CSS-430 : Operating Systems : HW08-Questions

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CSS 430

**Assignment Text**

Complete the following problems from the OSC book, 10th edition:

* Problem 10.3
* Problem 10.8
* Problem 10.29

10.3

Question: Consider the following page-replacement algorithms. Rank these algorithms on a five-point scale from “bad” to “perfect” according to their page-fault rate. Separate those algorithms that suffer from Belady’s anomaly from those that do not.

a. LRU replacement

b. FIFO replacement

c. Optimal replacement

d. Second-chance replacement

|  |  |  |
| --- | --- | --- |
| Rank | Algorithm | Suffers from Beladys Anomaly |
| 1 | Optimal | No |
| 2 | LRU | No |
| 3 | Second-Chance | Yes |
| 4 | FIFO | Yes |

10.8

Question: Consider the following page reference string: 1, 2, 3, 4, 2, 1, 5, 6, 2, 1, 2, 3, 7, 6, 3, 2, 1, 2, 3, 6.

How many page faults would occur for the following replacement algorithms, assuming one, two, three, four, five, six, and seven frames? Remember that all frames are initially empty, so your first unique pages will cost one fault each.

• LRU replacement

• FIFO replacement

• Optimal replacement

|  |  |  |  |
| --- | --- | --- | --- |
| Frames | LRU | FIFO | Optimal |
| 1 | 20 | 20 | 20 |
| 2 | 18 | 18 | 15 |
| 3 | 15 | 16 | 11 |
| 4 | 10 | 14 | 8 |
| 5 | 8 | 10 | 7 |
| 6 | 7 | 10 | 7 |
| 7 | 7 | 7 | 7 |

10.29

Question: Consider a demand-paging system with the following time-measured utilizations:

|  |  |
| --- | --- |
| CPU utilization | 20% |
| Paging disk | 97.7% |
| Other IO devices | 5% |

For each of the following, indicate whether it will (or is likely to) improve CPU utilization. Explain your answers.

**a. Install a faster CPU.**

No, the CPU is at 20% and doesn’t need to use its full power.  
**b. Install a bigger paging disk.**

No, disk accessing speed and main memory size is where the optimization needs to occur  
**c. Increase the degree of multiprogramming.**

No, more multiprogramming = less frames per process making it harder to accommodate all processes  
**d. Decrease the degree of multiprogramming.**

Yes, less multiprogramming = more frames per process  
**e. Install more main memory.**

Yes, more main memory = more frames per process so there are usually less page replacements

**f. Install a faster hard disk or multiple controllers with multiple hard disks.**

No, we need more main memory

**g. Add prepaging to the page-fetch algorithms.**

Yes, there is low I/O and prepaging reduces page faults **h. Increase the page size**

No, longer accessing time