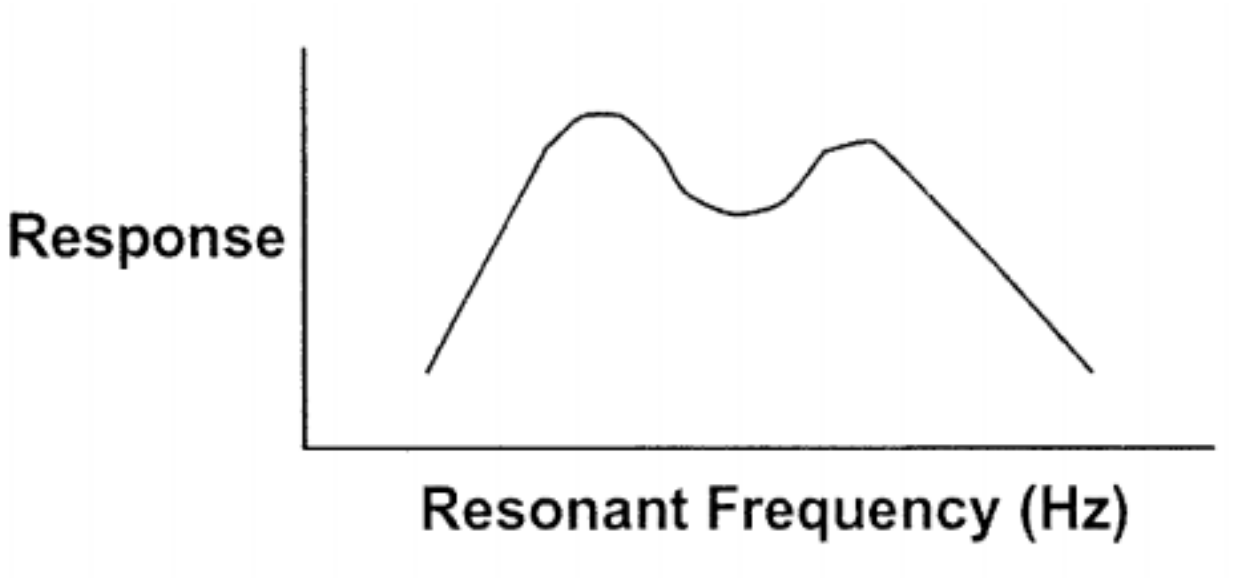
WORKSHOP PROBLEM 9a

Response Spectra



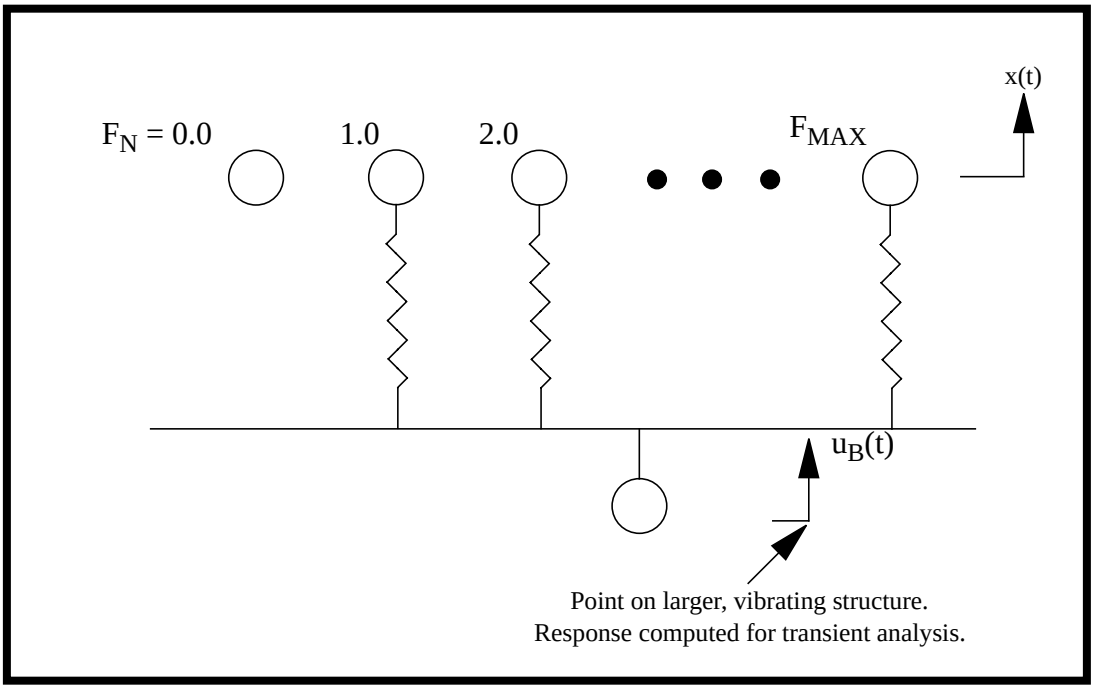
Objectives:

- Generate the shock spectrum.
- Submit the file for analysis in MSC/NASTRAN.
- Generate the shock spectrum using the direct transient method.

Model Description:

Define the shock response of the plate due to a 2.0 in/sec^2 sine pulse applied at the clamped edge. Use modes to a frequency of 1000 Hz with 3% critical damping. Use the SRSS option for model response summation.

Figure 9a.1-Model Description and Loading Diagram.



Suggested Exercise Steps:

- Generate the finite element representation of the model using (GRID) and (CMASS2) elements.
- Apply loading to mass, (TLOAD2) and (DAREA).
- Specify integration time steps (TSTEP).
- Define frequency and damping values for the SDOF oscillators (DTI).
- Specify damping information (FREQ) and natural frequency (FREQ1).
- Define the parameter to calculate shock spectrum.
  - PARAM, RESPECTRA, 0
- Generate an input file and submit it to the MSC/NASTRAN solver for direct transient analysis.
- Review the results.

```
ID SEMINAR,PROB9A
```

```
CEND
```

BEGIN BULK

1	2	3	4	5	6	7	8	9	10

1	2	3	4	5	6	7	8	9	10

ENDDATA

Generating an input file for MSC/NASTRAN Users:

MSC/NASTRAN users can generate an input file using the data from page 9-3 (Model Description). The result should be similar to the output below.

1. MSC/NASTRAN input file: **prob9a.dat**.

```
ID SEMINAR, PROB9a
SOL 109
TIME 30
CEND
TITLE= TRANSIENT RESPONSE
SUBTITLE= USING DIRECT TRANSIENT METHOD
LABEL= SHOCK SPECTRUM CALCULATION
ECHO= UNSORTED
SPC= 100
SET 111= 3000
DISPLACEMENT (SORT2)= 111 $ AT LEAST DISP AND VEL MUST APPEAR
VELOCITY (SORT2)= 111
ACCELERATION ()= 111
DLOAD= 500
TSTEP= 100
$
OUTPUT (XYPLOT)
$
$ SHOCK RESPONSE IS ONLY AVAILABLE IN PLOT OR PUNCH OUTPUT. THEREFORE,
$ THE 'OUTPUT(XYPLOT)' SECTION OF THE CASE CONTROL MUST BE USED.
$
XGRID=YES
YGRID=YES
XYPLOT ACCE / 3000(T1)
XLOG= YES
YLOG= YES
$
$ RELATIVE SHOCK RESPONSES ARE CONTAINED IN THE IMAGINARY/PHASE
$ COMPONENTS OF THE OUTPUT
$ ABSOLUTE SHOCK RESPONSES ARE CONTAINED IN THE REAL/MAGNITUDE
$ COMPONENTS OF THE OUTPUT
$
XTITLE= FREQUENCY (CYCLES/SEC)
YTITLE= RELATIVE DISPLACEMENT
XYPLOT DISP SPECTRAL 1 / 3000 (T1IP)
YTITLE= RELATIVE VELOCITY
XYPLOT VELOCITY SPECTRAL 1 / 3000 (T1IP)
YTITLE= ABSOLUTE ACCELERATION
XYPLOT ACCELERATION SPECTRAL 1 / 3000 (T1RM)
$
```

```
$ PUNCH SHOCK SPECTRUM FOR LATER USE
$
XYPUNCH ACCELERATION SPECTRAL 1 / 3000(T1RM)
$
BEGIN BULK
$
$ DEFINE GRID POINT
$
GRID, 3000, ,0.,0.,0., ,23456
$
$ DEFINE MASS
$
CMASS2, 100, 1.0, 3000, 1
$
$ APPLY LOADING TO MASS
$
TLOAD2, 500, 600, , 0, 0., 0.004, 250., -90.
$
DAREA, 600, 3000, 1, 1.
$
$ SPECIFY INTEGRATION TIME STEPS
$
TSTEP, 100, 100, 4.0E-4, 1
$
$ PARAMETER TO CALCULATE SHOCK SPECTRUM
$
PARAM, RSPECTRA, 0
$
$ SPECIFY FREQUENCY AND DAMPING VALUES FOR
$ THE SDOF OSCILLATORS AT GRID 3000
$
DTI, SPSEL, 0
DTI, SPSEL, 1, 111, 222, 3000
$ 1= SUBCASE... 111= DAMPING... 222= FREQUENCIES... 3000= GRID NUMBER
$
$ DAMPING INFORMATION FOR OSCILLATORS
$
FREQ, 111, 0., 0.02, 0.04
$
$ NATURAL FREQUENCIES OF OSCILLATORS
$
FREQ1, 222, 20., 20., 49
$
ENDDATA
```

Submitting the input file:

2. Submit the input file to MSC/NASTRAN for analysis.

   To submit the MSC/NASTRAN **.dat** file, find an available UNIX shell window and at the command prompt enter **nastran prob9a scr=yes**. Monitor the run using the UNIX **ps** command.

3. When the run is completed, use **plotps** utility to create a postscript file, **prob9a.ps**, from the binary plot file **prob9a.plt**. The nonlinear force and displacement plots are shown on the following pages.

4. When the run is completed, edit the **prob9a.f06** file and search for the word **FATAL**. If no matches exist, search for the word **WARNING**. Determine whether existing WARNING messages indicate modeling errors.

Comparison of Results

5. Compare the plot made from the exercise with the plots on the following pages.

Figure 9a.2

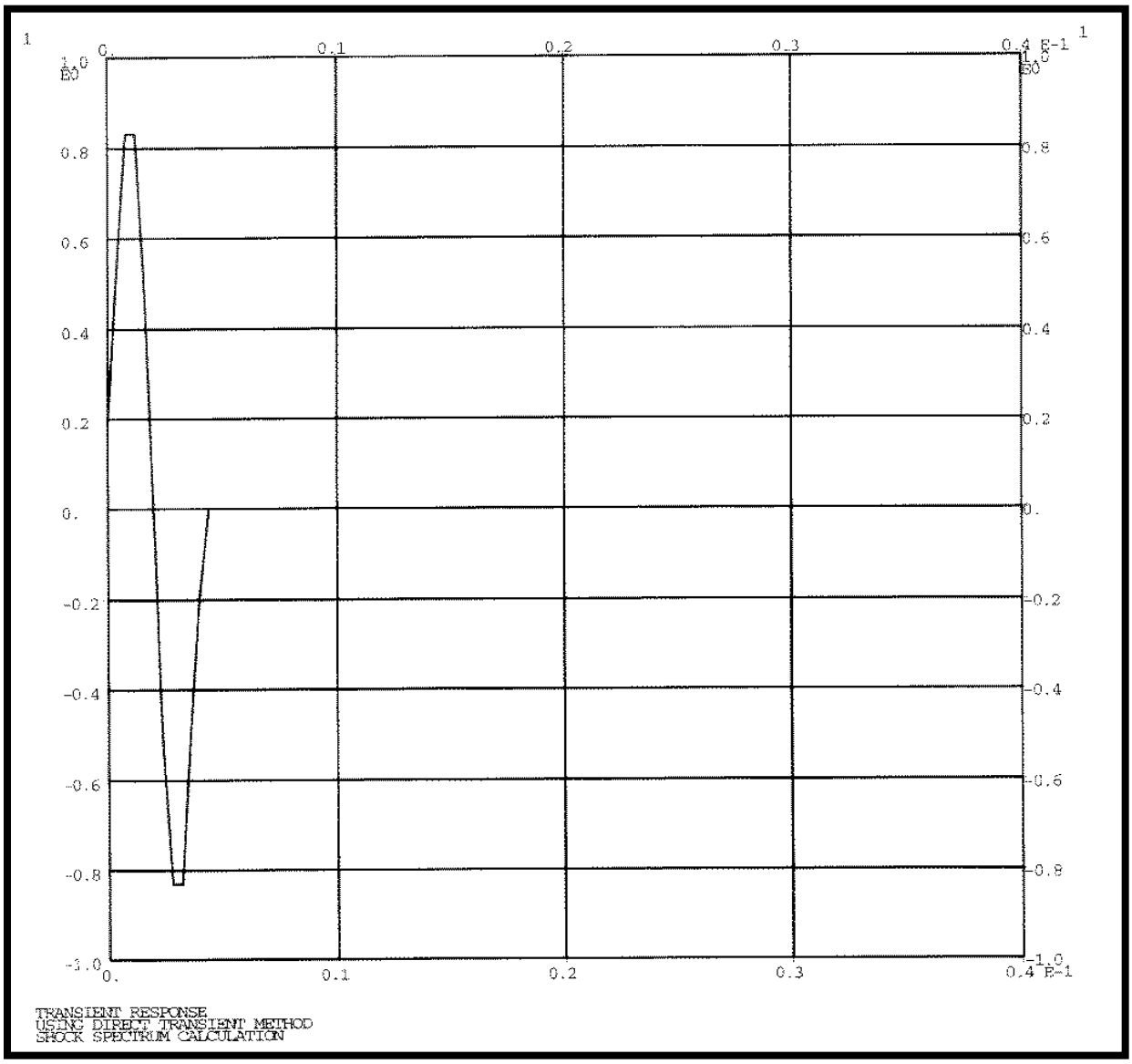

1
0.
0.1
0.2
0.3
0.4 E-1
1.0
EO
0.8
0.6
0.4
0.2
0.
-0.2
-0.4
-0.6
-0.8
-1.0
TRANSIENT RESPONSE
USING DIRECT TRANSIENT METHOD
SHOCK SPECTRUM CALCULATION

Figure 9a.3

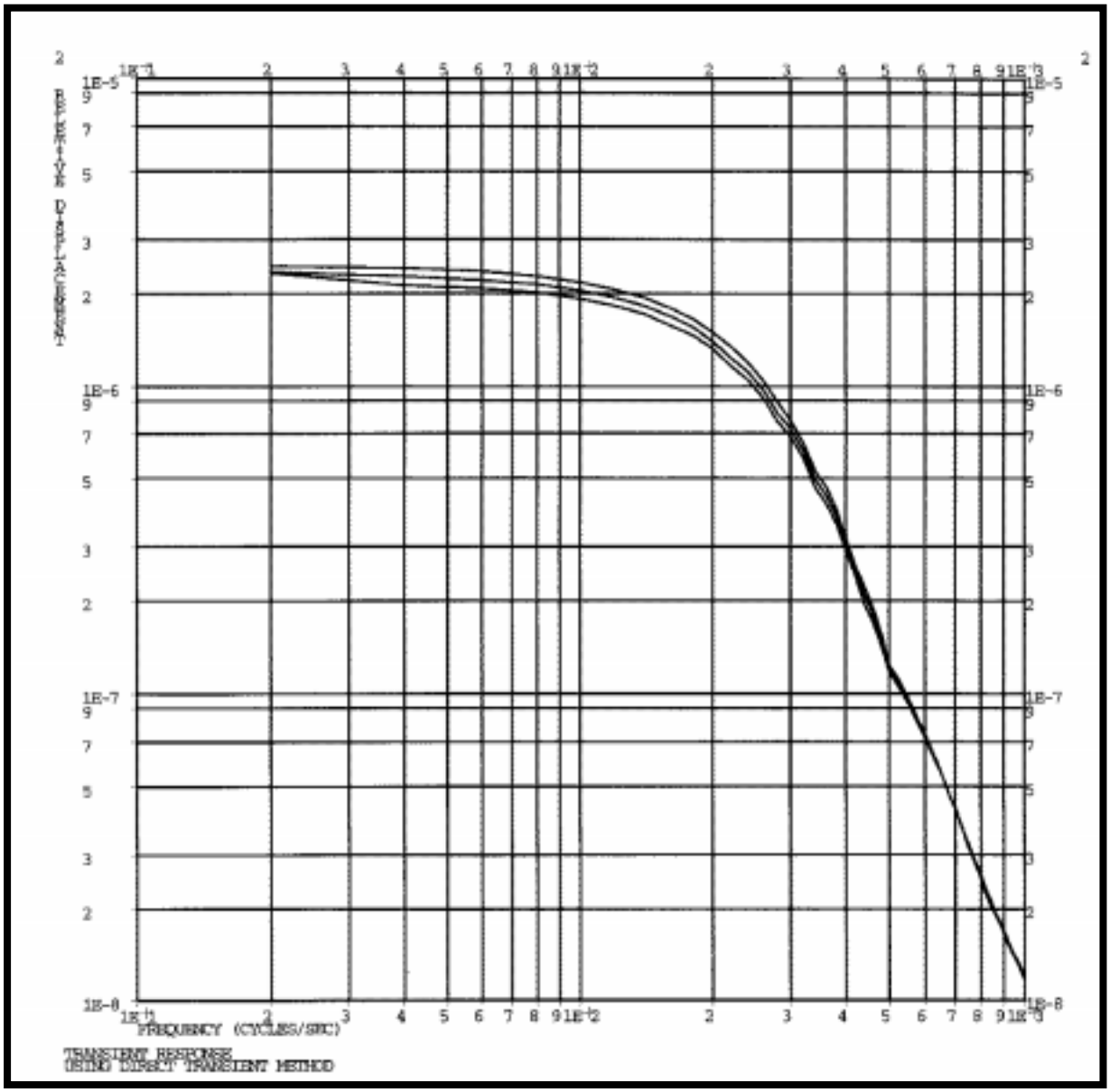

FREQUENCY (CYCLES/SEC)
TRANSIENT RESPONSE
(USING DIRECT TRANSIENT METHOD

Figure 9a.4

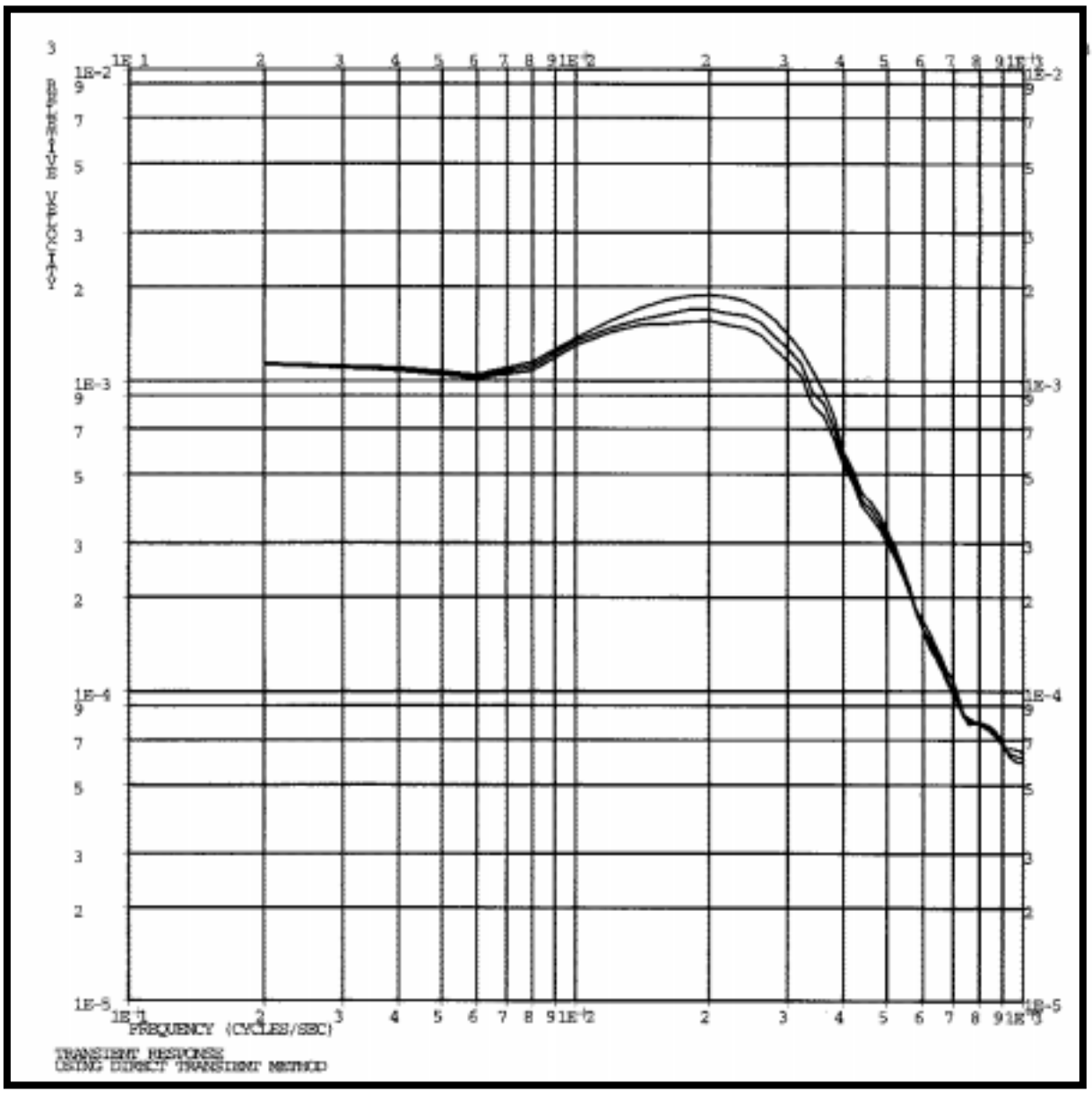
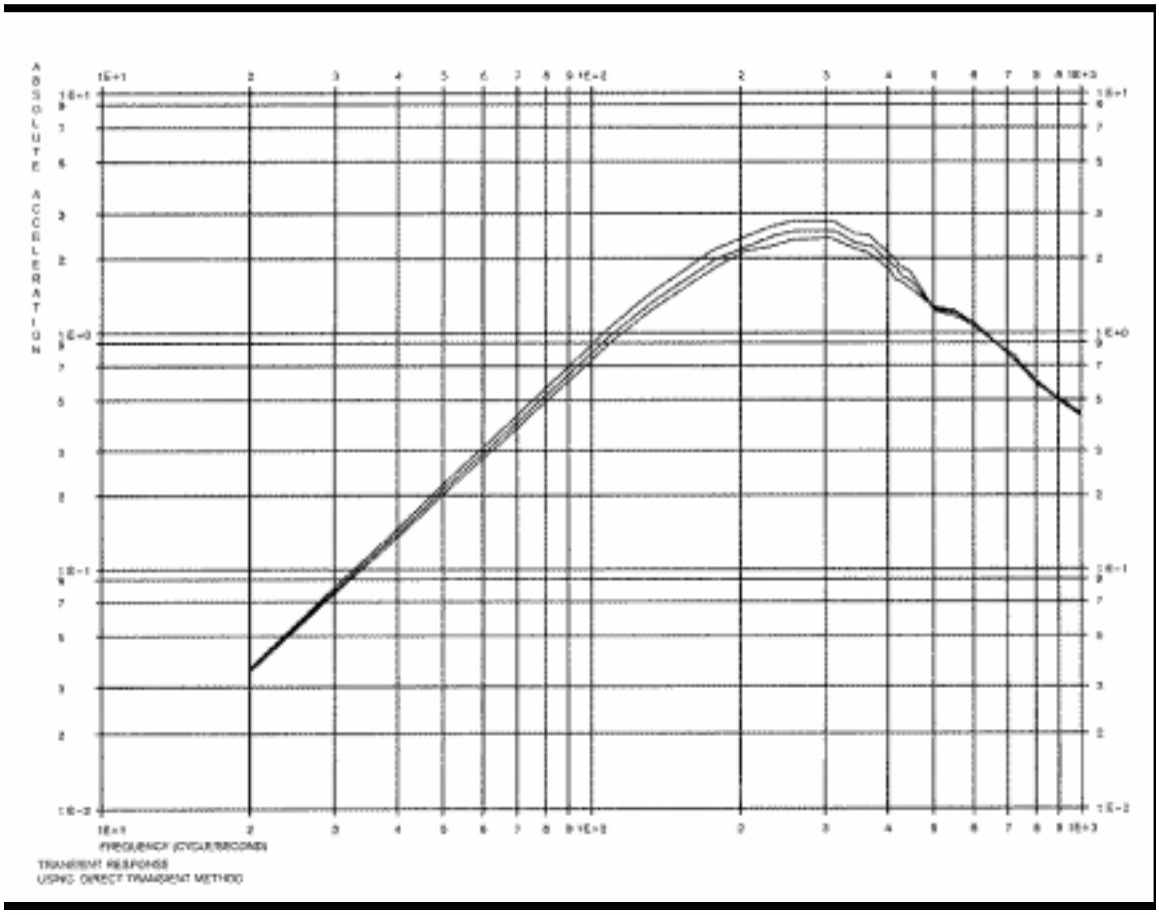

RESPONSE VELOCITY
FREQUENCY (CYCLES/SEC)
TRANSIENT RESPONSE
USING DIRECT TRANSIENT METHOD

Figure 9a.5


ABSOLUTE ACCELERATION
FREQUENCY (CYCLES/SECOND)
TRANSIENT RESPONSE
USING DIRECT TRANSIENT METHOD