

# Exam Review

## Administrivia

When: Dec 21 (THU) Noon — 1:50 PM

Where: CANTOR 102

What: EVERYTHING COVERED THIS SEMESTER

CHEAT SHEET: TWO LETTER PAPER SHEETS

DOUBLE SIDED

10pt font/Legible

Slides mostly cover topics after midterm

BUT

- Please make sure you review concurrency

- Look at the Dahlin standard

(A) I/O from disk —

(B) Demand paging

(C) MMIO & DMA

Virtual Memory

- Distinction b/w physical & virtual addresses
- Virtual address spaces & their relation to processes
- Page tables
  - Tree structure
  - Looking up virtual addresses
  - Valid/Dirty/RO/NX
- Page Faults
  - Demand paging + policies
- TLB
- Copy-on-write
  - How?
  - Why?

## Context Switch

- What
- How
- User space switching

## I/O

- Explicit I/O instructions

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inb/inw/outb/outw

TRADE-OFFS

- MMIO
- DMA
- Interrupts { Trade-offs
- Polling
- Device drivers
- Blocking vs non-blocking I/O

## Disks

- sectors, tracks, cylinders
- Interface
- Seek time
- 7200 RPM - Rotational delay { Contribution to access time
- Transfer time
- Sequential vs random access



# File Systems



- Interface
  - Open
  - Read/Write
  - mmap
  - lseek
- Representing files
  - Metadata
  - Data layout & trade-offs
    - Contiguous allocation
    - Linked
    - Indexed
  - Inode
    - ↳ Direct blocks
    - Indirect blocks
    - Double indirect
- Directories
  - dirent
  - link/entry/link
  - hierarchy & how it is setup.
- FFS & performance

- Cylinder groups
  - Layout for performance
    - ↳ Directories & files
- Buffer cache
- Crash recovery
  - Metadata/data consistency
  - ad-hoc/fsck
  - Copy-on-write
  - Journaling
    - ↳ Redo
    - Undo

## Security

- Stack smashing
  - stack (from before midterm)
  - executable code
    - ↳ some defenses
    - NX
- Unix security
  - UID, GID

- file permission checks

- setuid

- TOCTTOU Bugs

- TRUSTING TRUST

Putting it all together

- execve

- Loading executables