Final Conceptual Summary
First

• Review study questions for both midterms and both midterms themselves.
• Review the homeworks.
Sample Questions(I)

• Amdahl’s law with parallel processing
• Cache simulation
• How the cache work with multiple processors
• Simulate a short sequence of code on a machine with Tomasulo algorithm
• Compare the strength/weakness of different branch predictors
Sample Questions (II)

• Why are we moving forward to multithreaded computing?
• What is SMT? What is CMP? What are their advantages?
• What is helper thread? How may it help the main thread?
• Why there are nondeterminism in parallel programs? How to solve the problem?
Sample Problems (III)

• Understand the relationship between technology scaling trends and the emergence of CMPs/SMT

• What are potential impacts of resource sharing under SMT?

• Describe how a given code sample perform on a given architecture? Justify your answer.
Sample Problems

- A co-worker proposes that instead of predicting branches, the processor should just execute both paths simultaneously.
- Would this technique work better on an SMT or CMP? Why?
- How would it affect I cache and D cache miss rates?
- If you implemented this scheme on SMT, how would performance compare to using a highly-accurate branch predictor? Why?
- Suggest an improvement to this scheme and explain how it would improve performance.
Practice Problem

- Consider the following machine configuration:
  - 12 stage pipeline
  - 10 cycle branch resolution time
  - 16-entry D TLB with 4KB pages. Miss time: 100 cycles
  - 64 KB data cache.
- Your workload has a working set size of 128KB, so you purchase an otherwise identical machine with a 128KB L1 cache. You find that your performance is not improved. Why?
Sample Question

• Imagine that a new technology allows us to increase the density of on-chip memories by 100x. Describe how you would make use of this advance to improve processor performance.