ChEn-3170: Computational Methods in Chemical Engineering Spring 2020 UMass Lowell; Prof. V. F. de Almeida **04Mar20**

Mid-term Exam 04Mar20

Name:

Guidance:

- This is a closed-book, closed-note, individual exam.
- On-line mobile devices are not allowed.
- You may use an off-line, simple calculator without linear algebra functions, that does not store documents or notes.
- You may use scratch paper if you wish (paper will be provided).
- All pages must be submitted with your completed exam.
- Make sure to answer the question asked.
- Show your work and be clear.

Rubric Panel

Preview No.	Now Showing (2pm to 2:50pm)	Value	Score
1	Global Warming	15	
2	First Gear	15	
3	Don't Panic	50	
4	OMG	20	
.	Total	100	

Preview Problem 1 (15 pts)

Write an example for all basic data types in Python by creating a variable and assigning the data type as you would do in a Jupyter notebook cell. Make sure to write down the names of the data types as a comment.

In [ ]:

```
'''1) Basic data types'''
```

Preview Problem 2 (15 pts)

Write an example for all basic Python data structures by assigning a variable to the data structure as you would do in a Jupyter notebook cell. Make sure to write down the names of the data structures as a comment.

In [ ]:

```
'''2) Basic data structures'''
```

Preview Problem 3 (50 pts)

Given the following reaction mechanism

$$\begin{aligned} &\text{rxn 1:} && 2A + B \longrightarrow C \\ &\text{rxn 2:} && B + C \longrightarrow A \\ &\text{rxn 3:} && A + 2C \longrightarrow B \end{aligned}$$

$$\begin{aligned} &\text{rxn 1:} && 2A+B \longrightarrow C \\ &\text{rxn 2:} && B+C \longrightarrow A \\ &\text{rxn 3:} && A+2C \longrightarrow B \end{aligned}$$

and the following species production rate density [mol/(s L)] for species A, B, C as follows: -5, 2, 1, respectively,

1. Compute the reaction rates density for the corresponding reactions listed above compatible with the given production rates,
2. Prove quantitatively whether you can or cannot find other reaction rates for the same production rates.

In [ ]:

```
'''3.1 Reaction rates density'''
```

In [ ]:

```
'''3.2 Alternative reaction rates density'''
```

Preview Problem 4 (20 pts)

Demonstrate quantitatively whether the reaction mechanism in Problem 3 is valid or invalid.

In [ ]:

```
'''4) Demonstrate validity of mechanism in Problem 3'''
```