Computer Science and Engineering 3221.03

FINAL
Feb. 24 2009

Answer all questions in the space provided

Make sure that you have 9 pages

Student Last Name: _____

Student Given Name: _____

Student Id. No: _____

Question	Value	Score
A	54	
B	30	
C	30	

Question 1. [54 points]

1. [3 points] What is the two most important disadvantages of Round Robin?

2. [3 points] What is a working-set window with parameter Δ?

3. [3 points] Name two advantages of increased page size.

4. [3 points] Name two disadvantages of increased page size.

5. [3 points] What is the advantage of a solution to the dining philosopher's problem that does not guarantee bounded waiting?

6. [3 points] Why is spinlock useful in multiprocessor systems but not in uniprocessor ones?

7. [3 points] What is the most tangible disadvantage of FCFS page replacement algorithm??

8. [3 points] Name two possible uses of the *reference bit*.

9. [3 points] What is the main disadvantage of hierarchical page tables when used in 64 bit machines?

10. [3 points] What simple mechanism involving manipulation of memory can speed up fork-exec process creation?

11. [3 points] What problem does priority inheritance address?

12. [3 points] How can one implement a mutex or a condition variable using semaphores?

13. [3 points] What is a CPU-bound process?

14. [3 points] How can we use the dirty bit to speed up virtual memory?

15. [3 points] Name the three ways that we can mix user and kernel level threads.

16. [3 points] What do we use software interrupts for?

17. [3 points] What is the difficulty with a program that has poor locality?

18. [3 points] What is the main advantage of a File Allocation Table?

Question 2.

[30 points]

1. [10 points] Consider the following page reference string

$$1,2,3,4,1,2,1,2,3$$

and a system with three frames. How many page faults do we have with OPTI-MAL and how many with LRU replacement algorithms. (Show the sequence of page replacements with a table similar to the one used in the book and in class).

2. [10 points] A file system has a combined index scheme with one direct pointer, one single indirect and one double indirect. Every block is 1kB and every pointer is 16 bytes. Index tables fit exactly in one block.

  (1)   What is the biggest file allowed in this filesystem.

  (2)   If we double the page size, what happens to the filesize (approximately)?

3. [10 points] Three processes have burst times P1 : 10, P2 : 8 and P3: 5 and arrival times P1 : 0, P2 : 3 and P3 : 4. What is the average waiting time under FCFS and SRTF scheduling? Assume that no other processes enter the system.

Question 3.
[30 points]

1. [15 points] Solve the bounded buffer problem using monitors. A consumer can consume if there is at least an item in the buffer. A producer can produce if there is an empty space in the buffer. The buffer can fit N items. Write four routines pr_en(), pr_ex(), co_en(), co_ex() for the entry and exit sections of the producers and consumers respectively.

```
monitor bb {
  cond                                /*Condition variables used*/
  int                                 /*Other variables*/

  void pr_en(){




  }
  void pr_ex() {




  }
  void co_en() {




  }
  void co_ex(){




  }
```

```
}
```

2. [15 points] Solve the exact same problem as above using semaphores. Write 4 functions pr_en(), pr_ex(), co_en(), co_ex() for the entry and exit sections of the producers and consumers respectively.

```
semaphore                               /*Semaphores used*/
int                                     /*Other variables*/

void pr_en(){




}
void pr_ex(){




}
void co_en(){




}
void co_ex(){




}
```