**Max Score = 15 points**

CS 250 2018 Spring Homework 10

This assignment is due at 11:59:00 pm Thursday, April 12, 2018.

Insert your typewritten answers into this file. You may include images of neatly hand drawn diagrams when appropriate. To have this assignment graded, upload your file to Blackboard in either PDF or Word format. You may upload more than once to permit correction of errors. Late submissions will receive a score of zero (0).

You are responsible for ensuring that your upload (1) is to the location in Blackboard for this assignment, and (2) is the file that you intend to have graded for this assignment, and (3) is not marked “LATE” by Blackboard. You are encouraged to verify your upload was successful by downloading your file from Blackboard and examining that download.

Please be aware that Blackboard determines if an upload is late using an internal timer that measures time in units of seconds, but reports time to its users rounded down to the minute. This means that one second after Blackboard first shows time as 11:59pm any completing upload will be marked LATE because the internal program time is then after 11:59:00pm. Upload sufficiently before the stated deadline to avoid being late due to an upload that completes after 11:59:00pm.

1. Text exercise 14.4

If the interface width is 16, is the interface parallel or serial? Explain **The interface is parallel because if it was serial it would have a width of 1 because serial interfaces only have 1 wire.**

1. Text exercise 14.7

If the interface between a processor and storage device has a width of thirty-two bits, how can the processor transfer a data item that consists of sixty-four bits? **It can transfer data this way by first sending the data through a multiplexer and sending it in chunks that then gets sent through a demultiplexer when it is received.**

1. Text exercise 14.9

Suppose a serial interface has a latency of 200 microseconds. How long does it take to transfer one bit over the interface? How long does it take to transfer sixty-four bits over the interface? **The time to transfer one bit would be 200 microseconds. The time to transfer 64 bits would be 12800 microseconds.**

1. Text exercise 15.1

A hardware architect asks you to choose between a single, thirty-two bit bus design that multiplexes both data and address information across the bus or two sixteen-bit buses, one used to send address information and one used to send data. Which design do you choose? Why? **I would choose the design that uses multiplexers because multiplexing allows an architect to design a bus that has fewer lines and if the number of lines in a bus is fixed, multiplexing produces higher overall performance. So for this it would allow better data transfer and would be a better option.**

1. What are the two types of bus error? **The two types are non-existent address, and unaligned address.**
2. Run a system info command on your computer and use its output to find three different buses that your computer contains. For each bus, (1) describe in specific detail the physical hardware from which it would be constructed, (2) name the units within your computer that are connected to the bus (if any) and the external units (if any) typically connected to the bus, (3) classify the bus as serial or parallel, (4) state if the bus is proprietary or if is it standard and when was its standard specification released and what entity released the spec, and (5) state how the bus addresses are configured (manually per I/O device, by hardwiring on the bus, or automatically), and (6) state for automatically configured buses, state whether the bus is hot-pluggable or not. The web, especially Wikipedia, can be a helpful resource.
3. **Keyboard – designed from use of i/o buttons, connected to serial port, serial bus, it is standard, automatically, hot-pluggable**
4. **Mouse – designed from use of sensor and buttons, connected to serial port, serial bus, it is standard, automatically, hot pluggable**
5. **Speakers – designed from speakers, connected to serial port, serial bus, it is standard, automatically, hot-pluggable**
6. Text exercise 15.9

If a bus can transfer 64 bits in each cycle and runs at a rate of 66 MHz, what is the bus throughput measured in megabytes per second? **4,224 Mbytes per second.**

1. Text exercise 15.11

How many simultaneous transfers can occur over a crossbar switching fabric of N inputs and M outputs? **You could have a maximum simultaneous transfers of up to Min(N, M).**

1. Text exercise 16.1

Assume a RISC processor takes two microseconds to execute each instruction and an I/O device can wait at most 1 millisecond before its interrupt is serviced. What is the maximum number of instructions that can be executed with interrupts disabled? **The maximum number of instructions that can be executed is 500.**

1. Text exercise 16.5

Read about devices on a bus and the interrupt priorities assigned to each. Does a disk or mouse have higher priority? Why? **A mouse has higher priority because it needs to happen immediately when a user interacts with it. A disk however takes time to buffer before it can interrupt and therefore would not be instant even if needed, so it has a lower priority.**

1. Text exercise 17.4

A user invokes an app that writes a file. The app displays a progress bar that shows how much of the file has been written. Just as the progress bar reaches 50%, the battery fails and the device crashes. When the user reboots the device, he or she discovers that less than 20% of the file has actually been written. Explain why the app reported writing 50%. **The app reported 50% because it had buffered that much of the file, however it had not all be written to the cache when the battery failed and therefore when it was booted up it only had what was saved in the cache and lost all that was buffered.**