EI 338: Computer Systems Engineering
(Operating Systems & Computer Architecture)

Dept. of Computer Science & Engineering

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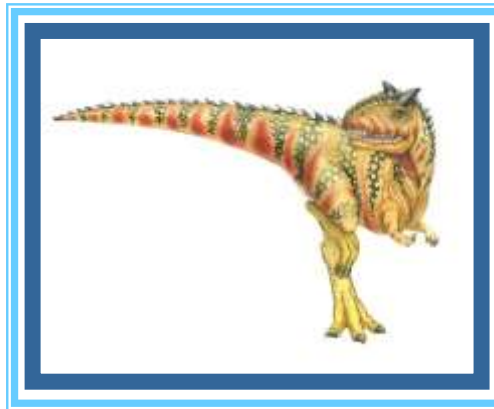
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Summary

Questions & Answers

- Face to face Q & A

- Time: 10am to 5pm on Jan 7th (Monday)

- Place: Room 513, SEIEE-3 Building

About The Final Exam (1)

- East Central Building (东中院) 2-201

- On Jan. 8th (Tuesday)

- Time: 13:10-15:10

- Close Book

  - Computer Architecture 30%

  - Operating System 70%

About The Final Exam (2)

- Question Types
  - Blank Filling (20%)
    - Definitions
    - Pseudo Codes in Projects
  - Questions (~30%)
  - Calculations (~50%)

OS-Chapter 1: Introduction

- Operating Systems Definitions

- Operating-System Structure

- Operating-System Operations

- Computer-System Architecture

- Computer-System Organization

- Interrupt, DMA, Cache

- Storage Hierarchy

- Process Management

- Memory Management

- Storage Management

- Multiprocessor Systems/Multi-core Systems

- Distributed Systems

OS-Chapter 2: Operating-System Structures

- Operating System Services

- User Operating System Interface (CLI, GUI)

- System Calls

- Types of System Calls

- System Programs

- Operating System Design and Implementation

- Operating System Structure

  - Microkernel system structure

- System Boot

OS-Chapter 3: Processes

- Process Concept

- Process State

- Process Control Block (PCB)

- Process Scheduling
    - Context switch

- Operations on Processes (Creation and Termination)

- Interprocess Communication
    - Communication Models
    - Communication in Client-Server Systems

OS-Chapter 4: Threads

- Multithreading Concepts

- Multithreading Models

  - Many-to-One

  - One-to-One

  - Many-to-Many

- Thread Libraries

  - Pthread

- Threading Issues

OS-Chapter 5: CPU Scheduling

- Scheduling Concepts

- Scheduling Criteria

- Scheduling Algorithms

  - FCFS

  - SJF

  - Priority Scheduling

  - Round-Robin (RR)

- Multi-core Scheduling

OS-Chapter 6&7: Process Synchronization

- Background
- The Critical-Section Problem
- Peterson's Solution
- Synchronization Hardware
- Locks, Semaphores
- Classic Problems of Synchronization
    - Bounded Buffer
    - Readers-Writers
    - Dining Philosophers
- Monitors
- Atomic Transactions

- The Deadlock Problem

- Deadlock Characterization

- Methods for Handling Deadlocks

  - Resource-Allocation Graph

  - Banker's Algorithm

- Deadlock Prevention

- Deadlock Avoidance

- Deadlock Detection

- Recovery from Deadlock

OS-Chapter 9: Main Memory

- Background

- Swapping

- Contiguous Memory Allocation

- Paging

- Structure of the Page Table

- Segmentation

- Example: The Intel Pentium

- Background

- Demand Paging

- Copy-on-Write

- Page Replacement Algorithm

  - FIFO

  - Optimal

  - LRU

- Allocation of Frames

- Thrashing

- Memory-Mapped Files

- Allocating Kernel Memory

- Other Considerations

OS-Chapter 11: Mass-Storage Systems

- Overview of Mass Storage Structure

- Disk Structure

- Disk Attachment

- Disk Scheduling

- Disk Management

- Swap-Space Management

- RAID Structure

OS-Chapter 12: I/O Systems

- Typical I/O devices

- I/O bus architecture

- Interrupt-Driven I/O Cycle

- DMA

- File Concept

- Access Methods

- Directory Structure

- File-System Mounting

- File Sharing

OS-Chapter 14&15: File System Implementation

- File-System Structure

- File-System Implementation

- Directory Implementation

- Allocation Methods

- Free-Space Management

- Benefits and Features

- Types of Virtual Machines and Their Implementations

- Virtualization and Operating-System Components

CA-Chapter 1: Fundamentals of Quantitative Design and Analysis

- Introduction

- Quantitative Principles of Computer Design

- Classes of Computers

- Computer Architecture

- Trends in Technology

- Trends in Cost

- Dependability
  - MTTF, MTTR

- Performance
  - Amdhal's law

CA-Chapter 2 & Appendix B: Memory Hierarchy Design

- Memory Hierarchies

- Six Basic Cache Optimizations

- Ten Advanced Cache Optimizations

- Calculate Memory Access Time based on Miss Rate.

CA-Appendix A
Instruction Set Principles

- **Instruction Set Architecture**

- **Classifying ISAs**

- **Encoding the Instruction Set**

Merry Christmas!
Happy Chinese New Year!
Wish all students have good grades!

End of Summary