

CSc 332 - Operating Systems

Lab – Spring 2019

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Task 5 - Process Synchronization

Dad-Son Problem

March 29, 2019

Max Points: 25 Due: May 3, 2019

The given `bank.c` program has 3 processes namely, the *dad* process and two *son* processes. The critical section (CS) in the given problem is a son withdrawing money from the bank and the dad depositing money in the bank, at randomly selected time intervals. The program in the given form has synchronization errors, i.e., these 3 processes get into a race condition when accessing the shared `bank_balance` variable. The program itself compiles correctly (i.e., there are no syntax errors).

In **Step 1**, you need to run the program and analyze the execution traces, whereupon you have to identify the synchronization errors. After identifying the synchronization errors, you need to insert the "`P(sem)`"

and "`V(sem)`" operations at right places in the code that fix the synchronization errors.

In **Step 2**, you work on a measurement component. A mutex algorithm is associated with a "bounded wait" property, i.e., how long a process *P* is forced to wait for entry into a CS after *P* has expressed interest in the CS. Let's call the wait time as $T(P)$, where $T(P)$ is the number of times processes other than *P* enter the CS after *P* expresses interest in the CS but before *P* actually enters the CS. You need to compute $T(P)$ for all three processes in the problem and display it at the end of "*N*" different attempts. Measure $T(P)$ for at least 5 different *N*'s and include the values in your report.

Instructions

- You need to have `sem.h` header file in your present working directory to run this program and invoke semaphore operations.
- The `bank.c` file is documented. Once you are done with your solution, insert comments at the places where you made changes to fix the synchronization errors and add the wait time measurement.
- This synchronization problem should be solved with as few semaphore variables as possible.

Submission Instructions

Submit the `bank.c` file with semaphore operations inserted at appropriate places and measurement component. Write a brief report (at most 1 page) on how your solution prevents race condition between the dad and son processes and measure the wait time of each process. Zip both the files into a single folder as: `task5_firstname_lastname.zip`. Email your zip file with the subject line, "Task 5 - CSc 332 - `firstname_lastname`".
