110-1 (2022) Mass and Energy Balances
Homework 2, 2022/05/06
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Submission deadline (electronic):

2022/05/18 (Wed.), 24:00 (it can be extended further depends on the situation), please submit this **homework file with answers** and your **Python script** to **Moodle**.

Note:

- **Please do the work on your own.** All the submitted homework will be screened and checked for plagiarism via scripts. **No plagiarism is allowed.** The score will be zero on both sides of the plagiarism, **and you will likely fail this course**.

Problem descriptions:

We have gone through the python script that can be used to auto-calculate the unknown compositions/flow rates in a single-unit mass balance problem without reactions. Now, please modify the Python script to solve the problem 3 in Homework-2 with the following requirements:

1. The script we taught has not included the "process relations" yet. Please modify the script so that we can freely input the process relations to solve the problem. **The input format should be free enough** that we can enter anything, for example:
   a、 "F4 = 5*F2" (equivalent as "F4-5*F2=0")
   b、 "y3M = 3*y1P"
   c、 "y4E - 2*y4M - y1C = 0"
   d、 Or input multiple process relations (combinations of the above).
   Hint:
   - If you input process relations, which will be served as "design variables". So, you will have to remove other inputs to keep the same number of design variables. But, be careful on choosing whom to be removed. Sometimes, if you remove the wrong one, the resulting balance equations may become not fully "independent", from which you cannot get the solutions. (Pay attention to the equations used for solving)
   - Couples of functions you can consider to use:
     sympify (https://docs.sympy.org/latest/modules/core.html),
     eval (https://docs.python.org/3/library/functions.html#eval).
     But these are not the only functions that can do the work. Feel free to organize your own script with combinations of any other functions that you can find on Google. (You will get more credits if you have innovative solutions)
2. In your script, please make it capable of doing the variable analysis automatically. For example, it should auto-calculate the number of total variables, design variables, and print them out. Note, the process relations (equations) should be printed out as well.

3. As I mentioned several times in the class, there is NO single correct answer when writing the script. It will be a good and correct script if your script works and fulfills the requirements. Even it is entirely different from others. Therefore, I would expect that everyone designs the script with your own logic and theoretically no one will be having the same flow.

Explaining your script

Other than designing the script, in this section, **please explain your flow (logic) of how you modified the script**. You only have to explain the scripts that **you add and modify**. No need to explain what we have gone through in the class.

Explanations: