CSE 560
Computer Systems Architecture

Exam 2 Review

1

Logistics

- Date and Time
  - Wednesday, Dec 4, in class, 5:30pm to 6:50pm, starting right at 5:30
  - Exam is timed for 80 mins from when we start

- Exam is in person, here in Green Hall L0120

2

Style

- Questions
  - Question 1 will be a collection of short answer things (e.g., true/false, fill in the blank, quick definition)
  - Questions 2 through N will be longer (going more in depth on a particular subject)
- Closed book, closed notes
- One-page "crib sheet" is allowed
  - 8.5 x 11 sheet, front and back, whatever you want to include (content-wise)
- Calculator is not allowed, show your work

3

Out-of-Order Execution

- Register Renaming
  - Free list
- Dynamic Scheduling
  - Instruction queue
  - Issue logic
- Commit
  - Reorder buffer
- Memory – load and store queues
- OoO Pipeline Diagrams

4

Caches

- Locality
  - Temporal
  - Spatial
- How they work
  - Direct mapped
  - Fully associative
  - Set associative

5

Alphabet Soup of Caches

- 3 C's
  - Cold
  - Conflict
  - Capacity
  - (Coherence)
- ABC's
  - Associativity
  - Block size
  - Capacity
- Performance implications of above

6

More Caching

- Writes
  - Write-through vs. write-back
  - Allocate vs. No-allocate
- Victim Buffer
- Lockup Free Caches
- Software Side
  - Prefetching
  - Scheduling
  - Loop unrolling

7

Virtual Memory

- Uses
  - Isolation
  - Protection
  - "Caching" of main memory
- Mechanisms
  - Address translation
  - Page faults
  - TLBs
- Full memory hierarchy

8

Security

- Spectre/Meltdown
  - Side Channel Attack
  - Exploits
  - What Machines Are Vulnerable
- Retpolines
- JumpSwitches
- Trusted Execution Environments

9

Multicores

- Shared memory model
  - Multiplexed uniprocessor
  - Hardware multithreading
  - Multiprocessing
- Synchronization
  - Locks
- Cache coherence
- Memory consistency models

10

Multiprocessors

- Flynn's taxonomy
- Physically distributed memory
- Cluster interconnects
  - Virtualization
- Custom interconnects
- Programming paradigms
  - MPI
- Graphics engines and systolic arrays

11

Q&A

- We'll start right at 5:30pm

- Closed book, closed notes

- One page "crib sheet" allowed (both sides), it does not have to be handwritten

- Calculator not allowed

12