Guidelines for Problem Presentations in ESM

An engineer is judged by the quality of the work produced. This work is usually in written form. The work must be easily followed by other individuals. It is imperative that each engineering student learn to communicate effectively by documenting clearly each step of all calculations. One of the goals of this course is to reinforce proper methods of presenting the solutions to engineering problems. This guide is intended to aid the student in achieving that goal. Your instructor may modify or add to the suggestions listed below.

1. Use only 8½" x 11" engineer's computation pad paper – no legal sizes or pages torn from composition books. Use only the front sides of the pages. Upon completion of the problem set, place a staple (no paper clips or dog ears) in the upper left-hand corner and write your name (last name first), course, and due date on the first page as shown on the sample problem. Put your name on each subsequent page. Place the (page number)/(total number of pages) at the upper right of every page. Submit your problem sets unfolded.

2. Use a pencil (no pens) and print neatly. Use a straightedge and templates for diagrams.

3. Begin each problem on a new page. Do not crowd your work.

4. Vector quantities should be clearly identified with standard notation, such as underlines, over-arrows, under-squiggles, etc. Failure to distinguish vectors from scalars is a bad practice which often leads to catastrophic thinking errors.

5. A clear and complete free-body diagram (FBD) is required for all problems involving static equilibrium.

6. The following points are to be followed in the solution of individual problems:

    a. Although rewriting the entire problem statement is unnecessary, a statement of the given and required quantities should be made. The following format is suggested:

        Given: (Include diagram if required)
        Find:
        Solution:

    b. There should be a clear statement of the method(s) utilized. This could be in the form of a governing equation (in variable form). Show enough steps in your solution to allow the reader to easily follow your thinking.

    c. If equations are used, first indicate the equation in variable form (using symbols). Then substitute known magnitudes into the equation. Indicate intermediate steps as desired. Display the final answer clearly marked with a double underline or put in a box. Proper units are a part of the answer.

    d. Your final answer should be accurate to:

        1. Three significant figures if the first non-zero number begins with 2-9.
        2. Four significant figures if the first non-zero number begins with a one.

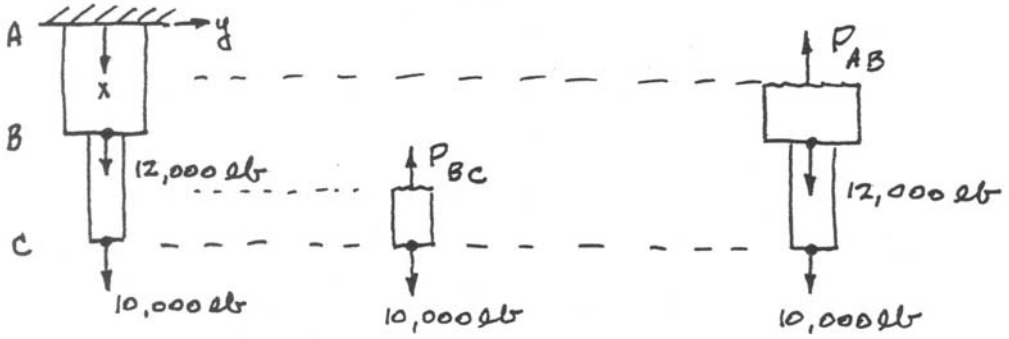
        Carry full intermediate results in calculator registers so as to avoid round-off errors in your final answer.

ESM 2204 WEDNESDAY, 8/28/02 YOUR NAME

1.3 GIVEN: TWO CYLINDRICAL RODS WITH APPLIED FORCES AS SHOWN.

FIND: AVERAGE NORMAL STRESS IN MIDSECTION OF EACH ROD.

SOLUTION: FIRST, FIND THE INTERNAL FORCES AT THE MIDSECTION OF EACH ROD (STATICS)



P_{AB} & P_{BC} ARE INTERNAL FORCES (ASSUMED TENSION)

SECTION BC: $+\downarrow \Sigma F_x = 0$: $10{,}000 - P_{BC} = 0 \Rightarrow P_{BC} = 10{,}000$ lb

SECTION AB: $+\downarrow \Sigma F_x = 0$: $10{,}000 + 12{,}000 - P_{AB} = 0 \Rightarrow P_{AB} = 22{,}000$ lb

BOTH INTERNAL FORCES ARE TENSILE

THE AVERAGE NORMAL STRESSES ARE FOUND USING EQ. (1.5)

$$\sigma_{BC} = \left(\frac{P}{A}\right)_{BC} = \frac{10{,}000}{\frac{\pi}{4}(0.75)^2} = 22{,}635 \text{ psi}$$

$$\sigma_{AB} = \left(\frac{P}{A}\right)_{AB} = \frac{22{,}000}{\frac{\pi}{4}(1.25)^2} = 17{,}927 \text{ psi}$$

THE FINAL ANSWERS ARE (AFTER ROUND-OFF):

$\sigma_{AB} = 17{,}930$ psi [OR, 17.93 ksi]

$\sigma_{BC} = 22{,}600$ psi [OR, 22.6 ksi]