# ADJ - Problem Set II

## 1 Problems (40 points; 13 points problem 1,2 ; 14 points problem 3)

Complete the following four problems. Both the syllabus rules and ADJ Ruleset 1v2 are in effect.

### M7: Process Synchronization I

1. [Silberschatz, Acuña] Assume that a context switch takes time $T$. Propose an algoithm to determine how long a process to hold a spinlock, based on the process load of a system and $T$. If the spinlock is held for long, switching to a mutex lock (where waiting threads are put to sleep) would give the system better CPU utilization by decreasing wasted cycles (i.e, the busy waiting in a spinlock). **Analyze** the problem, **design** an algorithm for computing the bound, and **justify** the algorithm's optimality. [5A+3D+5J points]

### M9: CPU Scheduling

2. [Acuña] Design an efficient (i.e., Big-Oh of a polynomial) algorithm for determining the time quantum $t$ for a round robin scheduler. The algorithm must consider the current process load and compute $t$, where system throughput is maximized for some interval. **Analyze** the problem, **design** an algorithm for computing the bound, and **justify** the algorithm's optimality. [5A+3D+5J points]

### M11: Virtual Memory

3. [Acuña] Consider the following fragment of code:

```
#define OFFSET(x, y, columns) = (y * columns + x)

//check if two matrices are the same.
int equals(IntMatrix* this, IntMatrix* other) {
    if (other == NULL)
        return 0;
    if(other->cols != this->cols || other->rowsls != this->rows)
        return 0;

    for(int y = 0; y < this->rows; y++)
        for (int x = 0; x < this->cols; x++)
            //no intentational magic; pointer arithmetic since C won't allow [][]
            if(*(this->data + OFFSET(x, y, this->cols)) !=
                *(other->data + OFFSET(x, y, this->cols))
                  return 0;

    return 1;
}
```

What page replacement scheme (of FIFO, OPR, LRU, MFU) should be used for this code? **Analyze** the problem, **design** a choice, and **justify** the choice. [5A+4D+5J 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 "LastName1and2ADJ2.pdf" where the last names are given in alphabetic order (e.g. "EdgarLisonbeeADJ2.pdf").