Assignment 2

This assignment is due on October 12.

1. (32%) Assume that an operating system is written for a machine architecture that has the following attributes:

   (a) a single processor, with some fixed number M of CPU registers
   (b) base-limit register addressing
   (c) a fixed set of N peripheral devices at known bus addresses

   Assume furthermore that

   - The process scheduler uses information about how much processor time a process has had and how long it has been in existence to decide which process to run next.
   - The operating system keeps track of which processes have created which other processes.
   - Processes can signal each other as a means of synchronizing their respective behaviors. Signals are small integer values.
   - Processes can share their executable code.

   Write a pseudo-code description of a PCB that could be used by such an operating system. What members must be part of the PCB? What are their data types?

2. (12%) Which of the following components of program state are shared across threads in a multithreaded process? ***Explain the answer.***

   (a) Register values
   (b) Heap memory
   (c) Global variables
   (d) Stack memory

3. (20%) Under what circumstances does a multithreaded program using multiple kernel threads provide better performance than a single-threaded solution to the same problem on a single-processor system?

4. (36%) Processes arrive into the ready queue according to the table below.

Process ID	**Arrival Time**	**Burst Time**
P_1	0	11
P_2	4	5
P_3	4	6
P_4	8	5
P_5	8	2

   Construct a Gantt chart and compute the mean waiting time for each of the following scheduling algorithms:

   (a) First-Come-First-Served
   (b) Round-Robin with Quantum =3
   (c) Shortest-Job-First
   (d) Shortest-Remaining-Time-First

Submitting the Solution

You must type your assignment. Handwritten assignments will not be accepted. You may, if you wish, submit it electronically instead of handing it in. This will save paper. If you choose to do this, then login to eniac remotely or go to Lab 1000G and login there and follow these instructions:

- The file must be either a plain text file or a PDF document;
- It must be named *hwk2_username* (with a .pdf extenssion if it is a PDF file);
- It must be placed in the directory `/data/yoda/b/student.accounts/cs340/projects/hwk2`;
- If must have permission 0600. If you (still) do not know how to do this, use the command `chmod 0600 filename`.

Do not submit it by hand if you also submit electronically. That is a waste of paper. Fear not; I will be able to read your assignment if you put it online.