COS 116
The Computational Universe
Homework 5

---

1. Suppose the user starts five tasks A, B, C, D, E on the computer and they are known to take 2, 12, 7, 4, 5 minutes each, respectively. As discussed in class there are a variety of ways to schedule these tasks.

- **a)** Suppose we use the algorithm "first job first" where we run A until it completes, then run B 12 minutes until it completes, etc. How long does it take to complete all of the jobs? How many jobs are completed in seven minutes? How many jobs are completed in 22 minutes?
- **b)** Suppose we use the algorithm "shortest job first," where the shortest job is run until completion, then the next shortest job, etc. How many jobs are completed in seven minutes? How many jobs are completed in 22 minutes?
- **c)** Suppose we can split jobs into one minute pieces. We will run one minute of job A, then one minute of B, then one minute of C, …, one minute of E, then loop back to the beginning of the list and run a minute of job A, a minute of job B, etc. When a job is completed, it is removed from the list. How many jobs are completed in seven minutes? How many jobs are completed in 22 minutes?
- **d)** In what situations would each of the three scheduling algorithms described above be best? You can use examples relating to computers or from everyday multitasking in life.

2. You saw in the lecture on chip fabrication a catalog page for a microprocessor. Suppose you are shopping for a new CPU for your PC and the CPU's specs say that the machine language instructions for this CPU assume that the memory is addressed by 32 bit addresses. How many memory locations must such a memory have?

However, then you note that the actual amount of RAM in your PC is only 256MB. Should you get alarmed about the mismatch? If you think it may not be a problem, indicate in a line or two why not.

3. Please list 4 things (technical or nontechnical) that you learnt from the discussion around the iPOD remote control.

4. In class you saw how silicon chips are manufactured. Which steps rely on the specific properties of silicon (which it may or may not share with another semiconductor)?

5. Look up the following numbers (approximate, of course) by web search and list them. Use a consistent unit (e.g, meters) (a) Width of human hair (b) Size of the Silicon atom (c) Size of the smallest feature in current silicon chips.

Please Turn Over

The current technologies can put about a billion transistors/gates on a square inch. Assuming the smallest feature of the silicon chip cannot be smaller than an atom, in approximately in how many years will Moore's Law stop applying? (Note that Moore's Law was phrased in terms of *area*, whereas the above numbers may be linear units.)