COSC 4330 SECOND MIDTERM MARCH 31, 2004

This exam is **closed book**. You can have **one** page of notes.

1. Consider the following solution to the mutual exclusion problem:

```
#define FALSE 0
#define TRUE  1

shared int reserved[2] = {FALSE, FALSE};

void enter_region(int pid) {
     while (reserved[other]); // busy wait
     reserved[pid] = TRUE; //
} // enter_region

void leave_region(int pid) {
     reserved[pid] = FALSE;
} // leave_region
```

a) What is wrong with it? (5 points) It does not guarantee mutual exclusion._____

b) When does this problem happen? (5 points) When two processes perform enter_region _ in lockstep. _____

2. Consider the following System V Release 4 scheduler:

```
#ts_quantum ts_tqexp ts_slpret ts_maxwait ts_lwait LEVEL
  800       0        1         16000      0        # 0
  400       0        2          8000      2        # 1
  200       2        3          4000      3        # 2
  100       2        4          2000      4        # 3
```

and identify the four incorrect parameters:

a) Parameter _ts_tqexp_____ on level _2__ should not be equal to _2 _____

b) Parameter _ts_slpret_____ on level _3___ should not be equal to _4 _____

c) Parameter _ts_lwait_____ on level _0___ should not be equal to _0 _____

d) Parameter _ts_lwait_____ on level _3___ should not be equal to _4 _____

3. Give two examples of data structures that are much costlier to pass to a remote procedure call than to a regular procedure call (2×5 points)

a) First example: __a large array_

b) Second example: __a long linked list_

4. What does the VMS scheduling policy do to favor interactive processes over other processes? (10 points)

They increase the priorities of processes reading from or reading to the terminal by a higher increment than those of processes doing disk I/Os. In addition, the reward for doing a read from a terminal is higher than the reward for doing a write to a terminal.

5. A restaurant has a dining room that can seat a maximum of 40 guests. Complete the following code fragments to ensure (a) that the room will never contain more than 40 guests and (b) that parties will either have all their guests seated or all their guests waiting. (20 points).

```
semaphore chairs = _40__;
semaphore access = _1___;
enter_room (int nguests) {
      int i;
      __P(&access)__;
      for (i = 0; i < nguests ; i++)
            __P(&chairs)__;
      __V(&access)__;
} // enter room
leave_room (int nguests) {
      int i;
      for (i = 0; i < nguests ; i++)
            __V(&chairs)__;
} // leave_room
```

6. Answer in ***one sentence or less*** to each of the following questions (6×5 points)

a) What is the major disadvantage of ***busy waits****?*

They result in too many context switches and, more generally, waste CPU cycles.

b) What is the major disadvantage of ***atomic transactions***?

They are costly to implement.

c) What is the major advantage of ***datagrams*** over ***virtual circuits***?

They have less overhead because they do not require the establishment of a connection between the sender and the receiver.

d) How can we implement the ***at-most-once*** semantics in remote procedure calls?

By attaching a serial number to each request and instructing the server to reject duplicate requests.

e) When should we worry about ***big-endians*** and ***little-endians***?

Whenever we are transmitting data between two different machines as their byte ordering could be different.

f) What is the difference between ***reliable datagrams*** and ***unreliable datagrams***?

Reliable datagrams are acknowledged by their receiver.