

Name _____

All questions are worth 10 points. Maximum score: 80

1. There are five conditions necessary for deadlocks to occur. List them and give a one or two-line explanation of each.

2. Given the following allocation tables, is the system in a safe state? If we grant a request of (0,0,3) from P0, will the system be in a safe state? If the states are safe, show the safe sequence. Otherwise show where building the safe sequence fails.

	Has		
	A	B	C
P0	0	1	0
P1	0	0	0
P2	1	2	0
P3	1	0	0
P4	0	0	2

	Max		
	A	B	C
P0	2	3	4
P1	1	4	1
P2	2	2	3
P3	2	4	5
P4	2	3	3

Free		
A	B	C
1	1	3

3. Is the following system deadlocked? If not show the “safe sequence” otherwise, list the processes that are deadlocked. If process P5 makes a request of (0,0,1) will this cause a deadlock?

	Has			Req			Free		
	A	B	C	A	B	C	A	B	C
P0	0	0	0	0	4	0	0	0	0
P1	1	0	0	0	2	1			
P2	0	1	0	0	1	0			
P3	0	2	0	2	1	1			
P4	1	1	1	0	0	0			

4. We have created a decimal machine with four-digit addresses. The first two digits are the page number, while the second two are the offset. Translate the following addresses, using the given table. If a particular virtual address cannot be translated, write “page fault” for the virtual address.

Page Table

22xx
21xx
22xx
14xx
66xx
27xx
13xx
56xx
89xx

Virtual	Real
0101	
2221	
0763	
0892	
0947	
0022	
0631	
0132	
0292	
0347	

5 Show how to solve the readers and writers problem using semaphores.

- 6 How does a condition variable differ from a semaphore? How is waiting different, and how is signaling different?

7. We have created a segmented decimal machine with four-digit addresses. The first digit is the segment number, while the last three are the offset. Translate the following addresses, using the given table. If a particular virtual address cannot be translated, write “segment fault” for the virtual address.

Segment Table

3361	0200
7201	0321
2323	0799
1901	1000
1422	0101
3333	0022
6111	0111
2227	0678
9200	0221

Virtual	Real
1101	
8220	
5763	
2692	
0947	
6022	
3631	
9132	
7292	
4047	

8. What are the three types of threading? Explain the features used by the programmer in each case.