COMP 480: Distributed Systems
Winter 2018 Review

Part A: Background Materials

I. **Chapter 1, Introduction**

    A. What is a distributed system and examples

    B. Common subproblems

    C. Safety Properties

        i. "Bad things never happen."

        ii. Examples

    D. Liveness Properties

        i. "Good things eventually happen."

        ii. Examples

    E. Review of background material

        i. Process vs program

        ii. FIFO channels

II. **Chapter 2, Interprocess Communications (IPC)**

    A. Guest lecture

    B. Treat inter-thread communications as IPC

    C. Client/Server model

    D. Peer-to-peer model

    E. Not directly responsible for Network Protocols

Part B: Fundamental Topics

III. **Chapter 3, Models of Communication**

    A. The Need for a Model

    B. A Message-Passing Model for Interprocess Communication

        i. Channels

        ii. Synchronous vs. Asynchronous Systems

    C. Relationship among Models

        i. Strong and Weak Models

IV. **Chapter 4, Representing Distributed Algorithms: Syntax and Semantics**

    A. Statements

        i. `if ...  fi`

        ii. `do ...  od`

    B. Guarded Actions

    C. Nondeterminism

    D. Atomic Operations

    E. Fairness

       i. Unconditionally Fair Scheduler

      ii. Weakly Fair Scheduler

     iii. Strongly Fair Scheduler

   F. Central vs. Distributed Schedulers

V. Chapter 5, Program Correctness

   A. Correctness Criteria

       i. Safety Properties

         a. "Bad things never happen."

         b. Example: If the process stops, it stops with the correct answer.

         c. One half of program correctness

      ii. Liveness Properties

         a. "Good things happen eventually."

         b. Example: All processes make progress towards an answer.

         c. The other half of program correctness

VI. Chapter 6, Time in a Distributed System

   A. Introduction

       i. The Physical Time

      ii. Sequential and Concurrent Events

   B. Logical Clocks

       i. Causality and "$\prec$"

      ii. Concurrency

   C. Vector Clocks

   D. Physical Clock Synchronization

       i. Preliminary Definitions

         a. Clock drift ρ

         b. Resynchronization period R

      ii. Clock Reading Error (Byzantine clocks)

     iii. Algorithms for Internal Synchronization

     iv. Algorithms for External Synchronization

Material for Exam II

Part C: Important Paradigms

VII. **Chapter 7, Mutual Exclusion**

    A. Introduction

    B. Solutions Using Message Passing

        i. Lamports Solution
        ii. RicartAgrawalas Solution
        iii. Maekawas Solution

    C. Token Passing Algorithms

        i. SuzukiKasami Algorithm
        ii. Raymonds Algorithm