## CS 162 Section 6

## True/False

- 1. If there is very high CPU utilization, then it is likely that thrashing is occurring.
- 2. If a particular IO device implements a blocking interface, then you will need multiple threads to have concurrent operations which use that device.
- 3. For IO devices which receive new data very frequently, it is more efficient to interrupt the CPU than to have the CPU poll the device.

## **Short Answer**

- 4. Two-level Page Tables:
  - i) Give a two to three sentence description of a two-level page table.
  - ii) Briefly (2 sentences) state one advantage AND one disadvantage of two-level page tables.
- 5. What is Belady's anomaly and which page replacement algorithm(s) coudld display it?

6. We looked at disabling CPU interrupts as a simple way to create a critical section in the kernel. Name two drawbacks of this approach. One of them should be a problem that is exacerbated by trends in modern computer hardware.

## **Longer Answer**

7. Below is a pseudo-code for the clock page replacement algorithm (we are assuming the clock is entirely "full" with pages, and a new page must be found. Fill in the blank:

```
replaced = false;
while (!replace) {
    1.
```

2. Advance clock hand

**Problem 2g[4pts]:** For the following problem, assume a hypothetical machine with 4 pages of physical memory and 7 pages of virtual memory. Given the access pattern:

```
ABCDEFCAAFFGABGDFF
```

Indicate in the following table which pages are mapped to which physical pages for each of the following policies. Assume that a blank box matches the element to the left. We have given the FIFO policy as an example.

| Access→ |   | A | В | С | D | Е | F | C | Α | Α | F | F | G | Α | В | G | D | F | F |
|---------|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FIFO    | 1 | Α |   |   |   | Е |   |   |   |   |   |   |   |   | В |   |   |   |   |
|         | 2 |   | В |   |   |   | F |   |   |   |   |   |   |   |   |   | D |   |   |
|         | 3 |   |   | С |   |   |   |   | Α |   |   |   |   |   |   |   |   | F |   |
|         | 4 |   |   |   | D |   |   |   |   |   |   |   | G |   |   |   |   |   |   |
| MIN     | 1 |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
|         | 2 |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
|         | 3 |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
|         | 4 |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| LRU     | 1 |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
|         | 2 |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
|         | 3 |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
|         | 4 |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |