ADJ - Problem Set I

1   Problems (40 points (Problems 1, 2 : 13 points; Problem 3: 14 points)

Complete the following problems. Both the syllabus rules and ADJ Ruleset1v2 are in effect.

M4: Operating-System Structures

1. [Acuña, Lisonbee] Different operating system structures offer both benefits and drawbacks over one another, and it's important to understand what kind of structure should be used for different use-cases.

   Consider the following situation. You are designing an operating system for an interstellar probe that is meant to run for hundreds of years. The probe should also support monitoring many specific instruments.

   What structure (simple, layered, microkernel, or modular) should you choose for its kernel? **Analyze** the problem, **design** a choice, and **justify** the choice. [8A+2D+6J points]

M5: Processes

2. [Acuña] Consider parallelizing the insertion and selection sort algorithms. Which would be more amenable to parallelism? **Analyze** the problem, **design** a choice, and **justify** the choice. [6A+2D+8J points]

M6: Threads

3. [Acuña] Consider the algorithmic task of compressing a video file for a cartoon. Initially, the video is a stream of separate images. The images are large, and in many places, differ only slightly from frame to frame. For instance, when an object is moving, the part of the image not involving the object does not change from one frame to the next.

   Say we want to design a compression mechanism based on determining the difference from the previous frame to the next frame, and saving only the difference into a compressed result. Of the five issues in multicore programming, which is the most problematic for multithreading this system? **Analyze** the problem, **design** a choice, and **justify** the choice. [8A+2D+8J points]

2   Submission

The submission for this assignment has one part: a write up. The file should be attached to the homework submission link on Canvas.

   Writeup: Submit the ADJ answers in PDF format. Please name your file as "LastName1and2ADJ1.pdf" where the last names are given in alphabetic order (e.g. "EdgarLisonbeeADJ1.pdf").