

1 Tape drives (4 pts.)

Imagine the system is in the state depicted below. List one request which the system should grant right away, and one request which the system should react to by blocking the process making the request. Briefly justify each of your answers.

Who	Max	Has	Room
A	3	1	2
B	2	1	1
C	4	2	2
System	5	1	-

If Process B requests one more tape drive, the system can safely grant that request—because B will have its maximal needs, if necessary, A and C can wait while B runs to completion and releases two tape drives. At that point either A or C could be run to completion, after which the other one clearly could. Because granting this request would result in the system being in a safe state, it should be granted.

On the other hand, if either Process A or Process C requests one more tape drive, the system must block that request rather than granting it. If the request were granted, the system would have zero tape drives to give out, but three processes each of which would be entitled to ask for more. As any one asked for more, it would be forced to block; if *all three* asked for more, all three would block, and they would be waiting for each other to release tape drives...

2 Race conditions (6 pts.)

2.1 3 pts

Show an execution trace in which thread 1's loop body executes exactly three times.

Execution Trace

time	Thread 0	Thread 1	n
0	n >= 0?		1
1	--n		1 to 0
2		n < 1?	0
3		++n	0 to 1
4	n >= 0?		1
5	--n		1 to 0
6		n < 1?	0
7		++n	0 to 1
8	n >= 0?		1
9	--n		1 to 0
10		n < 1?	0
11		++n	0 to 1
12		n < 1?	1
12		return (0)	

2.2 3 pts

Show an execution trace in which both thread 0 and thread 1 run forever.

Execution Trace

time	Thread 0	Thread 1	n
0	n \geq 0?		1
1	--n		1 to 0
2		n < 1?	0
3		++n	0 to 1
4	go to $t = 0$	go to $t = 0$	

Note

This homework assignment was probably “too easy” compared to most exam questions. But hopefully it served its purpose, which was to focus you on working through some examples, as a warm-up or inducement to look at old exams.

Also, hopefully it provides some guidance as to what we consider to be a clear execution trace. *Clarity—providing easy-to-evaluate evidence of your claim—is very important. Please look over your traces and verify that they are as easy to read as ours.*