

SYSTEMS EXAM

Spring 2022

90 minutes

Check which problems you are submitting:

#1

#2

#3

How many pages total? _____

Please do not write on the back of any pages.

(print name)

(signature)

(NetId)

- b) (10pts) Assume memory has **8 pages** and there are **4 page frames**. We have a page reference string of **2,6,5,7** to fill the first 4 frames. Complete the tables below by adding **three more page references** that will result in **LRU** having **fewer** page faults than **FIFO**.

LRU

pages	2	6	5	7	?	?	?
Frame 0	2	2	2	2			
Frame 1		6	6	6			
Frame 2			5	5			
Frame 3				7			

FIFO

pages	2	6	5	7	?	?	?
Frame 0	2	2	2	2			
Frame 1		6	6	6			
Frame 2			5	5			
Frame 3				7			

3. (20 pts Total) Mixed – Short answer

- a) (2pts) Name **two** (2) mechanisms that an applications programmer can use to ensure correct process **synchronization** when manipulating shared data?
- b) (2pts) Name a **hardware** solution to the **critical section** problem.
- c) (4pts) Define “**short-term scheduler**” and “**long-term scheduler.**” Specifically, where do processes go when using each of these?
- d) (4 pts) What is a **context-switch** and **name five (5) elements** of a process context switch.

- e) (4pts) What would be the **implementation** of a **block** and **wait semaphore** and how is the **value** of any semaphore modified?
- f) (4pts) A computer system has a **36-bit virtual address space** with a **page size of 8K**, and **4 bytes per page table entry**. How many **pages** are in the virtual address space? What is the **maximum size** of addressable **physical** memory in this system?