2) In *one or two sentences* explain why we don't use the most significant bits of an address for the index bits of a cache. **[6]**

Spatial locality tells us that we are likely to see accesses that are near each other spatially. As those addresses generally share close the same MSBs, Using thee MSBs as index bits would result in massive conflict.

4) Multiple choice/fill in the blank. **[12 points, -3 for each wrong or blank, min 0]**

   a. A given processor uses an average of 10 Watts and averages 100 MIPS on a given application. A certain architectural change is found to drop that to 5 Watts at 75 MIPS. That change drops the *power* utilization to about **25/50/66/75/90** percent of what it was, and drops *energy* utilization to about **25/50/66/75/90** percent of what it was.

   b. A battery is said to be able to output 5 Watts for 5 hours. This is a measure of **Energy** / Current / Power .

   c. Dynamic power is generally expected to be proportional to V / V^2 / **V³**
   while static power is generally expected to be proportional to V / V^2 / V^3.

   No answer all +ken

You have 20 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.**

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

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1) Consider two caches. Both are 16 cache lines in size, each cache line is 16 bytes and both start out with all lines marked invalid. The only difference is one is two-way associative and one is direct-mapped. [12]

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

   0x100
   0x000
   0x100

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

   0x000
   0x080
   0x180
   0x000