Do three Exercises: 2.2, 2.3 items (c)–(f), 2.4.

See below for samples on how to answer Exercise 2.3.

See back of page for homework presentation guidelines.

For Exercise 2.3 one or more nonlinear sources may be important, depending on the problem. For example, here are the answers to items (a,b) of that Exercise; note that you are required to answer (c) through (f):

(a) Main source of nonlinearities:

- Geometric: change in pipe geometry is important as it bends.
- Force BC: possible if forces follow the geometry change (“follower forces”)

(b) Main source of nonlinearities, in decreasing order of importance:

- Geometric: change in balloon geometry as it inflates is important
- Material: rubber is elastic but constitutively nonlinear
- Force B.C.: pressure stays normal to deforming balloon wall
- Displacement B.C.: (contact) might occur for some inflation devices; for example if the balloon is inflated inside a container, or triggered by a car airbag deploying on a collision event.
Homework Assignment and Solution Posting:

- Homework Exercises are chosen from those listed at the end of the Chapters of posted lectures. HW assignments are numbered and posted on the web site with their due dates. An assignment usually spans two Chapters (sometimes one, occasionally three). Normally posted on Wednesday or Thursday; due the following Thursday. Solutions are posted by linking to the index of the Chapter where they appear.

Guidelines for Preparation:

- **Group collaboration** for HW is allowed. Each student, however, submits an individual HW even if the submitter has discussed the assignment with others. Write the name of the submitter on the first page of the returned HW, and also on the cover page. Use this HW assignment sheet as cover. If the submitter has worked with other students, write their name on the cover page only, and identify them as collaborators. Members of a HW collaborative group may not submit identical HWs: those will get no credit.

- HW are due at the beginning of the class on the due date. If you will be absent that day, please make appropriate arrangements with instructor.

- The grading weight of each Exercise is given in the Notes. Often optional problems are assigned; if so they are given the same weight. The aggregate scores for each assignment are converted to percentages. For example, if three Exercises of weights 10, 15 and 15 are assigned and the scores are 8/10, 7/15 and 15/15, the overall score is 30/40=75%.

- The lowest HW grade will be dropped when computing the overall HW average.

Guidelines for Presentation:

- **Neatness counts**: normally 20% of the homework grade for each exercise is based on presentation, whereas the remainder is based on the technical content and correctness.

- Write only on one side of the paper. Homeworks using back of the paper will not be graded. Use of engineering paper is strongly recommended.

- Be sure to start each EXERCISE on a NEW PAGE to facilitate grading. Items need not start on a new page.

- You do not need to restate the homework question (as was required in ASEN 5007 to simplify the work of a TA or grader). But please identify the Exercise number, as well as item if necessary.

- **Show work**: just giving the final answers gets no credit.

- In the presentation of your technical work, keep a narrative of what you are doing, as if writing a technical paper. Identify the equations you use and their sources. Odds are that you did not come up with the equations you are using on your own. Where did you get them? Often an equation number from the Notes will do. If it has a well known name (for example: Hooke’s law, or force equilibrium equation), that will also do.

- Highlight answers by boxing or underscoring, and mark with arrow on margin.

- If the problem specifies physical units, identify them in the answers.

- When making plots of your results try to use graphics produced by a computer program if feasible. Use of personal computers for calculations in non-computer HW is encouraged (see next bullet).

- If you use Mathematica, Matlab or similar program to do a non-computer exercise, please include the output results (including graphics if necessary) and attach to the homework. Inclusion of the source cell(s) or file(s) (a.k.a. script) is optional. [Note: If you use Matlab, commands and results are often spaghetti-interweaved so it may be difficult or impossible to separate source and results. In this case you should include sufficient information or comments for the instructor to understand what you did.]

- For exercises requiring computer work, please follow the guidelines in the statement of the problem. Usually the source code or part of it is required, as well as the results.

- **Use the HW assignment sheet as cover**, and write submitter’s name on it plus that of collaborators as noted above. If a collaborative HW, underline submitter’s name.