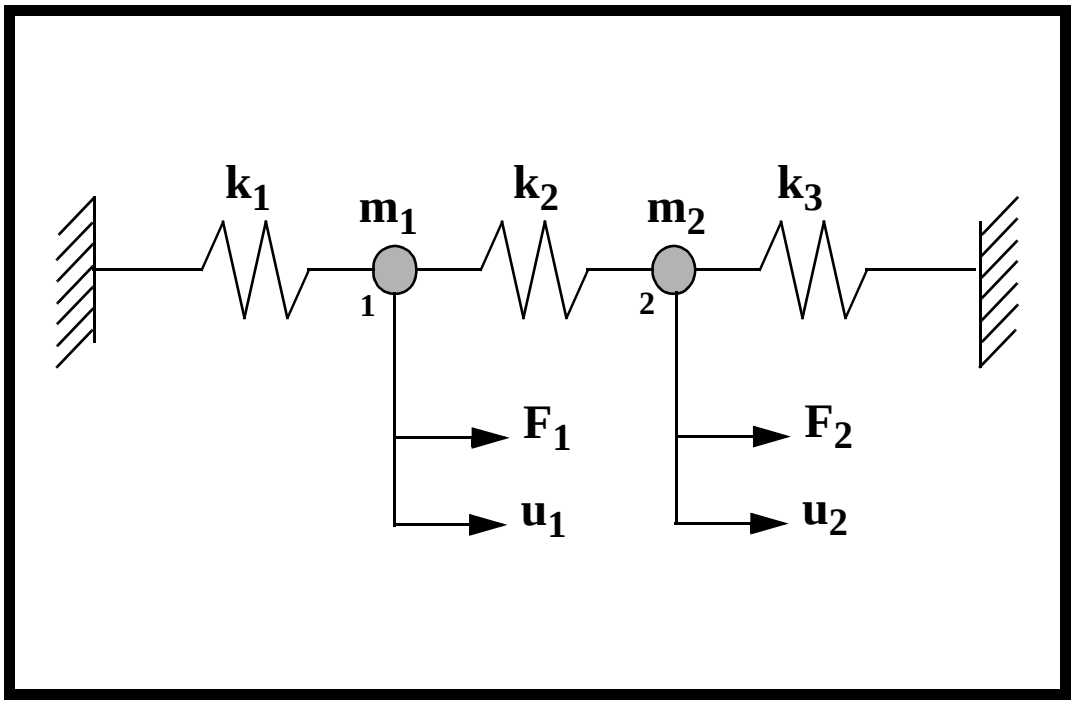
WORKSHOP 36

Objectives:

- Calculate the design sensitivity coefficients for the following spring/mass system.



Model Description:

- Design Variables - Spring constants K1, K2, K3
- Constraints:

  Displacements at Grid 1 (X direction) $\leq \pm 0.2$ m

Generating an input file for MSC.Nastran Users:

1. Generate an input file using the data from pages 36-1 through 36-3. Use the following input file as a starting point.

```
$
$    wkshp36.dat
$
TIME 5
SOL 200 $
CEND
TITLE=TWO MASS DIRECT FREQUENCY SENSITIVITY                D108G7v
DISPL = ALL
$
$   ADD REST OF CASE CONTROL
$
    .
    .
$
BEGIN BULK
$
$   ANALYTICAL MODEL
$
CELAS1  20      20      1       1
CELAS1  21      21      1       1       2       1
CELAS1  22      22      2       1
CONM2   10      1               1.
CONM2   11      2               2.
DAREA   201     1       1       100.    2       1       100.
FREQ    100     4.0     6.0
GRID    1               1.      0.      0.              23456
GRID    2               2.      0.      0.              23456
MAT1    200     1.0E7           0.3     0.1
PELAS   20      1.0E3
PELAS   21      1.5E3
PELAS   22      2.0E3
RLOAD1  200     201                     210
TABLED1 210
        1.      1.      10.     1.      ENDT
$
$   ADD DESIGN MODEL BELOW
$
    .
    .
    .
$
ENDDATA
```

2. The completed MSC.Nastran input file is shown below:

```
$
$    soln36.dat
$
TIME 5
SOL 200 $
CEND
TITLE=TWO MASS DIRECT FREQUENCY SENSITIVITY                D108G7v
DISPL = ALL
SUBCASE 2
DESSUB = 2
   ANALYSIS =  DFREQ
   FREQ  = 100
   DLOAD = 200
   dsaprt = all
BEGIN BULK
$
CELAS1  20      20      1       1
CELAS1  21      21      1       1       2       1
CELAS1  22      22      2       1
CONM2   10      1               1.
CONM2   11      2               2.
DAREA   201     1       1       100.    2       1       100.
DCONSTR 2       10      -2.0E-1 2.0E-1
DESVAR  1       K1      1.0E3   1.0E2   1.0E4
DESVAR  2       K2      1.5E3   1.5E2   1.5E4
DESVAR  3       K3      2.0E3   2.0E2   2.0E4
DRESP1  10      U1      FRDISP                  1               1
        2
DVPREL1 1       PELAS   20      3       1.0E3
        1       1.0
DVPREL1 2       PELAS   21      3       1.5E3
        2       1.0
DVPREL1 3       PELAS   22      3       2.0E3
        3       1.0
FREQ    100     4.0     6.0
GRID    1               1.      0.      0.              23456
GRID    2               2.      0.      0.              23456
MAT1    200     1.0E7           0.3     0.1
PELAS   20      1.0E3
PELAS   21      1.5E3
PELAS   22      2.0E3
RLOAD1  200     201                     210
TABLED1 210
        1.      1.      10.     1.      ENDT
ENDDATA
```

3. 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 wkshp36 scr=yes**. Monitor the run using the UNIX **ps** command.

4. When the run is completed, edit the **wkshp36.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.

   4a. While still editing **wkshp36.f06**, search for the word:

   M A T R I X

Comparison of Results:

5. Compare the results obtained in the **.f06** file with the following:

```
***************************************************************************
*                                                                         *
*   D E S I G N   S E N S I T I V I T Y   M A T R I X   O U T P U T       *
*                                                                         *
*                                                                         *
*   R E S P O N S E   S E N S I T I V I T Y   C O E F F I C I E N T S     *
*                                                                         *
***************************************************************************

TWO MASS DIRECT FREQUENCY SENSITIVITY                    D108G7V       NOVEMBER  11, 1997  MSC/NASTRAN  7/17/97   PAGE    14


------------------------------------------------------------------------------------------------------------------------------
DRESP1 ID=        10            RESPONSE TYPE= FRDISP       GRID ID=         1     COMP NO=        1        SEID=        (
SUBCASE  RESP VALUE  FREQ/TIME   DESIGN  VARIABLE  COEFFICIENT   DESIGN  VARIABLE  COEFFICIENT   DESIGN  VARIABLE  COEFFICIE
------------------------------------------------------------------------------------------------------------------------------
      2  1.9372E-01   4.0000E+00      1  K1        -2.2458E-04        2  K2        -7.2944E-06        3  K3        -1.3576E-(
      2 -1.4004E-01   6.0000E+00      1  K1        -5.9756E-05        2  K2        -1.4953E-05        3  K3        -1.6293E-(

------------------------------------------------------------------------------------------------------------------------------
DRESP1 ID=        10            RESPONSE TYPE= FRDISP       GRID ID=         2     COMP NO=        1        SEID=        (
SUBCASE  RESP VALUE  FREQ/TIME   DESIGN  VARIABLE  COEFFICIENT   DESIGN  VARIABLE  COEFFICIENT   DESIGN  VARIABLE  COEFFICIE
------------------------------------------------------------------------------------------------------------------------------
      2  1.7462E-01   4.0000E+00      1  K1        -1.5061E-04        2  K2         3.6472E-06        3  K3        -1.6910E-(
      2 -1.6738E-01   6.0000E+00      1  K1        -1.3631E-04        2  K2         7.4763E-06        3  K3        -1.1717E-(
```