EECS 470 Quiz, Winter 2011. Closed book, closed notes

Name: _____ Uname: _____

You have 15 minutes for this quiz. The quiz is closed notes/closed book. If you should finish early, you are welcome to turn in your quiz and step out of the room until the lecture starts. **There are 2 pages to this quiz and it is graded out of 30 points.**

I have neither given nor received aid on this quiz, nor observed anyone else doing so.

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1. Say you are the head architect at "Hobit PC" and your main product is a processor that executes 5000 MIPS and runs at 50 Watts. An intern has proposed a fairly trivial change to the architecture (removing half the cache and slowing down the multiplier) which will bring you down to 4400 MIPS but will drive the power draw down to 40 Watts. Is this worth pursuing? Explain your answer. **[10]**

    NO. WITH VOLTAGE/POWER SCALING YOU *SHOULD* BE ABLE TO DROP THE MIPS DOWN TO 4400 AND REDUCE POWER BY (4400/5000)^3 OR ABOUT 68% (ABOUT 34 WATTS). THIS IS BETTER (AND PROBABLY EASIER) THAN THE PROPOSED CHANGE.

2. Consider two caches. Both are 32 cache lines in size and each cache line is 16 bytes. Both start out with all lines marked invalid. The only difference is one is direct-mapped and one is two-way associative. **[10]**
    a. Find a shortest possible reference stream where the 2-way associative cache would get a hit and the direct-mapped cache would get no hits. Provide the reference stream in hex.

        0x000, 0x200, 0x000

    b. Find a shortest possible reference stream where the direct-mapped cache would get a hit and the 2-way associative cache would get no hits. Provide the reference stream in hex.

        0x000, 0x100, 0x300, 0x000

3. Fill in the blank/circle the correct answer **[10 points, -3 for each wrong/blank answer, minimum 0]**

   a. Batteries' endurance is generally measured in mAh. mAh stands for

      _MILLIAMP-HOUR_____ and is a unit of *charge* though we tend to use it to represent ***power /*** ENERGY ***/ voltage***.

   b. If a kWh costs 10 cents ($0.10), about how much does it cost to charge a typical rechargeable AA battery? Pick the best answer.
      ABOUT **$0.001** */ about $0.01 / about $0.10 / about $1.00*

   c. Once we get to fairly large devices, such as high-end servers, we tend to find that we need ***about half as much /*** ABOUT THE SAME AMOUNT ***/ about twice as much*** power to cool the device as we do to power it.