX, KY, KZ(Z-DIR. OF AXIAL) :  0.7751E+09   0.0000E+00
0.0000E+00
    ROTARY  MX, MY, MZ                  :  0.0000E+00   0.0000E+00
0.0000E+00
    COUPLING STIFFNESS: MX-KX, MY-KX, MZ-KX, MY-KY, MZ-KY,MZ-KZ
      0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00
0.0000E+00
  SPRING NO.    12 START ,END ,K-NODE :233  243  147
    LATERAL KX, KY, KZ(Z-DIR. OF AXIAL) :  0.6685E+09   0.0000E+00
0.0000E+00
    ROTARY  MX, MY, MZ                  :  0.0000E+00   0.0000E+00
0.0000E+00
    COUPLING STIFFNESS: MX-KX, MY-KX, MZ-KX, MY-KY, MZ-KY,MZ-KZ
      0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00
0.0000E+00
  SPRING NO.    13 START ,END ,K-NODE :234  244  228
    LATERAL KX, KY, KZ(Z-DIR. OF AXIAL) :  0.3391E+08   0.0000E+00
0.0000E+00
    ROTARY  MX, MY, MZ                  :  0.0000E+00   0.0000E+00
0.0000E+00
    COUPLING STIFFNESS: MX-KX, MY-KX, MZ-KX, MY-KY, MZ-KY,MZ-KZ
      0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00
0.0000E+00
  SPRING NO.    14 START ,END ,K-NODE :235  245  229
    LATERAL KX, KY, KZ(Z-DIR. OF AXIAL) :  0.1437E+08   0.0000E+00
0.0000E+00
    ROTARY  MX, MY, MZ                  :  0.0000E+00   0.0000E+00
0.0000E+00
    COUPLING STIFFNESS: MX-KX, MY-KX, MZ-KX, MY-KY, MZ-KY,MZ-KZ
      0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00
0.0000E+00
  SPRING NO.    15 START ,END ,K-NODE :236  246  238
    LATERAL KX, KY, KZ(Z-DIR. OF AXIAL) :  0.2162E+08   0.0000E+00
0.0000E+00
    ROTARY  MX, MY, MZ                  :  0.0000E+00   0.0000E+00
0.0000E+00
    COUPLING STIFFNESS: MX-KX, MY-KX, MZ-KX, MY-KY, MZ-KY,MZ-KZ
      0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00
0.0000E+00
  SPRING NO.    16 START ,END ,K-NODE :237  247  239
    LATERAL KX, KY, KZ(Z-DIR. OF AXIAL) :  0.1127E+08   0.0000E+00
0.0000E+00
    ROTARY  MX, MY, MZ                  :  0.0000E+00   0.0000E+00
```

0.0000E+00
COUPLING STIFFNESS: MX-KX, MY-KX, MZ-KX, MY-KY, MZ-KY,MZ-KZ
0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00
0.0000E+00
SPRING NO. 17 START ,END ,K-NODE :110 116 119
LATERAL KX, KY, KZ(Z-DIR. OF AXIAL) : 0.2260E+05 0.3770E+04
0.1560E+05
ROTARY MX, MY, MZ : 0.1000E+01 0.1000E+01
0.1000E+01
COUPLING STIFFNESS: MX-KX, MY-KX, MZ-KX, MY-KY, MZ-KY,MZ-KZ
0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00
0.0000E+00

I N T E R A C T I O N D A T A

NODE = 19
RECT FOUND SSI COEFF :

SOIL PROPERTIES (BELOW FOUNDATION):

SHEAR MODULUS	=	53851.0000
POISSON RATIO	=	.3500
SOIL DENSITY	=	.1500
SOIL PROPERTIES (SIDEWALL):		
SHEAR MODULUS	=	53851.0000
POISSON RATIO	=	.3500
SOIL DENSITY	=	.1500
SOIL DAMPING RATIO	=	3.0000
DEPTH OF BURIAL	=	39.5000
LENGTH IN (1) DIR	=	254.0000
LENGTH IN (2) DIR	=	158.3200

MAXIMUM BANDWIDTH IN K MATRIX = 153

ELEMENT NUMBER	BANDWIDTH
1	6
2	6
3	78
4	12
5	12
6	12
7	12
8	12
9	12
10	12
11	12
12	12
13	12
14	12
15	153
16	48
17	111
18	117
19	12
20	42
21	36
22	12

23	18
24	30
25	24
26	12
27	99
28	12
29	12
30	75
31	12
32	12
33	12
34	12
35	12
36	12
37	12
38	12
39	12
40	93
41	69

MAXIMUM BANDWIDTH IN K MATRIX = 153

ELEMENT NUMBER	BANDWIDTH
1	6
2	6
3	78
4	12
5	12
6	12
7	12
8	12
9	153
10	48
11	12
12	12
13	12
14	12
15	18
16	12
17	39

MODE SHAPE MODE 1

0.126E-02	-0.623E-04	-0.247E-03	0.649E-08	0.172E-04	-0.280E-05
0.288E-02	-0.115E-03	-0.469E-03	0.116E-07	0.315E-04	-0.567E-05
0.545E-02	-0.291E-03	0.152E-05	0.193E-07	0.459E-04	-0.864E-05
0.685E-02	0.140E-03	0.211E-02	0.250E-07	0.527E-04	-0.114E-04
0.111E-01	0.177E-03	0.236E-02	0.377E-07	0.693E-04	-0.140E-04
0.172E-01	-0.366E-03	-0.320E-03	0.715E-07	0.901E-04	-0.140E-04
0.233E-01	-0.374E-03	-0.312E-03	0.912E-07	0.105E-03	-0.140E-04
0.296E-01	-0.384E-03	-0.313E-03	0.981E-07	0.115E-03	-0.140E-04
0.375E-01	-0.388E-03	-0.313E-03	0.982E-07	0.194E-03	-0.140E-04
0.407E-01	-0.389E-03	-0.313E-03	0.982E-07	0.198E-03	-0.140E-04
0.438E-01	-0.390E-03	-0.313E-03	0.982E-07	0.201E-03	-0.140E-04
0.458E-01	-0.391E-03	-0.313E-03	0.982E-07	0.201E-03	-0.140E-04
0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
0.227E-05	0.196E-19	0.609E-24	-0.410E-22	0.936E-07	0.105E-27
0.573E-05	0.201E-19	0.610E-24	-0.422E-22	0.116E-06	0.105E-27
0.762E-05	0.204E-19	0.611E-24	-0.427E-22	0.127E-06	0.105E-27

0.149E-04	0.214E-19	0.614E-24	-0.444E-22	0.164E-06	0.105E-27
0.210E-04	0.223E-19	0.615E-24	-0.454E-22	0.189E-06	0.105E-27
0.300E-04	0.233E-19	0.617E-24	-0.465E-22	0.216E-06	0.105E-27
0.342E-04	0.238E-19	0.618E-24	-0.469E-22	0.226E-06	0.105E-27
0.447E-04	0.250E-19	0.619E-24	-0.475E-22	0.242E-06	0.105E-27
0.526E-04	0.259E-19	0.621E-24	-0.476E-22	0.248E-06	0.105E-27
0.569E-04	0.265E-19	0.621E-24	-0.476E-22	0.250E-06	0.105E-27
0.602E-04	0.271E-19	0.621E-24	-0.477E-22	0.251E-06	0.105E-27
0.634E-04	0.276E-19	0.621E-24	-0.477E-22	0.252E-06	0.105E-27
0.656E-04	0.280E-19	0.621E-24	-0.477E-22	0.252E-06	0.105E-27
0.679E-04	0.283E-19	0.621E-24	-0.477E-22	0.252E-06	0.105E-27
0.383E-03	0.259E-19	0.621E-24	0.180E-04	0.219E-19	0.615E-24
-0.450E-22	0.177E-06	0.105E-27	0.489E-05	0.200E-19	0.610E-24
-0.419E-22	0.111E-06	0.105E-27	-0.335E-42	-0.687E-42	0.947E-41
0.232E-41	-0.106E-41	0.140E-44	0.593E-32	0.232E-35	-0.823E-34
0.571E-38	0.488E-34	-0.134E-34	0.199E-31	0.101E-32	0.984E-33
-0.212E-36	0.149E-33	-0.120E-33	0.474E-30	0.453E-31	-0.323E-32
0.533E-34	0.153E-32	-0.189E-32	0.443E-30	0.556E-31	0.195E-32
0.711E-34	0.184E-32	-0.161E-32	0.612E-30	0.375E-31	-0.831E-32
0.615E-34	0.228E-32	-0.221E-32	0.670E-30	0.117E-31	-0.339E-31
0.646E-34	0.283E-32	-0.210E-32	0.172E-41	0.371E-41	-0.821E-42
0.736E-42	-0.338E-42	0.000E+00	0.246E-30	0.352E-31	-0.108E-31
0.400E-34	0.116E-32	-0.107E-32	0.643E-30	0.967E-32	-0.367E-31
0.640E-34	0.272E-32	-0.215E-32			

MODE SHAPE MODE 2

-0.299E-05	0.148E-06	0.589E-06	-0.154E-10	-0.409E-07	0.667E-08
-0.685E-05	0.273E-06	0.112E-05	-0.276E-10	-0.749E-07	0.135E-07
-0.130E-04	0.692E-06	-0.362E-08	-0.460E-10	-0.109E-06	0.206E-07
-0.163E-04	-0.333E-06	-0.501E-05	-0.594E-10	-0.125E-06	0.271E-07
-0.264E-04	-0.422E-06	-0.562E-05	-0.898E-10	-0.165E-06	0.332E-07
-0.410E-04	0.871E-06	0.762E-06	-0.170E-09	-0.215E-06	0.334E-07
-0.554E-04	0.890E-06	0.743E-06	-0.217E-09	-0.250E-06	0.334E-07
-0.704E-04	0.915E-06	0.745E-06	-0.234E-09	-0.273E-06	0.334E-07
-0.892E-04	0.922E-06	0.745E-06	-0.234E-09	-0.461E-06	0.334E-07
-0.969E-04	0.925E-06	0.745E-06	-0.234E-09	-0.472E-06	0.334E-07
-0.104E-03	0.928E-06	0.745E-06	-0.234E-09	-0.478E-06	0.334E-07
-0.109E-03	0.930E-06	0.745E-06	-0.234E-09	-0.479E-06	0.334E-07
0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
0.124E-02	0.270E-08	0.243E-10	-0.588E-11	0.510E-04	0.388E-14
0.312E-02	0.278E-08	0.244E-10	-0.604E-11	0.632E-04	0.388E-14
0.414E-02	0.282E-08	0.244E-10	-0.612E-11	0.692E-04	0.388E-14
0.811E-02	0.297E-08	0.245E-10	-0.636E-11	0.894E-04	0.388E-14
0.114E-01	0.308E-08	0.246E-10	-0.650E-11	0.103E-03	0.388E-14
0.163E-01	0.323E-08	0.247E-10	-0.665E-11	0.118E-03	0.389E-14
0.186E-01	0.330E-08	0.247E-10	-0.670E-11	0.123E-03	0.389E-14
0.243E-01	0.347E-08	0.248E-10	-0.679E-11	0.132E-03	0.389E-14
0.286E-01	0.360E-08	0.248E-10	-0.681E-11	0.135E-03	0.389E-14
0.309E-01	0.369E-08	0.248E-10	-0.681E-11	0.136E-03	0.389E-14
0.327E-01	0.377E-08	0.248E-10	-0.681E-11	0.137E-03	0.389E-14
0.345E-01	0.384E-08	0.248E-10	-0.681E-11	0.137E-03	0.389E-14
0.357E-01	0.389E-08	0.248E-10	-0.681E-11	0.137E-03	0.389E-14
0.369E-01	0.395E-08	0.248E-10	-0.681E-11	0.137E-03	0.389E-14
0.208E+00	0.360E-08	0.248E-10	0.980E-02	0.303E-08	0.246E-10
-0.644E-11	0.965E-04	0.388E-14	0.266E-02	0.276E-08	0.244E-10
-0.600E-11	0.604E-04	0.388E-14	-0.666E-25	-0.137E-24	0.188E-23
0.461E-24	-0.211E-24	0.349E-27	0.118E-14	0.461E-18	-0.164E-16

0.114E-20	0.971E-17	-0.267E-17	0.395E-14	0.200E-15	0.196E-15
-0.422E-19	0.296E-16	-0.239E-16	0.943E-13	0.901E-14	-0.642E-15
0.106E-16	0.304E-15	-0.375E-15	0.882E-13	0.111E-13	0.388E-15
0.141E-16	0.366E-15	-0.321E-15	0.122E-12	0.747E-14	-0.165E-14
0.122E-16	0.453E-15	-0.440E-15	0.133E-12	0.233E-14	-0.674E-14
0.128E-16	0.563E-15	-0.417E-15	0.341E-24	0.738E-24	-0.163E-24
0.146E-24	-0.670E-25	0.117E-27	0.490E-13	0.700E-14	-0.214E-14
0.796E-17	0.232E-15	-0.214E-15	0.128E-12	0.192E-14	-0.731E-14
0.127E-16	0.542E-15	-0.427E-15			

COMPOSITE DAMPING MATRIX
OMIGA1 = 27.665 P1 = 0.0700
OMIGA2 = 31.465 P2 = 0.0400
DAMPING MATRIX = 0.849E+01 * M + -0.604E-02 * K
NO INPUT DIRECTION 1

PULSE IN DIRECTION : 2
READ FROM FILE : H240.FC
PULSE TITLE : CONVOLVED MOTION: DECONVOLV
NUMBER OF FREQS = 1025
SCALE FACTOR = 0.083

NO INPUT DIRECTION 3

Appendix E

PSD PLOTTING SAMPLES

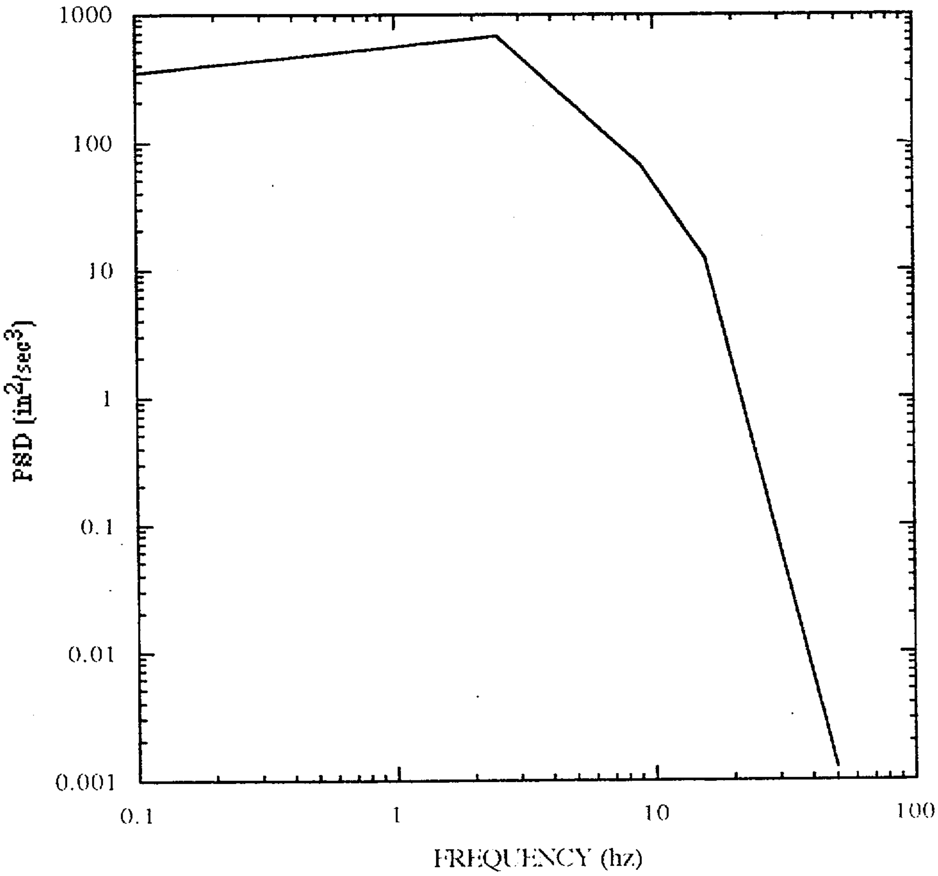
EXAMPLE: GENERATE ACCELEROGRAM FROM DEFINED PSD

```
  **************************************************
  **************************************************
*****          C A R E S (POST)              *****
  **************************************************
  **************************************************
* ANALYSIS #                                        *
*                                                   *
* 1. COMPUTES TIME HISTORY                          *
*    FOR GIVEN FOURIER COMPONENTS                   *
*                                                   *
* 2. GENERATES RESPONSE SPECTRA FOR GIVEN           *
*    ACCELERATION TIME HISTORY.                     *
*                                                   *
* 3. GENERATES RESPONSE SPECTRA FOR GIVEN           *
*    SSI OUTPUT DATA                                *
*                                                   *
* 4. PSD-RELATED ACCEL TIME HISTORY                 *
*    SPECTRA ANALYSIS                               *
*                                                   *
* 5. EXIT FROM CARES                                *
*                                                   *
  **************************************************


INPUT ITEM  FOR THE ANALYSIS..(1,2,3,4 or 5) ?   4
ANALYSIS #  =   4

IS THIS CORRECT (Y/N)    y

  ******************************************************
*                                                      *
*               C A R E S    S Y S T E M               *
*                    (MODULE: SEISMIC)                 *
*   OPTION 7 : PSD-RELATED TIME HISTORY AND RESPONSE   *
*                 SPECTRA ANALYSES.                    *
* PERFORMS THE FOLLOWING THREE TASKS:                  *
*(1)GENERATES ACCEL TIME HISTORIES ACCORDING TO A      *
*   USER-SUPPLIED TARGET PSD FUNCTION;                 *
*(2)PERFORMS OPTIONAL CLIPPING OF THE GENERATED ACCEL*
*   TIME HISTORY AND THEN CALCULATES THE PSD FUNCTION*
*   OF THE CLIPPED OR NON-CLIPPED ACCEL TIME HISTORY *
*(3)MULTIPLIES THE CLIPPED OR NON-CLIPPED ACCEL TIME *
*   HISTORY BY AN ENVELOPE FUNCTION AND THEN           *
*   CALCULATE THE ACCEL, VELO, DISPL AND PSEUDO-VELO *
*   RESPONSE SPECTRA.                                  *
  ******************************************************


        PRESS RETURN KEY TO CONTINUE WHEN READY
PAUSE: To resume execution, type:   go
Any other input will terminate the program.    go
Execution resumed after PAUSE.
```

```
IN ORDER TO DESCRIBE USER-SUPPLIED TARGET PSD
ENTER THE FOLLOWING PARAMETERS :

S1 , W1 , W2 , W3  , E0 , E1 , E2 , E3

S1---MUST BE POSITIVE AND MEASURED IN  IN**2/SEC**3
0 < W1 < W2 < W3 < WUPPER MUST BE SATISFIED
AND W1 ,W2 , W3 ARE MEASURED IN RAD/SEC.

 650,15.71,56.55,100.5,0.2,1.8,3,8

S1 =   6.500E+02 W1 =   1.571E+01 W2 =   5.655E+01
W3 =   1.005E+02 E0 =   2.000E-01 E1 =   1.800E+00
E2 =   3.000E+00 E3 =   8.000E+00
ARE THESE DATA CORRECT...................(Y/N) ?     y

ENTER THE FOLLOWING PARAMETERS TO DEFINE ACCEL:
NPT ,   NPTPWR   ,   DT

NPT---NO. OF PTS IN THE ACCEL. AND MUST BE A POWER OF 2
      UP TO MAX NO. OF 4096.
NPTPWR(<=10)--POWER TO WHICH 2 IS RAISED TO OBTAIN NPT.
DT---TIME STEP (SEC)

4096,12,0.01

TOTAL ACCEL DIGITIZED PTS    =  4096
POWER TO WHICH 2 IS RAISED   =   12
TIME STEP                    =  1.000E-02
ARE THESE DATA CORRECT..........................(Y/N) ?   y

ENTER THE FOLLOWING PARAMETERS :
WUPPER , F2UPPER , NENVEL ,ICLIP
WUPPER---UPPER CUT-OFF FREQ(RAD/SEC) BEYOND WHICH TARGET
         PSD IS CONSIDERED TO BE EQUAL TO ZERO
F2UPPER--CLIPPING VALUE (IN/SEC**2) FOR ACCEL HISTORY
NENVEL---ACCEL POINT AT WHICH RISE OF ENVELOPE FUNC ENDS
         CONSTANT PART OF ENVELOPE FUNC BEGINS.
         1 < NENVEL < NPT MUST BE OBEYED
ICLIP----IF ICLIP=0 DO NOT PERFORM CLIPPING
         IF ICLIP=1 PERFORM CLIPPING

314.2,386.4,300,1

WUPPER =   3.142E+02 F2UPPER =   3.864E+02
NENVEL =  300        ICLIP =     1
ARE THESE DATA CORRECT........................(Y/N) ?     y

ENTER A POSITIVE NUMBER FOR RANDOM NUMBER GENERATOR:      2
ENTER THE FOLLOWING PARAMETERS FOR CALCULATION
OF RESPONSE SPECTRA :
DAMP   ,  ISPECTR
DAMP---PERCENTAGE OF DAMPING FOR THE SPECTRA (%)
ISPECTR = 1 ,ACCEL RESPONSE SPECTRUM
ISPECTR = 2 ,VELOCITY RESPONSE SPECTRUM
ISPECTR = 3 ,DISPLACEMENT RESPONSE SPECTRUM
ISPECTR = 4 ,PSEUDO-VELOCITY RESPONSE SPECTRUM
```

```
5,1

DAMP =  5.000E+00%  ISPECTR =     1
 ARE THESE DATA CORRECT............................(Y/N) ?     y

 SOLUTION PROCESS BEGINS :
 DO YOU WANT TO SAVE THE TARGET PSD........(Y/N) ?     y
 NAME OF THE FILE STORING THE TARGET PSD :             yang.psd
 WISH TO SAVE ACCEL TIME HISTORY...............(Y/N)? y
 ENTER NAME OF FILE STORING ACCEL HISTORY :            yang.accel
 TYPE TITLE 1 FOR THIS RECORD (<78CHARACTERS) :        This is a test!
 ENTER FILE NAME FOR SAVING GENERATED PSD :             yang.psd.generated
 FILE NAME FOR RESPONSE SPECTRUM FILE :                yang.sp


  **************************************************
  **************************************************
*****              C A R E S (POST)            *****
  **************************************************
  **************************************************
* ANALYSIS #                                        *
*                                                   *
* 1. COMPUTES TIME HISTORY                          *
*     FOR GIVEN FOURIER COMPONENTS                  *
*                                                   *
* 2. GENERATES RESPONSE SPECTRA FOR GIVEN           *
*     ACCELERATION TIME HISTORY.                    *
*                                                   *
* 3. GENERATES RESPONSE SPECTRA FOR GIVEN           *
*     SSI OUTPUT DATA                               *
*                                                   *
* 4. PSD-RELATED ACCEL TIME HISTORY                 *
*     SPECTRA ANALYSIS                              *
*                                                   *
* 5. EXIT FROM CARES                                *
*                                                   *
  **************************************************


 INPUT ITEM  FOR THE ANALYSIS..(1,2,3,4 or 5) ?     5
 ANALYSIS #  =    5

 IS THIS CORRECT (Y/N)     y
```

INPUT PSD POLYGONAL FUNCTION USED FOR THIS EXAMPLE IS SHOWN IN THE FOLLOWING FIGURE



PARAMETERS FOR RG 1.60 PSD CRITERIA (5% Damping)

Frequency (hz)	Frequency (rad/sec)	PSD (in^2/sec^3)	LOG-LOG SLOPE
0.1	0.628	341.45	0.2
1.0	6.283	541.16	0.2
2.5	15.708	650.00	1.8
9.0	56.549	65.00	3.0
16.00	100.531	11.57	8.0
50.00	314.159	0.00127	

EXAMPLE ONE SIDED TARGET POLYGONAL PSD FUNCTION

EXAMPLE: PLOT PREVIOUSLY GENERATED PSD FUNCTION FOR A GIVEN ACCELERATION RECORD

```
  **************************************************
 *                                                 *
 *       C A R E S P L O T      S Y S T E M        *
 *                                                 *
 *                 (MODULE: SEISMIC)               *
 *  --GENERAL PLOTTING PROGRAM FOR CARES SYSTEM--  *
 *    PLOTTING OPTIONS:                            *
 *      1.CONVERTS INPUT ACCELERATION TIME HISTORY *
 *        DATA FILE TO CARES FORMAT                *
 *      2.PLOT TIME HISTORIES                      *
 *      3.PLOT RESPONSE SPECTRA                    *
 *      4.PLOT AMPLIFICATION/PSD FUNCTIONS         *
 *      5.PLOT GENERAL X-Y  GRAPHS                 *
 *      6.EXIT FROM CARES                          *
  **************************************************

SELECT AN OPT. YOU WISH TO EXECUTE...(1 thru 6)?

1.CONVERT ACCELERATION FILE.
2.PLOT TIME HISTORIES.
3.PLOT RESPONSE SPECTRA.
4.PLOT AMPLIFICATIONS/PSD FUNCTIONS.
5.PLOT GENERAL X-Y GRAPHS.
6.EXIT FROM THE PROGRAM.            4

RUN OPTION   =    4
IS THIS OPTION CORRECT...............(Y/N) ?    y

  **************************************************
 *                                                 *
 *       C A R E S P L O T      S Y S T E M        *
 *                                                 *
 *                 (MODULE: SEISMIC)               *
 *                                                 *
 *           AMPLIFICATION SPECTRA/PSD PLOTS       *
 *                                                 *
 *     PLOT AMPLIFICATION SPECTRA AND PSD FOR      *
 *     CARES SYSTEM.                               *
 *                                                 *
  **************************************************

SELECT INPUT OPTION.................(1,2 OR 3) ?

1. AMPLIFICATION PLOT FROM CONVOLUTION ANALYSIS .
2. AMPLIFICATION PLOT FROM SSI ANALYSIS .
3. PSD FUNCTION PLOT  .          3

FOR CURVE # :    1
INPUT FILE NAME FOR PSD PLOT  :   ?        yang.acc.psd
FILE NAME FOR PSD FUNCTION TO BE PLOTTED = yang.acc.psd
IS THIS CORRECT (Y/N)       y

X-AXIS IS IN LOG SCALE WITH MAX VALUE = 100 cps
Y-AXIS IS IN LOG SCALE
MAX PSD FUNCTION = 1288.00 in/sec3
ENTER VALUE OF Ymax (10**Ymax)       4
```

```
MAXIMUM Y AXIS VALUE = 10000.00 in2/sec3
MINIMUM Y AXIS VALUE =      0.10 in2/sec3
IS THIS CORRECT (Y/N)        y
ENTER THE PLOT TITLE (MAX 60 CHARACTERS)
PLOT OF OUTPUT PSD FILE yang.acc.psd

TITLE FOR PLOT WILL BE:
PSD FUNCTION: PLOT OF OUTPUT PSD FILE yang.acc.psd
IS THIS CORRECT (Y/N)       y

ENTER LABEL FOR 1st DATA SET USING LESS THAN 10 CHARACTERS     yang.acc.psd

LABEL FOR CURVE 1: yang.acc.p
IS THIS CORRECT (Y/N)       n

ENTER LABEL FOR 1st DATA SET USING LESS THAN 10 CHARACTERS     yang.acc

LABEL FOR CURVE 1: yang.acc
IS THIS CORRECT (Y/N)       y

Plotting on device 1

SELECT AN OPT. YOU WISH TO EXECUTE...(1 thru 6)?

1.CONVERT ACCELERATION FILE.
2.PLOT TIME HISTORIES.
3.PLOT RESPONSE SPECTRA.
4.PLOT AMPLIFICATIONS/PSD FUNCTIONS.
5.PLOT GENERAL X-Y GRAPHS.
6.EXIT FROM THE PROGRAM.           6

RUN OPTION    =     6
IS THIS OPTION CORRECT...............(Y/N) ?     y

(EXIT FROM PROGRAM)
```