ECE3221 – Quiz # 2 **May 17, 2017** **Adam Wilson**

Name: Solutions Student #: _____ Signature: _____

Calculators not allowed

1. (1 mark) This unit serves as the interface between the processor and the computer buses of a computer. It initiates read and write operations by manipulating the address and control lines. What is this unit called?

Control Unit

2. (3 marks) Complete the list of 4 repetitive steps (in order) that the processor of a computer will perform continually while a program is running (fetch and execute). Please provide a detailed explanation of what occurs at each step. I have filled in the 4th step for you:

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a. Fetch the next instruction at the address given by the program counter. (Memory Read)

b. Add a constant to the program counter so it will be ready and pointing to the address of the next instruction.

c. Execute the operation specified by the fetched instruction

d. Return to step 1.

3. (3 marks) How many address lines and how many data lines does a 128K x 1 memory chip have? What is the storage capacity of this memory chip in bytes?

# of Address Lines: 17 address lines (2^{17} = 128K locations or 131072 locations)

# of Data Lines: 1 data line

Storage capacity (in bytes): 16 Kbytes or 16384 bytes (131027 locations x 1 bit per location = 131027 bits or 131027 bits / 8 bits per byte = 16384 bytes

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4. (7 marks) The following decoder circuit is used to decode 8 small sections of memory within a 16-bit memory space. Fill in the addresses in the memory map of the system shown below with the starting and ending addresses of the total 16-bit memory space and starting and ending addresses of the RAM and ROM. Also fill in the blank to label which block is RAM and which is ROM.