EECE.4810/EECE.5730: Operating Systems

Spring 2017

Homework 3

Due <u>**3:15 PM**</u>, **Monday, 3/6/17—NO LATE SUBMISSIONS**

Notes:

- <u>**No late submissions will be accepted for this assignment.**</u>
- While typed solutions are preferred, handwritten solutions are acceptable.
- Any electronic submission must be in a single file. Archive files will not be accepted.
  - As noted in the syllabus, you will lose 10 points if you fail to follow this rule.
- Electronic submissions should be e-mailed to Dr. Geiger at Michael_Geiger@uml.edu. <u>Please include your name as part of your filename</u> (for example, mgeiger_hw3.pdf).
- Both EECE.4810 and EECE.5730 must complete problems 1-4, for a total of 50 points.

1. (16 points) Consider the following set of processes, with the length of the CPU-burst time given in milliseconds:

Process	Burst	Priority
P1	20	4
P2	5	3
P3	30	2
P4	2	3
P5	5	1

a. (12 points) Assume the processes arrived in the order P1, P2, P3, P4, P5, all at time 0.

What is the turnaround time (i.e., time of completion) of each process for each of the following four scheduling algorithms: FCFS (First Come First Serve), Round Robin (quantum=1), SJF (Shortest Job First), and a non-preemptive priority (a smaller priority number implies a higher priority)**?**

b. (4 points) For each of the four scheduling algorithms listed above, state whether your answer would have changed if each process arrived 1 millisecond apart (P1 at time 0, P2 at time 1, etc.) and briefly explain why. *(Note: You do <u>not</u> have to determine the turnaround time for each process with varying arrival times; you simply have to explain if your answer changes and why.)*

2. (9 points) Assume you have a multi-programmed system managing main memory using a base and bounds scheme. You have the following lists of holes and address space requests, each of which exists in the order shown:

   Available holes: 500 KB, 200 KB, 350 KB, 750 KB, 125 KB
   Address space requests: 300 KB, 175 KB, 400 KB, 200 KB, 95 KB

   How would these address spaces be placed using (a) first fit, (b) best fit, and (c) worst fit allocation? As part of your solution to each part, show the list of remaining holes after all address spaces are placed.

3. (10 points) On a system using segmentation to manage main memory, the segment table for the currently running process is listed below:

Segment #	V	Base	Bounds	Access
0	1	1020	500	read
1	0	74	12	read/write
2	1	19	78	read/write
3	1	4810	5730	read
4	1	3220	2160	read/exec

For each of the given memory accesses, determine if (i) the access is valid, and (ii) what the physical address is for each valid access. If the access is invalid, briefly explain why.

a. Read from virtual address 2, 16
b. Write to virtual address 1, 10
c. Write to virtual address 3, 5000
d. Read from virtual address 0, 600
e. Read from virtual address 4, 2000

4. (15 points) On a system using paging to manage main memory, the currently running process uses the page table below:

Virtual page #	Valid bit	Reference bit	Dirty bit	Frame #
0	1	0	0	5
1	1	0	1	0
2	0	0	0	--
3	1	1	0	3
4	0	0	0	--
5	1	1	1	2
6	0	0	0	--
7	1	1	0	1

a. (5 points) Which pages above are candidates to be evicted on a page fault? Which, if any, are better candidates to evict?

b. (10 points) Assuming 8 KB pages, what physical addresses would the virtual addresses below map to? Note that some virtual addresses may not have a valid translation, in which case you should note that address causes a page fault.

- 0xABCD
- 0x1792
- 0x4680
- 0x5701