
WORKSHOP PROBLEM 5a

Writing Out Matrices in Various Formats

Objectives:

- Calculate the rigid body strain energy and write out the rigid body vector, stiffness, and mass matrices in various formats.

Procedure:

1. This workshop is an extension of workshop #3.
2. Make a copy of workshop #3 and write out the rigid body vectors, g-size stiffness matrix (kjjz), and g-size mass matrix (mjxx) in the following formats:
 - DMI
 - Output2
 - Output4 in ASCII format

Hints:

- Use the following modules:
 - MATPCH
 - OUTPUT2
 - OUTPUT4

Solution Input File:**soln5a.dat**

```

assign output2='soln5a.op2',unit=12,delete
assign output4='soln5a.op4',unit=13,formatted,delete
SOL      103
TIME     5
diag 8
$
compile semg $
alter 'kjjz.*stiffness' $
vecplot , ,bgpdts,eqexins,cstms,,,,/rigid///4 $
trnsp rigid/rigidt $
mpyad kjjz,rigidt,/reacg $
message //' reacg is the reactions -- K * Urigid '
$matgpr gpls,uset,sils,reacg// 'h'/'g' $
matprn reacg// $
mpyad rigid,reacg,/straine $
add straine,/strain/(0.5,0.) $
message //'STRAIN ENERGY' $
matprn strain// $
$alter 114 $ v70
alter 'mjjx,.*mass' $
matpch rigid,kjjz,mjjx,/// $
output2 rigid,kjjz,mjjx,///12 $
output4 rigid,kjjz,mjjx,///13/0 $
$
CEND
TITLE = Over constrain check
method = 100
SPC = 10
DISP = ALL
$
BEGIN BULK
$
eigr1,100,,,2
$
GRID      1      0      0.0      0.0      0.0      0
GRID      2      0      10.      0.0      0.0      0
GRID      3      0      20.      0.0      0.0      0
GRID     30      1      20.      0.0      0.0      1
$
CORD2R    1              0.      0.      0.      0.      1.      0.
          1.      0.      0.
CBAR      1      1      1      2              1.
CBAR      2      1      2      3              1.
CELAS2    999     10.      3      2      30      2
$
PBAR      1      1      10.     100.     100.     50.
MAT1      1      1.+7              .3      .1
$

```

```
SPC1      10      123456  1      30
FORCE    100      3          10.    0.    0.    -1.
PARAM    USETPRT  1
PARAM          WTMASS  0.00259
PARAM    GRDPNT  0
$
ENDDATA
```

Partial Output for Comparison of Results:

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

```

    ^^^ REACG IS THE REACTIONS -- K * URIGID
1    OVER CONSTRAIN CHECK
...
0
0    MATRIX REACG      (GINO NAME 101 ) IS A DB  PREC          6 COLUMN X          24 ROW RECTANG
MATRIX.
0COLUMNS      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
0COLUMNS      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.
    ^^^STRAIN ENERGY
1    OVER CONSTRAIN CHECK
...
0
0    MATRIX STRAIN     (GINO NAME 101 ) IS A DB  PREC          6 COLUMN X          6 ROW SQUARE
MATRIX.
0COLUMNS      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
0COLUMNS      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.
0*** USER INFORMATION MESSAGE 4103      MATPCH HAS PUNCHED MATRIX DATA BLOCK RIGID      ONTO      31 DMI CARDS.
0*** USER INFORMATION MESSAGE 4103      MATPCH HAS PUNCHED MATRIX DATA BLOCK KJJZ      ONTO      51 DMI CARDS.
0*** USER INFORMATION MESSAGE 4103      MATPCH HAS PUNCHED MATRIX DATA BLOCK MJJX      ONTO      10 DMI CARDS.
0*** USER INFORMATION MESSAGE 4114 (OUTPX2)
      DATA BLOCK RIGID      WRITTEN ON FORTRAN UNIT 12,  TRL =
          101                24                6                2                2                4
2083
      (MAXIMUM POSSIBLE FORTRAN RECORD SIZE =      4098 WORDS.)
      (MAXIMUM SIZE OF FORTRAN RECORDS WRITTEN =      7 WORDS.)
      (NUMBER OF FORTRAN RECORDS WRITTEN =      142 RECORDS.)
      (TOTAL DATA WRITTEN FOR DATA BLOCK =      214 WORDS.)
0*** USER INFORMATION MESSAGE 4114 (OUTPX2)
      DATA BLOCK KJJZ      WRITTEN ON FORTRAN UNIT 12,  TRL =
          102                24                24                6                2                10
1198
      (MAXIMUM POSSIBLE FORTRAN RECORD SIZE =      4098 WORDS.)
      (MAXIMUM SIZE OF FORTRAN RECORDS WRITTEN =      7 WORDS.)
      (NUMBER OF FORTRAN RECORDS WRITTEN =      220 RECORDS.)
      (TOTAL DATA WRITTEN FOR DATA BLOCK =      370 WORDS.)
0*** USER INFORMATION MESSAGE 4114 (OUTPX2)
      DATA BLOCK MJJX      WRITTEN ON FORTRAN UNIT 12,  TRL =
          103                24                24                6                2                2
156
      (MAXIMUM POSSIBLE FORTRAN RECORD SIZE =      4098 WORDS.)
      (MAXIMUM SIZE OF FORTRAN RECORDS WRITTEN =      7 WORDS.)
      (NUMBER OF FORTRAN RECORDS WRITTEN =      100 RECORDS.)
      (TOTAL DATA WRITTEN FOR DATA BLOCK =      130 WORDS.)
1  OVER CONSTRAIN CHECK
0
0  MATRIX STRAIN      CONTINUED
0*** USER WARNING MESSAGE 6450 (OUTPT4)
      THE SELECTION OF THE  ASCII FORMAT OPTION IN THE OUTPUT4 MODULE FOR DATABLOCK RIGID      MAY RESULT IN NUMERIC
TRUNCATION.
...

```

...

USER INFORMATION:

1. THE FORTRAN FORMAT BEING USED IS (1P,5E16.9)
2. THE DEFAULT FORTRAN FORMAT IS (1P,5E16.9)
3. THE FIFTH PARAMETER OF THE OUTPUT4 MODULE CAN BE USED TO INCREASE THE NUMBER OF SIGNIFICANT DIGITS.

USER ACTION:

1. IF THE NUMBER OF SIGNIFICANT DIGITS IS ACCEPTABLE, THEN NO ACTION IS REQUIRED.
2. IF ADDITIONAL SIGNIFICANT DIGITS ARE REQUIRED, THEN INCREASE THE VALUE OF THE FIFTH PARAMETER, AND RERUN THE JOB.

DATA BLOCK RIGID WRITTEN ON FORTRAN UNIT 13 FROM DMAP MODULE OUTPUT4 IN ASCII FORMAT (1P,5E16.9)

TRAILER = 101 24 6 2 2 4 2083

0*** USER WARNING MESSAGE 6450 (OUTPT4)

THE SELECTION OF THE ASCII FORMAT OPTION IN THE OUTPUT4 MODULE FOR DATABLOCK KJJZ MAY RESULT IN NUMERIC TRUNCATION.

USER INFORMATION:

1. THE FORTRAN FORMAT BEING USED IS (1P,5E16.9)
2. THE DEFAULT FORTRAN FORMAT IS (1P,5E16.9)
3. THE FIFTH PARAMETER OF THE OUTPUT4 MODULE CAN BE USED TO INCREASE THE NUMBER OF SIGNIFICANT DIGITS.

USER ACTION:

1. IF THE NUMBER OF SIGNIFICANT DIGITS IS ACCEPTABLE, THEN NO ACTION IS REQUIRED.
2. IF ADDITIONAL SIGNIFICANT DIGITS ARE REQUIRED, THEN INCREASE THE VALUE OF THE FIFTH PARAMETER, AND RERUN THE JOB.

DATA BLOCK KJJZ WRITTEN ON FORTRAN UNIT 13 FROM DMAP MODULE OUTPUT4 IN ASCII FORMAT (1P,5E16.9)

TRAILER = 102 24 24 6 2 10 1198

0*** USER WARNING MESSAGE 6450 (OUTPT4)

THE SELECTION OF THE ASCII FORMAT OPTION IN THE OUTPUT4 MODULE FOR DATABLOCK MJJX MAY RESULT IN NUMERIC TRUNCATION.

USER INFORMATION:

1. THE FORTRAN FORMAT BEING USED IS (1P,5E16.9)
2. THE DEFAULT FORTRAN FORMAT IS (1P,5E16.9)
3. THE FIFTH PARAMETER OF THE OUTPUT4 MODULE CAN BE USED TO INCREASE THE NUMBER OF SIGNIFICANT DIGITS.

USER ACTION:

1. IF THE NUMBER OF SIGNIFICANT DIGITS IS ACCEPTABLE, THEN NO ACTION IS REQUIRED.
2. IF ADDITIONAL SIGNIFICANT DIGITS ARE REQUIRED, THEN INCREASE THE VALUE OF THE FIFTH PARAMETER, AND RERUN THE JOB.

DATA BLOCK MJJX WRITTEN ON FORTRAN UNIT 13 FROM DMAP MODULE OUTPUT4 IN ASCII FORMAT (1P,5E16.9)

TRAILER = 103 24 24 6 2 2 156