

- Given two processes, each of which have a critical section with respect to a variable Q, show how to protect these critical sections **TestAndSet** instructions and semaphores.
- Using two semaphores S1 and S2, show how a deadlock can occur between two processes, even if the semaphores are used correctly.
- List the five conditions necessary for deadlock.

- Is the following system safe?

Has				
	A	B	C	D
P0	3	0	1	1
P1	0	1	0	0
P2	1	1	1	0
P3	1	1	0	1
P4	0	0	0	0

Max				
A	B	C	D	
1	1	0	0	
0	1	1	2	
3	1	0	0	
0	0	1	0	
2	1	1	0	

Free				
A	B	C	D	
1	0	2	0	

- Is the following system deadlocked?

Has				
	A	B	C	D
P0	3	0	1	1
P1	0	1	0	0
P2	1	1	1	0
P3	1	1	0	1
P4	0	0	0	0

Req				
A	B	C	D	
0	0	0	0	
0	1	1	1	
3	1	0	0	
2	0	1	0	
2	1	1	0	

Free				
A	B	C	D	
1	0	2	0	

- Is the following system deadlocked?

Has				
	A	B	C	D
P0	3	0	1	1
P1	0	1	0	0
P2	1	1	1	0
P3	1	1	0	1
P4	0	0	0	0

Max				
A	B	C	D	
0	0	0	0	
0	1	1	1	
3	1	0	0	
0	0	1	2	
2	1	1	0	

Free				
A	B	C	D	
1	0	1	0	

- Assume we have a computer with decimal addressing. Both virtual and real addresses are four digits. The first two digits are the page number or the page frame number, and the last two digits are the offset. Given the following page table, translate the addresses given below. If a page fault would occur, then write "PF" for the real address.

0	32xx
1	21xx
2	72xx
3	09xx
4	01xx
5	22xx
6	00xx

Virtual	Real
2231	
0222	
0131	
0664	
0725	
0099	
1182	
0341	
0560	
0427	

8. Assume we have a computer with decimal addressing. Both virtual and real addresses are six digits. There are two levels of hierarchical page tables. The first two digits index the first table, the second two digits index the second table, and the last two digits are the offset. Page frame numbers are four digits. Given the following page tables, translate the addresses given below. If a page fault would occur, then write "PF" for the real address.

0	012731
1	000042
2	212132
3	100100

At 012731

0	1123xx
1	0022xx
2	5121xx
3	1905xx

At 000042

0	0010xx
1	0011xx
2	0221xx
3	2321xx

At 212132

0	1100xx
1	9919xx
2	2131xx
3	0001xx

At 100100

0	8080xx
1	7121xx
2	2345xx
3	1111xx

Virtual	Real
000021	
010132	
030415	
020377	
020023	

Virtual	Real
010217	
112138	
030051	
020160	
040044	