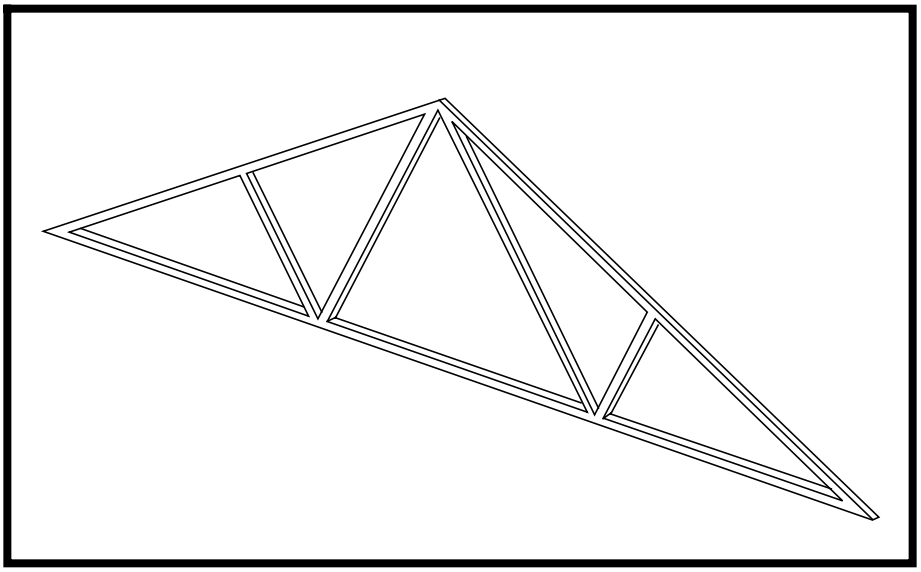
WORKSHOP PROBLEM 8

Results Combination Using Restart



Objectives:

- Using the model from **Workshop 2**, create two additional load cases for the truss using a combination of three previous load cases on a restart run.
- Restart an existing static analysis of a truss under these loading conditions.
- Review results.

Model Description:

This problem will be a restart of Problem 2. The solution will consist of two subcom's that will combine the results of the previous run.

The first subcom will be the sum of the first three subcases.

The second subcom will be the sum of the following:

(1.0 x subcase 1) + (2.0 x subcase 2) + (1.5 x subcase 3)

For each of the two combination cases -ONLY-, find the displacements and reaction forces for all grid locations, the element forces, stresses and margins of safety for all elements.

Suggested Exercise Steps:

- Modify the MSC/NASTRAN input file to include the additional subcases which are summations of the results of previous subcases (SUBCOM).
- Specify the coefficients for forming a linear combination of the previous subcases (SUBSEQ).
- Request that data stores in a previous run be used in the current run (RESTART).
- Review results.

```
ID SEMINAR,PROB8
```

```
CEND
```

```
BEGIN BULK
```

1	2	3	4	5	6	7	8	9	10

1	2	3	4	5	6	7	8	9	10

ENDDATA

Exercise Procedure:

1. make a copy of the MSC/NASTRAN input file from exercise 2.

2. **MSC/PATRAN** users: in an available UNIX window, type:

   cp prob2.bdf prob8.bdf

3. **MSC/NASTRAN** users: in an available UNIX window, type:

   cp prob2.dat prob8.dat

4. The text below defines the two SUBCOM's. Using a text editor, insert the SUBCOM definitions before the line **`BEGIN BULK`**.

```
SUBCOM 10
   LABEL = COMBINED LOADS
   SUBSEQ = 1.0, 1.0, 1.0
   TEMP(LOAD) = 2
   DISP = ALL
   FORCE = ALL
   STRESS = ALL
   SPCFORCE = ALL
SUBCOM 20
   LABEL = SCALED LOAD COMBINATIONS
   SUBSEQ = 1.0, 2.0, 1.5
   TEMP(LOAD) = 33
   DISP = ALL
   FORCE = ALL
   STRESS = ALL
   SPCFORCE = ALL
```

5. Delete all output requests from SUBCASE 1, 2, and 3.

6. Since the entire Bulk Data is stored in the database, only the changes to the Bulk Data are required in the input file for a restart. Therefore, DELETE all existing Bulk Data Entries, between BEGIN BULK and ENDDATA.

7. In order to scale the temperature load, it will be necessary to change the temperature distribution for the temperature load. **(See page 8-10 for a hint.)** To re-define the temperature load for the scaled load combinations, insert the following text before the line **`ENDDATA`**.

```
TEMPD,33,54.0
TEMP,33,1,31.5
TEMP,33,2,12.0
TEMP,33,4,63.0
TEMP,33,6,114.0
TEMP,33,7,84.0
```

The completed input file should resemble the following output:

```
RESTART VERSION=1,KEEP
ID SEMINAR,PROB8
TIME 5
SOL 101
CEND
TITLE = GARAGE ROOF FRAME
SUBTITLE = WOOD AND STEEL MEMBERS
   SPC = 20
SUBCASE 1
   LABEL = GRAVITY LOAD
   LOAD = 1
SUBCASE 2
   LABEL = TEMPERATURE
   TEMP(LOAD) = 2
SUBCASE 3
   LABEL = SNOW AND CONCENTRATED LOAD
   LOAD = 3
SUBCOM 10
   LABEL = COMBINED LOADS
   SUBSEQ = 1.0, 1.0, 1.0
   TEMP(LOAD) = 2
   DISP = ALL
   FORCE = ALL
   STRESS = ALL
   SPCFORCE = ALL
SUBCOM 20
   LABEL = SCALED LOAD COMBINATIONS
   SUBSEQ = 1.0, 2.0, 1.5
   TEMP(LOAD) = 33
   DISP = ALL
   FORCE = ALL
   STRESS = ALL
   SPCFORCE = ALL
BEGIN BULK
TEMPD,33,54.0
TEMP,33,1,31.5
TEMP,33,2,12.0
TEMP,33,4,63.0
TEMP,33,6,114.0
TEMP,33,7,84.0
ENDDATA
```

Hint:

Determining the grid temperatures, sid=33 for Subcom 20

For example:

Calculate the temperature change in Subcase 3 at grid 1.

Temp (at grid 1) = 45.0, Reference Temp = 72.0

Δ Temp = 45.0-72.0 = -27.0

Calculate the scaled temperature effect for the Δ Temp.

Scale factor (subcom 20 for subcase 3) = 1.5

Scaled Δ Temp = 1.5 x -27.0 = -40.5

Calculate the scaled temperature load at grid point 1.

Reference Temp = 72.0, Scaled Δ Temp = -40.5

Scaled Temp load = 72.0 + (-40.5) = 31.5

SUBMITTING THE INPUT FILE:

8. Make sure that the files prob2.DBALL and prob2.MASTER exist for the restart. If not, re-run the analysis from problem 2.

   8a. To submit the MSC/PATRAN **.bdf** file for analysis, find an available UNIX shell window. At the command prompt enter: **nastran prob2.bdf**. Monitor the run using the UNIX **ps** command.

   8b. To submit the MSC/NASTRAN **.dat** file for analysis, find an available UNIX shell window. At the command prompt enter: **nastran prob2**. Monitor the run using the UNIX **ps** command.

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

   9a. To submit the MSC/PATRAN **.bdf** file for analysis, find an available UNIX shell window. At the command prompt enter:

   nastran prob8.bdf dbs=prob2.

   Monitor the run using the UNIX **ps** command.

   9b. To submit the MSC/NASTRAN **.dat** file for analysis, find an available UNIX shell window. At the command prompt enter:

   nastran prob8 dbs=prob2.

   Monitor the run using the UNIX **ps** command.

10. When the run is completed, edit the **prob8.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.

    10a. While still editing **prob8.f06**, search for the word:

    D I S P L A C E (spaces are necessary).

    What are the components of the displacement vector for GRID 1, 3, and 5 (translation only)?

    Search for the word:

Combined Load Case		**Scaled Load Combinations**	
Grid 1		Grid 1	
Disp. X =	_____	Disp. X =	_____
Disp. Y =	_____	Disp. Y =	_____

Disp. Z =	_____	Disp. Z =	_____
Grid 3		Grid 3	
Disp. X =	_____	Disp. X =	_____
Disp. Y =	_____	Disp. Y =	_____
Disp. Z =	_____	Disp. Z =	_____
Grid 5		Grid 5	
Disp. X =	_____	Disp. X =	_____
Disp. Y =	_____	Disp. Y =	_____
Disp. Z =	_____	Disp. Z =	_____

S I N G L E (spaces are necessary).

What are the components of the reaction force at GRID 1 and GRID 7?

Combined Load Case		**Scaled Load Combinations**	
GRID 1		GRID 1	
T1 =	_____	T1 =	_____
T2 =	_____	T2 =	_____
T3 =	_____	T3 =	_____
GRID 7		GRID 7	
T1 =	_____	T1 =	_____
T2 =	_____	T2 =	_____
T3 =	_____	T3 =	_____

Search for the word:

F O R C E D I S T (spaces are necessary).

What is the axial force in the BAR elements, (CBAR)?

Combined Load Case		**Scaled Load Combinations**	
Element 4		Element 4	
PCT 1.000	_____	PCT 1.000	_____
PCT 0.000	_____	PCT 0.000	_____

Element 11		Element 11	
PCT 1.000	_____	PCT 1.000	_____
PCT 0.000	_____	PCT 0.000	_____

What is the axial force in CROD elements 7 and 8?

Combined Load Case		**Scaled Load Combinations**	
Element 7	_____	Element 7	
Element 8	_____	Element 8	

Search for the word:

S T R E S S (spaces are necessary).

What is the margin of safety for elements 6 and 11?

Combined Load Case		**Scaled Load Combinations**	
Element 6		Element 6	
PCT 1.000	_____	PCT 1.000	_____
PCT 0.000	_____	PCT 0.000	_____
Element 11		Element 11	
PCT 1.000	_____	PCT 1.000	_____
PCT 0.000	_____	PCT 0.000	_____

What is the Axial Stress for all elements 6 and 11?

Combined Load Case		**Scaled Load Combinations**	
Element 6		Element 6	
PCT 1.000	_____	PCT 1.000	_____
PCT 0.000	_____	PCT 0.000	_____
Element 11		Element 11	
PCT 1.000	_____	PCT 1.000	_____
PCT 0.000	_____	PCT 0.000	_____

Comparison of Results:

11. Compare the results obtained in the **.f06** file with the results below.

COMBINED LOADS

D I S P L A C E M E N T V E C T O R

POINT ID.	TYPE	T1	T2	T3	R1	R2	R3
1	G	0.0	0.0	0.0	0.0	0.0	-5.915849E-03
2	G	1.071794E-01	-3.381076E-01	0.0	0.0	0.0	2.544115E-03
3	G	-8.569690E-03	-3.316230E-01	0.0	0.0	0.0	1.548285E-04
4	G	-6.612658E-02	-8.022887E-02	0.0	0.0	0.0	1.870617E-03
5	G	-1.656732E-02	-6.795923E-02	0.0	0.0	0.0	1.394551E-03
6	G	-4.515067E-02	-4.489013E-02	0.0	0.0	0.0	-3.918693E-05
7	G	-1.096685E-02	0.0	0.0	0.0	0.0	9.692505E-05

SCALED LOAD COMBINATIONS

D I S P L A C E M E N T V E C T O R

POINT ID.	TYPE	T1	T2	T3	R1	R2	R3
1	G	0.0	0.0	0.0	0.0	0.0	-8.865292E-03
2	G	1.416618E-01	-5.078505E-01	0.0	0.0	0.0	3.890638E-03
3	G	-2.634441E-02	-4.915359E-01	0.0	0.0	0.0	3.416293E-04
4	G	-1.370600E-01	-1.097557E-01	0.0	0.0	0.0	2.991944E-03
5	G	-4.667113E-02	-7.261032E-02	0.0	0.0	0.0	2.102673E-03
6	G	-8.816119E-02	-3.688439E-02	0.0	0.0	0.0	-5.870433E-05
7	G	-4.026162E-02	0.0	0.0	0.0	0.0	-1.006498E-04

COMBINED LOADS

F O R C E S O F S I N G L E - P O I N T C O N S T R A I N T

POINT ID.	TYPE	T1	T2	T3	R1	R2	R3
1	G	1.165000E-04	1.427116E+04	0.0	0.0	0.0	0.0
7	G	0.0	4.254492E+03	0.0	0.0	0.0	0.0

SCALED LOAD COMBINATIONS

F O R C E S O F S I N G L E - P O I N T C O N S T R A I N T

POINT ID.	TYPE	T1	T2	T3	R1	R2	R3
1	G	1.747500E-04	2.087533E+04	0.0	0.0	0.0	0.0
7	G	0.0	5.850326E+03	0.0	0.0	0.0	0.0

COMBINED LOADS

F O R C E D I S T R I B U T I O N I N B A R E L E M E N T S (C B A R)

0 ELEMENT ID.	STATION (PCT)	BEND-MOMENT PLANE 1	BEND-MOMENT PLANE 2	SHEAR FORCE PLANE 1	SHEAR FORCE PLANE 2	AXIAL FORCE	TORQUE
1	0.000	-1.101318E+05	0.0	-5.653981E+03	0.0	-2.128362E+04	0.0
1	1.000	-6.385827E+04	0.0	4.005832E+03	0.0	-1.645372E+04	0.0
2	0.000	-6.385827E+04	0.0	-2.361120E+03	0.0	-1.551464E+04	0.0
2	1.000	-2.932529E+04	0.0	8.588179E+02	0.0	-1.390467E+04	0.0
3	0.000	-2.932529E+04	0.0	-2.448169E+02	0.0	-8.965545E+03	0.0
3	1.000	1.008947E+04	0.0	-2.448169E+02	0.0	-8.965545E+03	0.0
4	0.000	1.008947E+04	0.0	1.168222E+02	0.0	-9.063545E+03	0.0
4	1.000	-8.718536E+03	0.0	1.168222E+02	0.0	-9.063545E+03	0.0
9	0.000	1.101318E+05	0.0	6.071592E+02	0.0	1.650811E+04	0.0
9	1.000	-6.442806E+03	0.0	6.071592E+02	0.0	1.650811E+04	0.0
10	0.000	-6.442801E+03	0.0	-1.497711E+03	0.0	7.484518E+03	0.0
10	1.000	-3.088237E+04	0.0	5.022894E+02	0.0	7.484518E+03	0.0
11	0.000	-3.088237E+04	0.0	-2.062547E+02	0.0	8.054436E+03	0.0
11	1.000	8.718536E+03	0.0	-2.062547E+02	0.0	8.054436E+03	0.0

F O R C E S I N R O D E L E M E N T S (C R O D)

ELEMENT ID.	AXIAL FORCE	TORQUE	ELEMENT ID.	AXIAL FORCE	TORQUE
5	-6.647411E+03	0.0	6	9.620107E+03	0.0
7	1.160979E+03	0.0	8	1.335437E+02	0.0

SCALED LOAD COMBINATIONS

F O R C E D I S T R I B U T I O N I N B A R E L E M E N T S (C B A R)

ELEMENT ID.	STATION (PCT)	BEND-MOMENT PLANE 1	BEND-MOMENT PLANE 2	SHEAR FORCE PLANE 1	SHEAR FORCE PLANE 2	AXIAL FORCE	TORQUE
1	0.000	-1.646336E+05	0.0	-8.478093E+03	0.0	-4.916200E+04	0.0
1	1.000	-9.568688E+04	0.0	6.011627E+03	0.0	-4.191714E+04	0.0
2	0.000	-9.568688E+04	0.0	-3.547410E+03	0.0	-3.490165E+04	0.0
2	1.000	-4.296488E+04	0.0	1.282497E+03	0.0	-3.248670E+04	0.0
3	0.000	-4.296488E+04	0.0	-3.428836E+02	0.0	-6.799488E+03	0.0
3	1.000	1.223832E+04	0.0	-3.428836E+02	0.0	-6.799488E+03	0.0
4	0.000	1.223832E+04	0.0	1.546559E+02	0.0	-3.095565E+03	0.0
4	1.000	-1.266080E+04	0.0	1.546559E+02	0.0	-3.095565E+03	0.0
9	0.000	1.646336E+05	0.0	8.958865E+02	0.0	1.151820E+04	0.0
9	1.000	-7.376643E+03	0.0	8.958865E+02	0.0	1.151820E+04	0.0
10	0.000	-7.376637E+03	0.0	-2.213971E+03	0.0	3.048369E+03	0.0
10	1.000	-5.029421E+04	0.0	7.860291E+02	0.0	3.048369E+03	0.0
11	0.000	-5.029421E+04	0.0	-3.278907E+02	0.0	1.012675E+04	0.0
11	1.000	1.266080E+04	0.0	-3.278907E+02	0.0	1.012675E+04	0.0

F O R C E S I N R O D E L E M E N T S (C R O D)

ELEMENT ID.	AXIAL FORCE	TORQUE	ELEMENT ID.	AXIAL FORCE	TORQUE
5	-1.022127E+04	0.0	6	1.392133E+04	0.0
7	1.387669E+03	0.0	8	3.803258E+02	0.0

COMBINED LOADS

S T R E S S D I S T R I B U T I O N I N B A R E L E M E N T S (C B A R)

ELEMENT ID.	STATION (PCT)	SXC	SXD	SXE	SXF	AXIAL	S-MAX	S-MIN	M.S.-T M.S.-C
1	0.000	1.181742E+04	-1.181742E+04	-1.181742E+04	1.181742E+04	-3.869750E+03	7.947666E+03	-1.568717E+04	5.3E-01
1	1.000	6.852154E+03	-6.852154E+03	-6.852154E+03	6.852154E+03	-2.991585E+03	3.860569E+03	-9.843739E+03	1.4E+00
2	0.000	6.852154E+03	-6.852154E+03	-6.852154E+03	6.852154E+03	-2.820844E+03	4.031310E+03	-9.672998E+03	1.5E+00
2	1.000	3.146677E+03	-3.146677E+03	-3.146677E+03	3.146677E+03	-2.528123E+03	6.185547E+02	-5.674800E+03	3.2E+00
3	0.000	3.146678E+03	-3.146678E+03	-3.146678E+03	3.146678E+03	-1.630099E+03	1.516579E+03	-4.776777E+03	1.5E+01
3	1.000	-1.082626E+03	1.082626E+03	1.082626E+03	-1.082626E+03	-1.630099E+03	-5.474730E+02	-2.712725E+03	4.0E+00
4	0.000	-1.082626E+03	1.082626E+03	1.082626E+03	-1.082626E+03	-1.647917E+03	-5.652911E+02	-2.730543E+03	
4	1.000	9.355210E+02	-9.355210E+02	-9.355210E+02	9.355210E+02	-1.647917E+03	-7.123962E+02	-2.583438E+03	7.8E+00
9	0.000	-7.791193E+03	7.791193E+03	7.791193E+03	-7.791193E+03	2.539710E+03	1.033090E+04	-5.251483E+03	1.3E+00
9	1.000	4.557917E+02	-4.557917E+02	-4.557917E+02	4.557917E+02	2.539710E+03	2.995501E+03	2.083918E+03	3.6E+00
10	0.000	4.557914E+02	-4.557914E+02	-4.557914E+02	4.557914E+02	1.151464E+03	1.607256E+03	6.956730E+02	1.4E+01
10	1.000	2.184751E+03	-2.184751E+03	-2.184751E+03	2.184751E+03	1.151464E+03	3.336216E+03	-1.033287E+03	6.2E+00
11	0.000	2.184751E+03	-2.184751E+03	-2.184751E+03	2.184751E+03	1.239144E+03	3.423895E+03	-9.456072E+02	6.0E+00
11	1.000	-6.167866E+02	6.167866E+02	6.167866E+02	-6.167866E+02	1.239144E+03	1.855931E+03	6.223574E+02	2.4E+01

S T R E S S E S I N R O D E L E M E N T S (C R O D)

ELEMENT ID.	AXIAL STRESS	SAFETY MARGIN	TORSIONAL STRESS	SAFETY MARGIN	ELEMENT ID.	AXIAL STRESS	SAFETY MARGIN	TORSIONAL STRESS	SAFETY MARGIN
5	-1.278348E+03	4.9E-01	0.0		6	1.850021E+03	2.7E-02	0.0	
7	2.232651E+02	7.5E+00	0.0		8	2.568148E+01	7.3E+01	0.0	

SCALED LOAD COMBINATIONS

S T R E S S D I S T R I B U T I O N I N B A R E L E M E N T S (C B A R)

ELEMENT ID.	STATION (PCT)	SXC	SXD	SXE	SXF	AXIAL	S-MAX	S-MIN	M.S.-T M.S.-C
1	0.000	1.766560E+04	-1.766560E+04	-1.766560E+04	1.766560E+04	-8.938545E+03	8.727053E+03	-2.660414E+04	-9.8E-02
1	1.000	1.026744E+04	-1.026744E+04	-1.026744E+04	1.026744E+04	-7.621297E+03	2.646146E+03	-1.788874E+04	3.4E-01
2	0.000	1.026745E+04	-1.026745E+04	-1.026745E+04	1.026745E+04	-6.345754E+03	3.921691E+03	-1.661320E+04	4.4E-01
2	1.000	4.610240E+03	-4.610240E+03	-4.610240E+03	4.610240E+03	-5.906672E+03	-1.296432E+03	-1.051691E+04	1.3E+00
3	0.000	4.610240E+03	-4.610240E+03	-4.610240E+03	4.610240E+03	-1.236271E+03	3.373969E+03	-5.846510E+03	6.1E+00
3	1.000	-1.313203E+03	1.313203E+03	1.313203E+03	-1.313203E+03	-1.236271E+03	7.693250E+01	-2.549474E+03	3.1E+00
4	0.000	-1.313203E+03	1.313203E+03	1.313203E+03	-1.313203E+03	-5.628300E+02	7.503730E+02	-1.876033E+03	2.9E+01
4	1.000	1.358536E+03	-1.358536E+03	-1.358536E+03	1.358536E+03	-5.628300E+02	7.957062E+02	-1.921366E+03	1.1E+01
9	0.000	-1.164688E+04	1.164688E+04	1.164688E+04	-1.164688E+04	1.772031E+03	1.341892E+04	-9.874853E+03	7.9E-01
9	1.000	5.218553E+02	-5.218553E+02	-5.218553E+02	5.218553E+02	1.772031E+03	2.293887E+03	1.250176E+03	1.4E+00
10	0.000	5.218549E+02	-5.218549E+02	-5.218549E+02	5.218549E+02	4.689798E+02	9.908347E+02	-5.287512E+01	2.3E+01
10	1.000	3.558028E+03	-3.558028E+03	-3.558028E+03	3.558028E+03	4.689798E+02	4.027008E+03	-3.089049E+03	5.0E+00
11	0.000	3.558028E+03	-3.558028E+03	-3.558028E+03	3.558028E+03	1.557961E+03	5.115989E+03	-2.000067E+03	3.7E+00
11	1.000	-8.956794E+02	8.956794E+02	8.956794E+02	-8.956794E+02	1.557961E+03	2.453640E+03	6.622816E+02	1.1E+01

S T R E S S E S I N R O D E L E M E N T S (C R O D)

ELEMENT ID.	AXIAL STRESS	SAFETY MARGIN	TORSIONAL STRESS	SAFETY MARGIN	ELEMENT ID.	AXIAL STRESS	SAFETY MARGIN	TORSIONAL STRESS	SAFETY MARGIN
5	-1.965628E+03	-3.3E-02	0.0		6	2.677178E+03	-2.9E-01	0.0	
7	2.668595E+02	6.1E+00	0.0		8	7.313957E+01	2.5E+01	0.0	

12. End of Exercise.