New York University
Tandon School of Engineering
Department of Electrical & Computer Engineering

Introduction to Operating Systems (CS-GY6233)
Spring 2020

Assignment 4

a) (3 points) Repeat assignment #3, except that you should now use a shared memory buffer of fixed size = 5 entries.
b) (6 points) Repeat assignment #3 using ordinary Unix pipes (i.e. unnamed) instead of shared memory. Observe how the blocking read operation allows the two processes to synchronize their communications with ease.
c) (6 points) Write a program that uses the pthreads library to create a secondary thread of execution, such that the thread function and the main routine have a common variable (you may name it `counter`) that is shared between them. The parent thread should have a loop that increments the `counter` `n` times, whereas the child thread should implement a loop that decrements the `counter` `n` times and exit, where `n` is a parameter passed to your program during its invocation from the command-line.
   After the parent thread has incremented the `counter` `n` times, it shall wait for the secondary thread to exit, and then print the value of `counter` to the screen.
   You shall run your program multiple times (let's say 10) for different value of `n` (which you pass from the command-line), and `n` should perhaps change from 10 to 100,000,000 in a logarithmic manner (i.e. multiply by 10 after each experiment).
   Tabulate your results by recording the values of `n` and `counter` in each experiment, and then answer the following questions:
   1. Does the value of the counter change from one experiment to the other, or is it constant? If it is constant, what is the value? Explain why if not constant.
   2. Is there a range of values for `n` where the behavior is different from the behavior in other ranges? Explain why if any.\

   Hint: You may want to search for the term "atomic instructions".

What to hand in (using NYU Classes):

- Your ".c" and ".h" files (with appropriate comments). Do not attach project or make files.
- A file containing any comments you would like to add (if any) in word of pdf format.
- A screen shot(**s**) of your terminal window (possibly in the same file) showing the current directory, the command used to compile your program, the command used to run your program and the output of your program.

RULES:

- You may consult with other students about GENERAL concepts or methods, but copying code (or code fragments) or algorithms is NOT ALLOWED and is considered cheating (whether copied form other students, the internet or any other source).
- If you are having trouble, please ask your teaching assistant for help.
- You must submit your assignment prior to the deadline.