University of California, Berkeley
Computer Science and Electrical Engineering
Computer Science 152
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Discussion section 102

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Class Diagnostic Quiz
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Write the answers to STARed questions on a separate piece of paper.

Common sense questions:

*1.1 Name five classic components of computer.

1.2 What is the rate of capacity change for DRAM (often called DRAM rule of thumb)?

1.3 What's the name of the first electronic computer with 18,000 vacuum tubes with 20-10 digit registers.

Performance questions:

2.1 What is a relation between Performance and Execution time?

2.2 What is the most accurate representation computer performance?

2.3 If machine A runs a program in 25 seconds and machine B runs the same program in 40, how much faster is A than B?

2.4 What is the equations for CPU execution time for a program using variables (a) Instruction count, CPI, Clock rate, and (b) Instruction count, MIPS?

*2.5 Consider the machine with three instruction classes and CPI

Instruction Class	Class A - 1 cycles	Class B - 2 cycles	Class C - 3 cycles
I-count from Cmpiler Y	5 million	2 million	1 million
I-count from Cmpiler Z	20 million	1 million	1 million

Machine runs 150Mhz. Calculate MIPS and CPU time for instruction output from both compilers Y and Z. What does this tell you about MIPS?

2.6 Write an equation for MFLOPS.

2.7 Write an equation for geometric mean and harmonic mean. Briefly explain why these are better than arithmetic mean.

2.8 What is the general idea behind Amdahl's law?

*2.9 Consider the problem of going from Nevada to California over Sierra Nevada mountains and through desert to LA. Your walk over the mountains will take 20hours. The last 200 miles, however can be done by high-speed vehicle. There are three ways to complete your journey.
(a) continue walking at average of 4 miles/hour.
(b) drive awesome Korean-made Hyundai Excel at average of 50 miles/hour.
(c) fly on Southwest at average of 600 miles/hour.
What are the speedups for different vehicles for the entire trip?

2.10 Write equation for die yield.

*2.11 Given wafer yield is 90%, alpha for simple MOS=2.0, defects per unit area=2 square cm, and die area is 1 square centimeter, what is the die yield?

Instruction Set Design:

*3.1 What would C compiler produce in MIPS architecture for following line?
f = (a + b) - (c * d);

*3.2 What would faster way to multiply value of register $8 by 16 than using add-shift multiply algorithm or multiply instruction? (hint: use just one simple MIPS instruction)

*3.3 Draw three different formats of instruction in MIPS ISA and name them.

3.4 What is the most frequently used addressing mode?

*3.5 Write pseudo assembly codes for (a)accumulator architecture, (b)stack architecture, and (c)load-store general purpose register architecture for the following code.
a=(b + c) + (d - c);

Technology:

4.1 If PMOS was faster which kind of gate would be best?

4.2 When a HIGH is applied to PMOS transistor, what happens to the gate for the conduction path?

*4.3 Other than internal delays of the gates of the critical path, what other thing(s) must be considered for the cycle time?

*4.4 Draw a full-adder using gates.