

CSE 120: Midterm

July 13, 2005—Day 5

Name: _____

Student ID: _____

Write your name on *all* pages because the pages will be separated for grading.

No books, no notes, but calculators are allowed. If you need to make an assumption to solve a problem, state the assumption.

Problem	Score
1	/5
2	/2
3	/2
4	/2
5	/4
6	/5
7	/5
8	/10
9	/10
10	/15
11	/15
Total	/75

Name : _____

1. 5 pts. For each of the following, specify whether it results in an Interrupt (I), Exception (trap) (E), or Neither (N):
 - (a) executing a Test and Set instruction
 - (b) Disk read completed
 - (c) Attempt to write to read-only memory
 - (d) System call (fork, for example)
 - (e) Call to library routine (strcpy, for example)
2. 2 pts. Which of the following is the best definition for *thrashing*?
 - (a) State where the CPU utilization is low because each process spends little CPU time before making an I/O call.
 - (b) State where the system spends much more time paging than actually executing processes.
 - (c) State where the high degree of multiprogramming causes the turnaround time of processes to be high due to the limited amount of CPU time available to each process.
3. 2 pts. Once the system detects thrashing, what can it do to eliminate the problem?
 - (a) Decrease the degree of multiprogramming
 - (b) Increase the priority of CPU-bound jobs
 - (c) Increase the degree of multiprogramming
 - (d) Decrease the priority of CPU-bound jobs
 - (e) none of the above
4. 2 pts. The Banker's algorithm deals with deadlock via:
 - (a) Deadlock Avoidance
 - (b) Deadlock Prevention
 - (c) Deadlock Detection and Recovery

Name : _____

8. 10 pts. Using the reference string $\langle 2\ 1\ 0\ 3\ 2\ 1\ 4\ 2\ 1\ 0\ 3\ 4 \rangle$, fill in the two tables below (representing three and four page frames respectively) using the FIFO page replacement policy. How many page faults occur in each case?

Name : _____

9. 10 pts. Using the same reference string as in the previous question ($\langle 2\ 1\ 0\ 3\ 2\ 1\ 4\ 2\ 1\ 0\ 3\ 4 \rangle$, fill in the two tables below (representing three and four page frames respectively) using the LRU page replacement policy. How many page faults occur in each case?

Name : _____

10. 15 pts. The following table lists the arrival time, execution time, and priority (higher number means greater priority) of 5 jobs.

Job	Arrival time	Execution time	Priority
A	0	30	3
B	20	40	5
C	30	30	4
D	60	20	1
E	100	60	2

Give the start time (the time the job is *first* scheduled; note that a job may have to wait when it arrives) and end time of each of the jobs using each of the following scheduling algorithms.

- (a) Shortest Job First (assume that only one job at a time runs and runs until it finishes)

- (b) Priority (assume that only one job at a time runs and runs until it finishes)

- (c) Round-Robin with a quantum of 20

Name : _____

11. 15 pts. We have two processes which each repeatedly execute two sections of code, and then increment a shared variable :

```
shared Integer numIterations = 0;
```

Process A

```
loop begin
```

```
    A1;
```

```
    A2;
```

```
    numIterations++;
```

```
loop end;
```

Process B

```
loop begin
```

```
    B1;
```

```
    B2;
```

```
    numIterations++;
```

```
loop end;
```

We want to satisfy the following constraints:

- (a) Statement A2 in the i th iteration of A's loop cannot execute until statement B1 executes in the i th iteration of B's loop
- (b) Statement B2 in the i th iteration of B's loop cannot execute until statement A1 executes in the i th iteration of A's loop
- (c) numIterations must always maintain the number of loops process A has completed plus the number of loops process B has completed

Add to the existing code to satisfy the given constraints, but without adding additional constraints (for example, it shouldn't matter whether A1 or B1 executes first).

You may declare additional shared or local variables of type Integer, Boolean, or Semaphore, but make sure to give them initial values.