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## WORKSHOP PROBLEM 5b

# *Reading in Matrices, Output2, and Output4 Files*

### Objectives:

- Read in the output generated from the previous run and calculate the strain energy, reaction, and rigid body mass.

### Procedure:

1. Use DMIIN, INPUTT2, and INPUTT4 modules to read the DMI, OUTPUT2, and OUTPUT4 output generated from the previous run.
2. Calculate the strain energy and reaction from each of these input and print out the results.
3. Calculate the rigid body mass matrix.

### Hints:

- See workshops #3 and #5a.

## Solution Input File:

### soln5b.dat

```
assign inputt2='wk5a.op2', unit=12
assign inputt4='wk5a.op4', unit=13, formatted
sol 100
compile userdmap, souin=mscsou, list
alter 2
dmiin dmi,dmindx/rigid,kjjz,mjjx,,,,,,,,/s,n,yes1 $
inputt2 /r2,k2,m2,///12 $
inputt4 /r4,k4,m4,///3/13//0 $
$
trnsp rigid/rigidt $
mpyad kjjz,rigidt,/reacg $
mpyad rigid,reacg,/straine $
add straine,/strain/(.5,0.) $
matprn reacg,strain// $
$
trnsp r2/r2t $
mpyad k2,r2t,/reac2 $
mpyad r2,reac2,/st2e $
add st2e,/st2/(.5,.0) $
matprn reac2,st2// $
$
trnsp r4/r4t $
mpyad k4,r4t,/reac4 $
mpyad r4,reac4,/st4e $
add st4e,/st4/(.5,.0) $
matprn reac4,st4// $
$
smpyad r2,m2,r2t,///mass/3 $
message //'Mass is the 6x6 mass properties of the model' $
matprn mass// $
cend
title = test reading matrices
begin bulk
include 'wk5a.pch'
enddata
```

## Partial Solution for Comparison of Results:

Compare the results obtained in the .f06 file with the results below:

```

0*** USER INFORMATION MESSAGE 4105 (INPTX2)
      DATA BLOCK R2      RETRIEVED FROM FORTRAN TAPE 12
      NAME OF DATA BLOCK WHEN PLACED ON FORTRAN TAPE WAS RIGID .
0*** USER INFORMATION MESSAGE 4105 (INPTX2)
      DATA BLOCK K2      RETRIEVED FROM FORTRAN TAPE 12
      NAME OF DATA BLOCK WHEN PLACED ON FORTRAN TAPE WAS KJJZ .
0*** USER INFORMATION MESSAGE 4105 (INPTX2)
      DATA BLOCK M2      RETRIEVED FROM FORTRAN TAPE 12
      NAME OF DATA BLOCK WHEN PLACED ON FORTRAN TAPE WAS MJJX .
1     TEST READING MATRICES
...
0
0     MATRIX REACG      (GINO NAME 101 ) IS A DB  PREC          6 COLUMN X          24 ROW RECTANG
MATRIX.
0COLUMN      1 THRU          1 ARE NULL.
0COLUMN      2     ROWS      14 THRU      20     -----
      ROW
      14)  1.0000D+01  0.0000D+00  0.0000D+00  0.0000D+00  0.0000D+00  0.0000D+00 -1.0000D+01
0COLUMN      3     ROWS      14 THRU      20     -----
      ROW
      14)  1.0000D+01  0.0000D+00  0.0000D+00  0.0000D+00  0.0000D+00  0.0000D+00 -1.0000D+01
0COLUMN      4 THRU          4 ARE NULL.
0COLUMN      5     ROWS      14 THRU      20     -----
      ROW
      14)  -2.0000D+02  0.0000D+00  0.0000D+00  0.0000D+00  0.0000D+00  0.0000D+00  2.0000D+02
0COLUMN      6     ROWS      14 THRU      20     -----
      ROW
      14)  2.0000D+02  0.0000D+00  0.0000D+00  0.0000D+00  0.0000D+00  0.0000D+00 -2.0000D+02
0THE NUMBER OF NON-ZERO TERMS IN THE DENSEST COLUMN =      2
0THE DENSITY OF THIS MATRIX IS      5.56 PERCENT.
1     TEST READING MATRICES
...
      2)  5.0000D+00  5.0000D+00  0.0000D+00 -1.0000D+02  1.0000D+02
0COLUMN      4 THRU          4 ARE NULL.
0COLUMN      5     ROWS      2 THRU          6     -----
      ROW
      2)  -1.0000D+02 -1.0000D+02  0.0000D+00  2.0000D+03 -2.0000D+03
0COLUMN      6     ROWS      2 THRU          6     -----
...

```

```

ROW
  2)  1.0000D+02  1.0000D+02  0.0000D+00 -2.0000D+03  2.0000D+03
OTHE NUMBER OF NON-ZERO TERMS IN THE DENSEST COLUMN =      4
OTHE DENSITY OF THIS MATRIX IS  44.44 PERCENT.
1  TEST READING MATRICES
...
0
0  MATRIX REAC2  (GINO NAME 101 ) IS A DB  PREC          6 COLUMN X          24 ROW RECTANG  MATRIX.
OCOLUMNS      1 THRU          1 ARE NULL.
OCOLUMN        2  ROWS      14 THRU      20  -----
ROW
  14)  1.0000D+01  0.0000D+00  0.0000D+00  0.0000D+00  0.0000D+00  0.0000D+00 -1.0000D+01
OCOLUMN        3  ROWS      14 THRU      20  -----
ROW
  14)  1.0000D+01  0.0000D+00  0.0000D+00  0.0000D+00  0.0000D+00  0.0000D+00 -1.0000D+01
OCOLUMNS      4 THRU          4 ARE NULL.
OCOLUMN        5  ROWS      14 THRU      20  -----
ROW
  14)  -2.0000D+02  0.0000D+00  0.0000D+00  0.0000D+00  0.0000D+00  0.0000D+00  2.0000D+02
OCOLUMN        6  ROWS      14 THRU      20  -----
ROW
  14)  2.0000D+02  0.0000D+00  0.0000D+00  0.0000D+00  0.0000D+00  0.0000D+00 -2.0000D+02
OTHE NUMBER OF NON-ZERO TERMS IN THE DENSEST COLUMN =      2
OTHE DENSITY OF THIS MATRIX IS  5.56 PERCENT.
1  TEST READING MATRICES
...
0
0  MATRIX ST2    (GINO NAME 102 ) IS A DB  PREC          6 COLUMN X          6 ROW SQUARE  MATRIX.
OCOLUMNS      1 THRU          1 ARE NULL.
OCOLUMN        2  ROWS      2 THRU      6  -----
ROW
  2)  5.0000D+00  5.0000D+00  0.0000D+00 -1.0000D+02  1.0000D+02
OCOLUMN        3  ROWS      2 THRU      6  -----
ROW
  2)  5.0000D+00  5.0000D+00  0.0000D+00 -1.0000D+02  1.0000D+02
OCOLUMNS      4 THRU          4 ARE NULL.
OCOLUMN        5  ROWS      2 THRU      6  -----
ROW
  2)  -1.0000D+02 -1.0000D+02  0.0000D+00  2.0000D+03 -2.0000D+03
...

```

```
0COLUMN      6      ROWS      2 THRU      6      -----
  ROW
    2)      1.0000D+02  1.0000D+02  0.0000D+00 -2.0000D+03  2.0000D+03
0THE NUMBER OF NON-ZERO TERMS IN THE DENSEST COLUMN =      4
0THE DENSITY OF THIS MATRIX IS  44.44 PERCENT.
1  TEST READING MATRICES
...
0
0  MATRIX REAC4      (GINO NAME 101 ) IS A DB  PREC      6 COLUMN X      24 ROW RECTANG  MATRIX.
0COLUMNNS      1 THRU      1 ARE NULL.
0COLUMN      2      ROWS      14 THRU      20      -----
  ROW
    14)      1.0000D+01  0.0000D+00  0.0000D+00  0.0000D+00  0.0000D+00  0.0000D+00 -1.0000D+01
0COLUMN      3      ROWS      14 THRU      20      -----
  ROW
    14)      1.0000D+01  0.0000D+00  0.0000D+00  0.0000D+00  0.0000D+00  0.0000D+00 -1.0000D+01
0COLUMNNS      4 THRU      4 ARE NULL.
0COLUMN      5      ROWS      14 THRU      20      -----
  ROW
    14)      -2.0000D+02  0.0000D+00  0.0000D+00  0.0000D+00  0.0000D+00  0.0000D+00  2.0000D+02
0COLUMN      6      ROWS      14 THRU      20      -----
  ROW
    14)      2.0000D+02  0.0000D+00  0.0000D+00  0.0000D+00  0.0000D+00  0.0000D+00 -2.0000D+02
0THE NUMBER OF NON-ZERO TERMS IN THE DENSEST COLUMN =      2
0THE DENSITY OF THIS MATRIX IS  5.56 PERCENT.
1  TEST READING MATRICES
...
0
0  MATRIX ST4      (GINO NAME 102 ) IS A DB  PREC      6 COLUMN X      6 ROW SQUARE  MATRIX.
0COLUMNNS      1 THRU      1 ARE NULL.
0COLUMN      2      ROWS      2 THRU      6      -----
  ROW
    2)      5.0000D+00  5.0000D+00  0.0000D+00 -1.0000D+02  1.0000D+02
0COLUMN      3      ROWS      2 THRU      6      -----
  ROW
    2)      5.0000D+00  5.0000D+00  0.0000D+00 -1.0000D+02  1.0000D+02
0COLUMNNS      4 THRU      4 ARE NULL.
0COLUMN      5      ROWS      2 THRU      6      -----
  ROW
...

```

```

ROW
  2)  -1.0000D+02 -1.0000D+02  0.0000D+00  2.0000D+03 -2.0000D+03
OCOLUMN  6      ROWS      2 THRU      6      -----
ROW
  2)  1.0000D+02  1.0000D+02  0.0000D+00 -2.0000D+03  2.0000D+03
OTHE NUMBER OF NON-ZERO TERMS IN THE DENSEST COLUMN =      4
OTHE DENSITY OF THIS MATRIX IS  44.44 PERCENT.
^^^MASS IS THE 6X6 MASS PROPERTIES OF THE MODEL
1  TEST READING MATRICES
...
0
0  MATRIX MASS      (GINO NAME 101 ) IS A DB  PREC      6 COLUMN X      6 ROW SQUARE  MATRIX.
OCOLUMN  1      ROWS      1 THRU      1      -----
ROW
  1)  5.1800D-02
OCOLUMN  2      ROWS      2 THRU      6      -----
ROW
  2)  5.1800D-02  0.0000D+00  0.0000D+00  0.0000D+00  5.1800D-01
OCOLUMN  3      ROWS      3 THRU      5      -----
ROW
  3)  5.1800D-02  0.0000D+00 -5.1800D-01
OCOLUMNS  4 THRU      4 ARE NULL.
OCOLUMN  5      ROWS      3 THRU      5      -----
ROW
  3)  -5.1800D-01  0.0000D+00  7.7700D+00
OCOLUMN  6      ROWS      2 THRU      6      -----
ROW
  2)  5.1800D-01  0.0000D+00  0.0000D+00  0.0000D+00  7.7700D+00
OTHE NUMBER OF NON-ZERO TERMS IN THE DENSEST COLUMN =      2
OTHE DENSITY OF THIS MATRIX IS  25.00 PERCENT.
1  * * * END OF JOB * * *

```