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

Introduction to Operating Systems (CS-GY6233)
Spring 2020

Assignment 5
(20 points)

a) (8 points) Repeat part b of assignment #4, except that you should now use a TCP/IP socket for communicating between the processes. In order to do so, you will need to assign one process as a client and the other as a server. For simplicity, the parent (consumer) should be the server whereas the child process should be the client. Use the following socket functions in their default mode. You may use the `man` command in your Linux virtual machine for information about the parameters:

CLIENT	**SERVER**
socket() – opens a socket (similar to fork())	socket()
connect() – connects to a server	bind() – assigns a particular port number to the server listen() – listens to connection requests from clients accept() – accepts a connection from client
write() – writes a buffer to server, just as in file or pipe writing	read() – reads a buffer from client, just as in file or pipe reading
close() – closes the socket	Close()

(2 points): Answer the following:

- Which of the calls above are blocking and which are not? Explain what that means? Is this a form of direct communications or indirect communications?
- How would you change your program to communicate between processes in a different machine?

b) (7 points) Repeat part C of assignment #4 except that you should now protect access to the shared counter using the peterson's method. Do it once using a single CPU core in your virtual machine and then using multiple CPU cores (>1). You should be able to change the virtual machine settings when it's powered off.

- Do you expect a difference when running with a single CPU core versus multiple cores (assuming each process is executed on a separate CPU)? Explain your answer. Hint: You may want to search for the term "sequential consistency" or "loose memory models".
- If you are developing an operating system, how would you implement the synchronization primitives then?

c) (3 points) Repeat part C of assignment #4 except that you should now protect access to the shared counter using a pthreads mutex.

<u>What to hand in (using NYU Classes):</u>

- 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.