CSCI 360: Introduction to Operating Systems

Final Exam: **Closed Book**

Location: **Building 356, Room 319**

Total Marks: **120**

Duration: **180 minutes**, starting from **9:00AM, December 12, 2022.**

Exam Mode and Question Types

1. Exam will be **in person**.
2. Exam will have questions to demonstrate the understanding the concepts of operating system topics listed below by discussing, analyzing, or comparing them.
3. Exam will have questions to demonstrate the understanding of some algorithms discussed in the course by applying them in a given context.
4. Exam will have questions to demonstrate the understanding of the solutions of some important operating system problems by writing pseudocodes close to both high level language like C and assembly language.

Topics

1. Process Synchronization
   a. Race Condition
   b. Critical Region Problem: Peterson's Solution
   c. Producer Consumer Problem
   d. Semaphore
   e. Mutex
   f. The Dinning Philosophers Problem
   g. The Readers and Writers Problem
2. Memory Management
   a. Address Space: Base and Limit Register
   b. Swapping
   c. Free Memory Management
      i. Bitmap
      ii. Linked List
   d. Memory Allocation Algorithms
      i. First Fit

        ii.   Best Fit

        iii.   Worst Fit

   e.   External Fragmentation and Compaction

   f.   Virtual Memory and Paging

   g.   Page Table and TLB

   h.   Page Fault and Replacement Algorithms

   i.   Segmentation

   j.   Segmentation with Paging

3. File System

   a.   File Abstraction

   b.   File Concepts

        i.   Name

        ii.   Structure

        iii.   Types

        iv.   Attributes

        v.   Operations

        vi.   File System Calls

   c.   Directory Concepts

        i.   Structures

        ii.   Path Names

        iii.   Operations

        iv.   Directory Entries

   d.   File System Layout

   e.   Disk Block Allocation

        i.   Contiguous

        ii.   Linked List

   f.   Free Disk Block Management

   g.   DOS File System

   h.   UNIX File System

   i.   ~~Free Block List Enhancement~~

   j.   ~~File System Consistency~~

   k.   ~~File System Caching~~

   l.   ~~Reducing Disk ARM Motion~~

4. I/O System

a. I/O Concepts

    i. I/O Devices

    ii. Device Controllers

    iii. I/O Port Numbers

    iv. Memory Mapped I/O

    v. Programmed I/O

    vi. Interrupt Driven I/O

    vii. Direct Memory Access (DMA)

b. I/O Software

    i. Goals

    ii. Layers

    iii. Interrupt Handler

    iv. Device Driver

    v. Device Independent I/O Layer

    vi. User I/O Layer

5. POSIX system calls and the library functions covered so far in the example codes of the course.

6. POSIX system calls and the library functions covered in Assignment 3, 4, and 5.