

Computer Engineering

PhD Screening Exam

2005/4/1

Area G2: Computer Systems Design (ECE 153A/B, 154)

1. You have a processor design with 32 registers. Assuming there is ample room on the chip to provide 64 registers for the next version of the processor, what problems do you anticipate in implementing the change?
2. Why isn't a PC with a 3 GHz Pentium 4 chip twice as fast as a PC with a 1.5 GHz Pentium 4?
3. How many pins does a 256 Mb (megabit) DRAM chip have?
4. A computer system uses 32-bit addresses and has a 1 MB cache memory with 16B cache lines (blocks). How long are the cache tags with direct mapping? With 4-way set-associative mapping?
5. Explain how a DMA controller works. Can there be multiple DMA controllers on the same memory bus?
6. You have a temperature sensor in a car engine that outputs a voltage in the range 0-5 V for the temperature range 0-200°F. How can you make the engine temperature appear on a dashboard display? Answer for two cases: (a) Relationship between output voltage and temperature is linear; (b) The relationship is nonlinear, but known.