EL2208 Problem Solving with C Lab. Lab #5

Computing yield in a chemical reaction as a function of time.

As usual, work on praktikum.ee.itb.ac.id server.

This week you will compute yield in a chemical reaction as a function of time and plot the resulting data using MATLAB. MATLAB is a very large piece of software used for a wide variety of applications in engineering. In this class, we use it as a plotting package.

The chemical reaction of interest has a yield given by the equation

$$yield = 1 - e^{-kt} \quad \textbf{(1)}$$

where

$$k = e^{-q} \quad \textbf{(2)}$$

and

$$q = \frac{2000}{T + 273.16} \quad \textbf{(3)}$$

The variable **t** is the time in seconds and **T** is the temperature of the reaction in degrees Celsius. Use the #define statement to set **T** to 10 degrees. Vary **t** from **0** to **4000** seconds at increments of 1 second using a `while` loop. Compute the yield as shown in Equations (1), (2) and (3). For each pass through the `while` loop, print the time and the yield, 2 numbers per line. Use free formating (just %lf). Do NOT put any column headings at the top of the two columns. You should see output that looks similar to:

```
0.000000 0.000000
1.000000 0.000856
2.000000 0.001711
3.000000 0.002565
4.000000 0.003418
5.000000 0.004271
    .        .
    .        .
    .        .
```

When your code is running correctly, redirect the output to a file called lab5.out by typing

```
lab5 > lab5.out
```

if lab5 is the name of your executable file. You can see the contents of the output file by typing

```
more lab5.out
```

Use the space bar to move down in the file, the **b** key to move up in the file and **ctrl-c** to quit the **more** command. More information on the **more** command can by found by typing **man more**.

Next, you need to put the MATLAB path into your workspace. Start MATLAB by typing matlab on the Command Prompt.

```
                          < M A T L A B >
              Copyright 1984-2001 The MathWorks, Inc.
                   Version 6.1.0.450 Release 12.1
                             May 18 2001


  To get started, type one of these: helpwin, helpdesk, or demo.
  For product information, visit www.mathworks.com.

>>
```

The >> is the MATLAB command prompt. To load your data into MATLAB, type

```
load lab5.out
```

at the command prompt. To produce a plot, type

```
plot(lab5(:,1),lab5(:,2),'-')
```

The first argument to the **plot** command is the x-axis and the second argument is the y-axis. Put a grid on the plot by typing the word

```
grid
```

on the MATLAB command line. To label the x- and y-axis, type

```
xlabel('Time(s)')
ylabel('Yield')
```

Put a title on the plot by typing

```
title('Yield of Chemical Reaction')
```

You can get help for any command in MATLAB by typing

```
help command name
```

For instance, you can type

```
help plot
```

to see more options for line types and colors to use in plots. MATLAB also lets you use the up/down arrows to repeat previous commands.

Show your lab instructor the plot when you are done then submit it using perl submission code. Submit only the C code.