

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

1. Which of the following statements are *true* or *false* (2 points) and *why*? (3 points)

- a) You cannot combine non-blocking sends with blocking receives.

False, non-blocking sends with blocking receives are the default for BSD sockets.

- b) All mutex semaphores should always be initialized to one.

True, a zero value will either disallow access and any value greater than one will not enforce mutual exclusion.

- c) Peterson's algorithm for mutual exclusion assumes the existence of a test-and-set instruction.

False, Peterson's algorithm does not require any special instructions.

- d) The VMS scheduler gives its biggest reward to processes that write to a terminal.

False, it gives its biggest reward to processes that read from a terminal.

- e) The all or nothing semantics guarantees that remote procedure calls will be executed at most once.

False, it guarantees that remote procedure calls will be executed exactly once or not at all.

- f) All preemptive policies have multiple priority levels.

False, the round-robin policy is preemptive and has no priorities

2. Consider the instruction **TSET R7, LOCK** and assume it is used to ensure mutual exclusion within a critical section. What are the two possible values for **R7** after the instruction is executed (2×2 points) and what are their meanings? (2×3 points)

- a) If **R7** equals 0 then the lock was previously unlocked and the process was able to enter the critical region _____

- b) If **R7** equals 1 then the lock was previously locked and the process could not enter the critical region _____

3. Consider the following System V Release 4 scheduler:

#ts_quantum	ts_tqexp	ts_slpret	ts_maxwait	ts_lwait	LEVEL
1000	0	1	8000	0	# 0
500	1	2	4000	1	# 1
200	2	3	2000	2	# 2
100	3	3	1000	3	# 3

and find what is wrong with it. (2×10 points)

It does not penalize processes that have exhausted their quanta and does not reward those that have waited a long time.

4. In the Round Robin policy, what the advantages and disadvantages of selecting a small time quantum? (2×5 points)
- The main advantage of small time quanta is that _it guarantees that all processes will always get the CPU within reasonable amount of time _____**
 - The main disadvantage of small time quanta is that _it increases the contest switch overhead _____**

5. Consider the following solution to the mutual exclusion problem and explain when it fails (5 points) and what happens then. (5 points)

```
shared int reserved[2] = {0, 0}; // global variable

void enter_region(int pid) { // pid will always be 0 or 1
    int other; other = 1 - pid; // pid of other process
    reserved[pid] = 1; // reserve
    while (reserved[other] && reserved[pid]); // busy wait
} // enter_region

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

When _two processes try to enter the critical section in lockstep _____
then _they will deadlock_____

6. Consider the function

```
void doubletrouble(int *one, int *two) {
    *one += *one;
    *two *= *two;
} // doubletrouble
```

and assume the following calling sequence:

```
alpha = 10;
doubletrouble (&alpha, &alpha);
```

What will be the value of **alpha** *after the call* assuming that

- the call was a *conventional procedure call*? (5 points) **Answer: alpha = ____400____**
 - the call was a *remote procedure call*? (5 points) **Answer: alpha = _20 or 100____**
7. Give an example of an application where
- Datagrams are more indicated than streams. (5 points)
_Remote procedure calls whose data can fit in a single message _____
 - Streams are more indicated than datagrams. (5 points)
_File transfers, web services _____