Home Work Format

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Google search

"engineering home work format"

First 2 Hits

- Rowan University
- Auburn University

Rowan University

Glassboro, NJ (12,000 students, 18 miles southeast of Philadelphia.)

- **Under Graduate**
- Chemical
- Civil & Environmental
- Electrical & Computer
- Mechanical
- Bioengineering

- **Graduate**
- Chemical
- Civil
- Electrical & Computer
- Engineering Management
- Environmental
- Mechanical

Rowan Engineering

The work you submit is a representation of you and what you know. Be proud of what you submit. In your engineering career, bosses and clients may judge you solely on how you present your work. Colleagues will have to follow precisely and understand completely your work.

In the shorter term, the homework you submit becomes your study guide for future exams. Just because you know where you came up with a certain value today, doesn't mean you'll remember that in three weeks when you're studying for the midterm.

You should adopt the approach used in engineering practice, " Can another engineer use this documentation to duplicate my work?"

1. Homework must be done in pencil and on engineering paper. Do not write on the back side of the engineering paper. Multiple sheets should be stapled together in the upper left corner.

2. The top line of each sheet of engineering paper must include the following: Your Name, Course Name, Date, Page #

3. Include the entire problem statement and problem number. Neatly draw given figures and/or figures relevant to the solution.

4. Reference all figures, tables, constants, equations, and conversions used to complete the problem.

5. Show all your work in the solution. Include all appropriate sketches.

6. Include all the appropriate units throughout the solution.

7. Do not round numbers during the solution. The final answer should be given in three or four significant figures, unless otherwise noted.

8. Put your final answers in a box for easy reference by the reader. Do not box other values that are not your final answers.

9. Start a new page for every new problem. Problems should be in the order assigned.

10. Do not crowd your work, and present the solution in a logical solving order.

Auburn University

Auburn, AL (25,000 students)

Programs

- Aerospace Engineering
- Biosystems Engineering
- Chemical Engineering
- Civil Engineering
- Electrical Engineering
- EE with Computer Engineering Option
- Industrial and Systems Engineering
- Materials Engineering
- Mechanical Engineering
- Software Engineering
- Polymer & Fiber Engineering
- Environmental Science

Department of Chemical Engineering

Purpose of this Document

The homework format described below is intended to familiarize you with the way practicing engineers actually do their work. The format includes most of the elements required by professional engineering offices, and it includes common standards for the presentation of computations, tables and graphs.

In professional practice, all written work is kept as a record of the engineering/design/construction process.

Such records are needed to show that accepted engineering and design methodologies were employed, to establish professional responsibility for the work, to justify time sheets, to justify client billings, to permit error checking and correction and to provide a record of the as-built facility.

For these reasons, actual engineering worksheets contain information that identifies the responsible worker and checker, the date the work was done, the project name and account number, task name and account number, and page numbers, including the total number of pages in the task, so that missing pages can be detected. All work must be checked by others and must be filed for future retrieval and reference. Also, it may be necessary to excerpt portions of the work for transcription to databases or other reports.

Consequently, it is essential that work results and records be presented in prescribed formats that are familiar to their users. The use of familiar formats makes data recovery and checking faster and more accurate, which enhances the productivity of the firm or agency. The details of the prescribed formats vary from company to company and agency to agency, but these variations do not mean that formats are unimportant.

Herein presented are those format elements which the Department of Chemical Engineering at Auburn University has adopted. These should be used in all courses unless specifically indicated otherwise by the professor. These same standards apply to examinations and quizzes as appropriate.

WORK WHICH DOES NOT ADHERE TO THESE STANDARDS MAY BE RETURNED UNGRADED OR CREDIT MAY BE DEDUCTED AT THE PROFESSOR'S DISCRETION.

Format Elements

- "Engineering paper" (National 42-182, 5 square or equivalent) MUST be used.

- Always use the unruled side of the paper ONLY, keeping holes on the left.

- In the case of large tables or figures, keep holes on top edge.

- Work only one problem per page.

- At the top of the page, indicate the course, student name, and problem number as well as the page sequencing information (see example below).

- CHEN2610   Doe, Mary   Felder 5.23   1/5

All writing must be done in pencil and be easily readable (i.e., neatly printed or cursive letters of sufficient darkness). It is suggested a mechanical drafting pencil with grade 2B or softer lead be used. All straight lines are to drawn with a ruler.

It is suggested a 6 inch clear plastic ruler be purchased. This is also an aid for reading tables and figures. A template of common drawing shapes (squares, circles, etc.) is also recommended. Circles and other curved shapes should be drawn with a template or compass or other instrument.

Answers are to be clearly identified. There is only to be a single answer submitted for each part of each question. The answer should be underlined twice and an arrow used in the right margin to locate it easily.

Accuracy

Avoid writing down excessive digits from calculations. Most data items should be written down to 4 significant decimal digits (i.e., molecular weights, constants, etc.). Final answers should reflect no greater than 0.1% accuracy (i.e., 3-4 significant decimal digits).
Some examples are:

345.	1.070
3.45	107.0
0.0345	0.0001070

Units

Much credit is lost in failing to use units in calculations. This does not just include writing down the units but "using them" (i.e., canceling units to determine the final units).

Problem Solving Methodology

A standardized approach to solving problems often is the best way to develop a problem's solution. These steps constitute a rational approach toward the completion of any engineering problem.

1. Draw a schematic diagram and label its important components to help you understand the physical situation. Use a nomenclature that is convenient and well accepted.

2. Write the general equations describing the physical situation.

3. Write appropriate auxiliary equations (boundary or initial conditions, chemical reactions, equilibrium constraints, physical property correlations, etc.)

4. Simplify the set of equations, stating all appropriate assumptions.

5. Solve the set of equations.

6. Substitute any numerical values required for quantification of the solution.

7. **THINK!!** What do your solutions indicate, are they reasonable?

In completing this procedure, the following additional considerations will help you to develop a good engineering approach. These will provide you with a better understanding of why you are using a particular procedure, not just what the steps are for a solution.

1. Write legibly (illegible assignments will not be graded).

2. Always use and keep track of units. Mistakes can frequently be identified through inconsistencies in the units.

3. Annotate or explain each step in the calculations. Do not just provide a series of equations.

4. If your solution involves the use of spreadsheet calculations, describe the logic and equations used in the calculations.

5. Any tables or figures used to present results should be described with text as well. These figures do not speak for themselves.

Significant Digits Example

Leading the News

Student-Built Car Breaks Solar Speed Record.

Popular Science (1/10, Nosowitz) reports, "A new champion amongst solar-powered cars has emerged in sunny Australia: A student-built solar car, christened the Sunswift IV, has crushed the previous speed record with a run that topped out at 56.85 mph." The vehicle was designed by students at the University of New South Wales "specifically to break the existing speed record of 49.09 mph, set by the GM Sunraycer way back in 1987." By removing the 55-pound battery, among other modifications, the vehicle was able to average "55.14 mph in two trips (going in opposite directions) on a 2,500-meter track." The article notes, "The record is peculiar because it can only be awarded to cars powered solely by the sun--no batteries can be involved (unlike some solar powerhouses), which is why the previous record stood so long (and why the actual speeds are not that fast)."

The Wired (1/10, Barry) "Autopia" blog reports, "Currently, [the team is] optimizing Ivy for the upcoming World Solar Challenge to be held in October. We also plan to take the solar car on a school tour around Australia to try and generate some excitement amongst children who might consider doing engineering or science when they go to university," said project manager Daniel Friedman. "Not only does the Sunswift team hope to inspire the next generation, but they also aim to inspire their competitors to advance the field of solar automobiles." Friedman said, "Our vision is hopefully that a few other teams take on the challenge and try break this record again. We might even find some designing cars specifically geared toward breaking this record, and in the process develop even more efficient cars."

Format for Prof Lawrence's Classes

- Use the Rowan and Auburn University requirements as general guidance.
- See the instructions on the specific UTA course web site. Also see the link below for examples.
- mae.uta.edu/~lawrence/ansys/solutions
- In addition, present your results first using the units of the problem definition and then in the alternative set of units commonly used in engineering, e.g. *Stress A = 250 MPa = 36,260 psi*
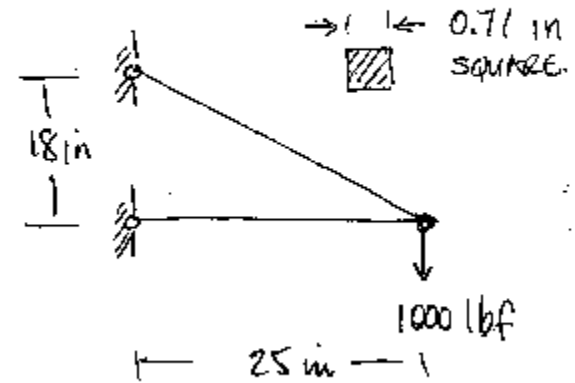
ANSYS Prob

PROBLEM ANSYS 1

GIVEN: THE TRUSS STRUCTURE SHOWN

MATERIAL IS STEEL

$E = 3 \times 10^7$ psi

$\nu = 0.3$

CROSS SECTIONAL AREA $A \cong 0.5 \text{ in}^2$

$I \cong 0.021 \text{ in}^4$

18 in

0.71 in SQUARE

1000 lbf

25 in

FIND: MAXIMUM STRESS AND DEFLECTION.
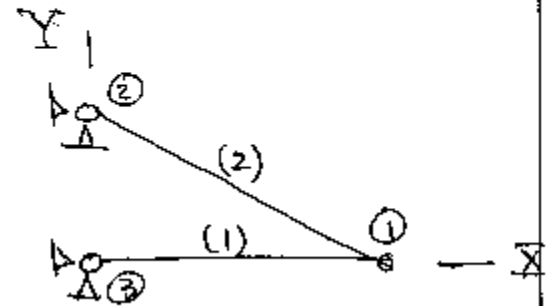DOES BUCKLING OCCUR?

SOLUTION: CREATE ANSYS MODEL
AS SHOWN

NODES ①

ELEMENTS (1)

LINK1 ELEMENT USED

GLOBAL AXES X-Y

Problem definition text file.

```
/FILNAM,truss
/title, Simple Truss
/prep7
n, 1, 25.0,  0.0, 0.0        ! Node 1 is located at (25.0, 0.0, 0.0)
n, 2,  0.0, 18.0, 0.0
n, 3,  0.0,  0.0, 0.0
et, 1, link1                 ! Element type; no.1 is link1
mp, ex, 1, 3.e7              ! Material Properties, E for material no. 1
mp, nuxy, 1, 0.3            ! & poisson's ratio for material no.1
r, 1, 0.5                    ! 'Real Constant' number 1 is 0.5
                             !   (Cross sectional area)
en, 1, 3, 1                  ! Element Number 1 connects nodes 1 & 2
en, 2, 2, 1

d, 3, ux, 0.                 ! Displacement at node 3 in x-dir is zero
d, 3, uy, 0.                 ! Displacement at node 3 in y-dir is zero
d, 2, ux, 0.
d, 2, uy, 0.
f, 1, fy, -1000.            ! Force at node 1 in y-direction is -1000.
```

Model
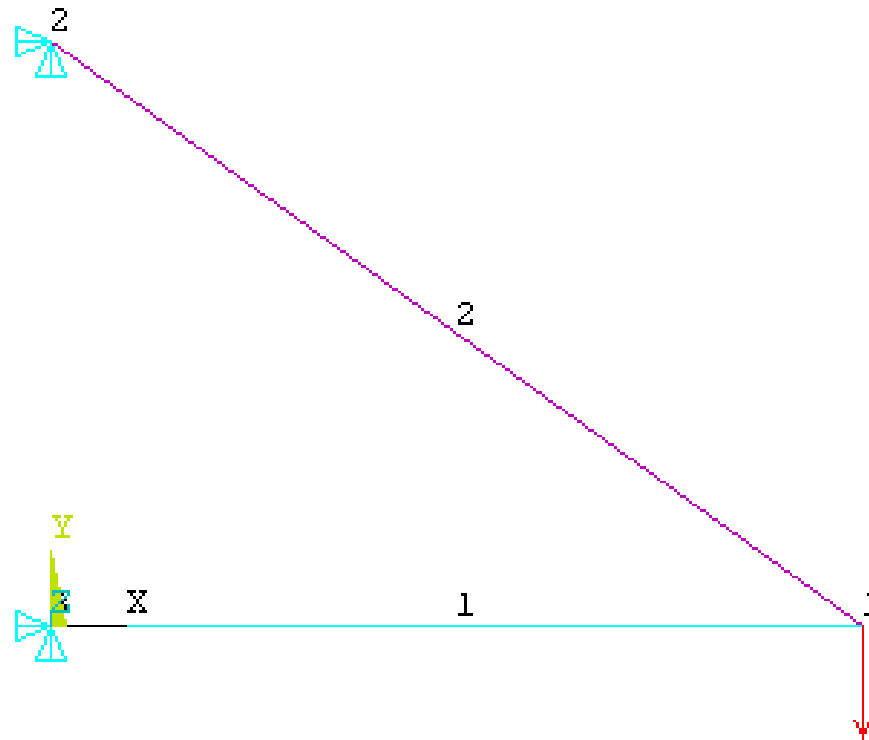
Computed Results

DISPLACEMENT RESULTS

```
  NODE     UX        UY
   1 -0.23148E-02-0.92304E-02
   2  0.0000     0.0000
   3  0.0000     0.0000
```

MAXIMUM ABSOLUTE VALUES
NODE   1   1
VALUE -0.23148E-02-0.92304E-02

STRESS RESULTS

```
   ELEM   STRESS
   1  -2777.8
   2   3422.9
```
MINIMUM VALUES
ELEM   1
VALUE   -2777.8

MAXIMUM VALUES
ELEM   2
VALUE   3422.9

RESULTS

THE MAXIMUM DEFLECTION OCCURS
AT NODE 1 AND IS FOUND TO BE

node 1 $\Rightarrow$

$$U_X = -0.2314E-2 \text{ inches}$$
$$U_y = -0.9230E-2 \text{ inches}$$

THE MAXIMUM STRESS IS IN ELEMENT
(2)

$$\sigma = 3423 \text{ psi}$$
TENSION

THEORETICAL BUCKLING LOAD FOR
ELEMENT (1) IS (EULER LONG COLUMN)

$$P_{CR} = \frac{\pi^2 EI}{L^2} = \frac{\pi^2 (3\times10^7)(0.021)}{(25)^2} = 9948 \text{ lbf}$$

ACTUAL LOAD CARRIED BY ELEMENT (1)
IS $F_{(1)} = 1388 \text{ lbf}$

$\therefore$ NO BUCKLING

Plane Stress example problem

Given: The wrench shown is made of a steel with a yield strength of 45,000 psi. and is loaded with a pressure of 150 psi. along its handle as shown. It is 0.4 inches thick and about 7 inches in length.

Find: Determine if any yielding occurs because of this load.

Solution: The geometry was created in Pro/E, saved as an IGES file and imported into ANSYS 6.1. The plane2 6 node triangle element, plane stress with thickness option was used in the modeling.

Material properties were
E = 3.e7 psi, nu = 0.3.
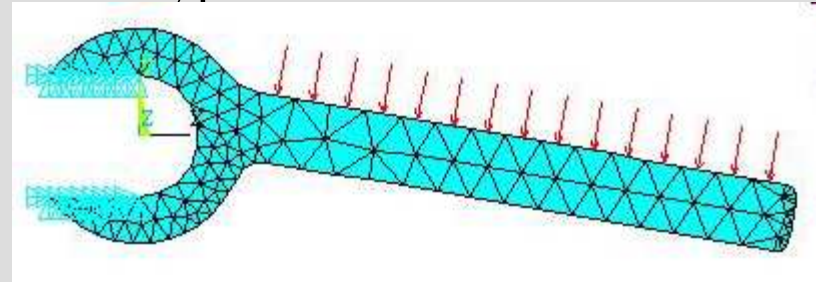
Boundary conditions ux = uy = 0 were applied along the lines where the wrench contacts the bolt.The mesh was refined to eliminate element-solution stress contour discontinuities. The following plots of von Mises stress show a maximum value of 39,333 psi at the fillet radius on the underside of the wrench.

Data entered Interactively:

Element Type:

LIST ELEMENT TYPES FROM   1 TO   1 BY   1

 ELEMENT TYPE   1 IS PLANE2   2-D 6-NODE TRI. STRUC. SOLID   INOPR
  KEYOPT(1-12)=   0 0 3   0 0 0   0 0 0   0 0 0   0

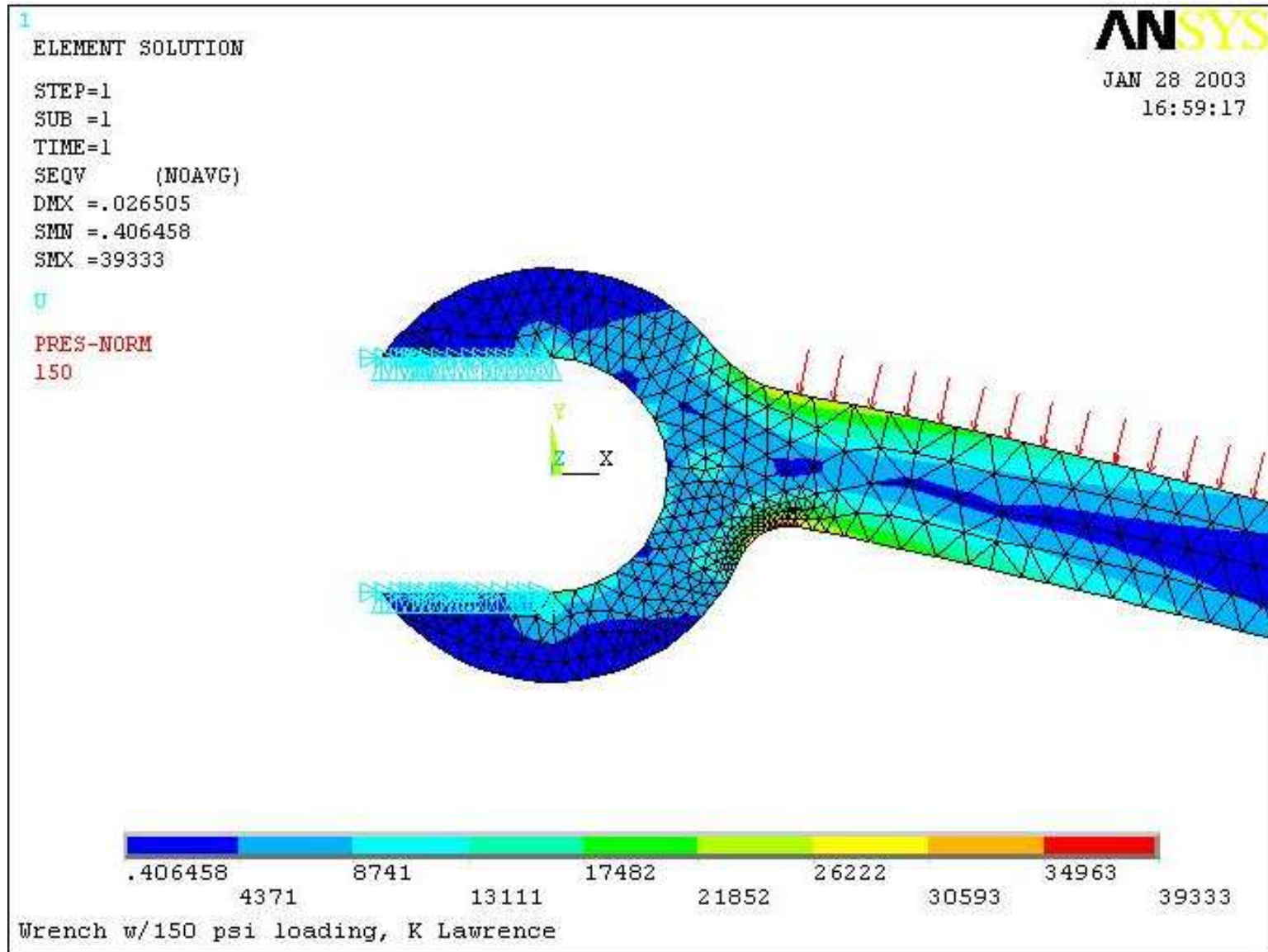 CURRENT NODAL DOF SET IS UX   UY
  TWO-DIMENSIONAL MODEL

Thickness:
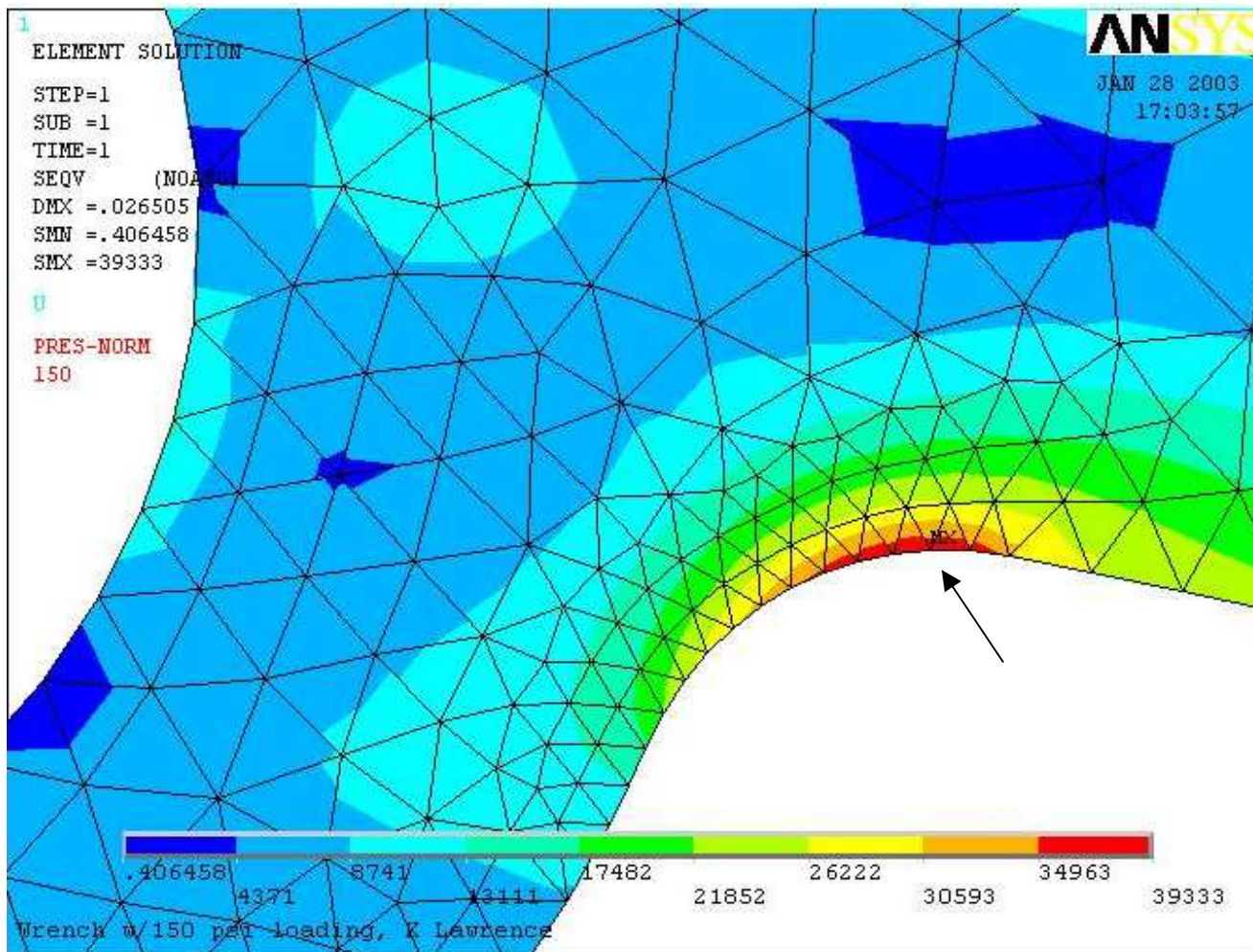
LIST REAL SETS   1 TO   1 BY   1

 REAL CONSTANT SET   1 ITEMS 1 TO 6
  0.4000   0.0000   0.0000   0.0000   0.0000   0.0000

Material Properties:

 MATERIAL NUMBER =   1 EVALUATED AT TEMPERATURE OF   0.0000
  EX   = 0.30000E+08
  PRXY = 0.30000

Computed von Mises Stress Distribution

ELEMENT SOLUTION

STEP=1
SUB =1
TIME=1
SEQV   (NOAVG)
DMX =.026505
SMN =.406458
SMX =39333

PRES-NORM
150

.406458   8741   17482   26222   34963
    4371   13111   21852   30593   39333

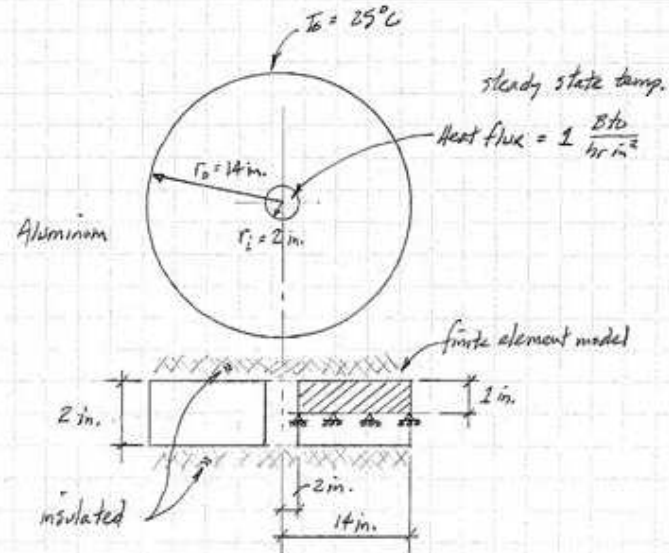Wrench w/150 psi loading, K Lawrence

ANSYS
JAN 28 2003
16:59:17

Results:

The maximum von Mises stress, **SEQV = 39,333 psi**, is less than the material yield strength of **45,000 psi**, so no yielding is likely to occur.

Thermal Stress Problem

The results of the thermal analysis (nodal temperatures) are used as the only loading in the following stress analysis.
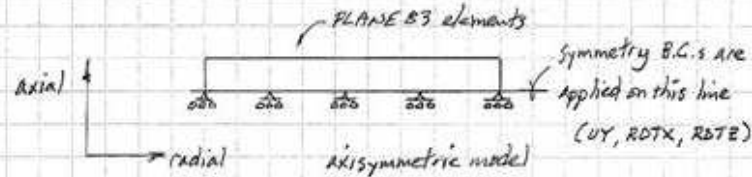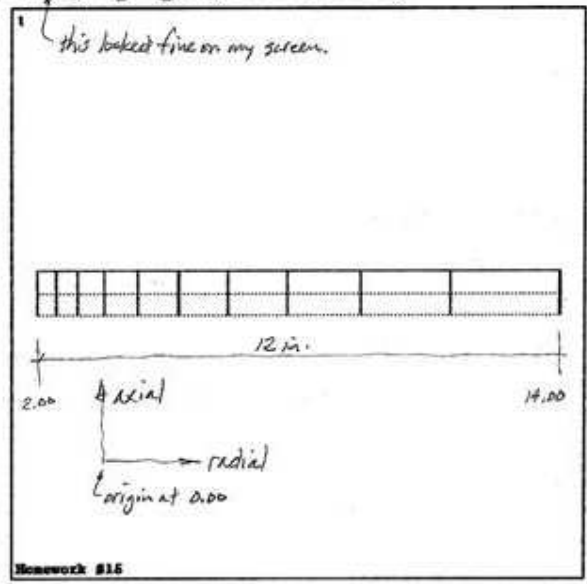

Static analysis is performed.

Results of the thermal analysis show temperatures on the inside surface reach over 1600°F (a little high for aluminum). Resulting temperature distribution depends on radial dimension only, as it should.
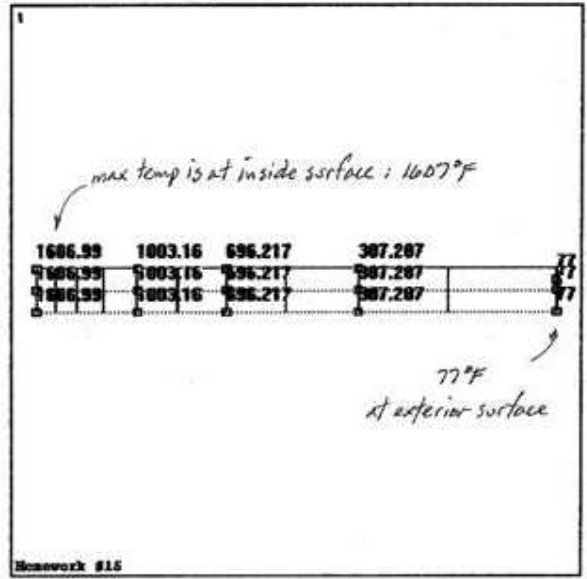
Results of the stress analysis show larger vertical expansion toward the center of symmetry due to the higher temperature change. Poisson's ratio effects show up. Deformed shape and stress distribution looks good.

Comments.

1) I got lucky on symmetry. The element local coordinate system determines which way is axial, radial & circumferential. I just happened to model it like it was drawn on the blackboard.

2) The symmetry boundary conditions on the bottom part of the FEM could easily be messed up.

ANSYS 5.3
MAY 7 1997
19:58:54
ELEMENTS
TYPE NUM

ZV =1
DIST=6.6
XF =8
YF =.5

this looked fine on my screen.

12 in.

2.00   ↑ axial   14.00

→ radial

origin at 0.00

Homework #15

ANSYS 5.3
MAY 7 1997
19:58:54
ELEMENTS
TYPE NUM

ZV =1
DIST=6.6
XF =8
YF =.5

max temp is at inside surface : 1607°F

1606.99	1003.16	696.217	387.287

77°F at exterior surface

Homework #15

fin