

Name _____

All questions are worth 10 points. Maximum score: 70

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 (2,0,0) 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	1	3	0
P1	1	1	2
P2	2	2	1
P3	1	1	0
P4	2	0	1

	Max		
	A	B	C
P0	3	3	6
P1	2	3	2
P2	3	2	1
P3	3	3	5
P4	2	4	1

Free		
A	B	C
2	0	2

3. Is the following system deadlocked? If not show the “safe sequence” otherwise, list the processes that are deadlocked. If process P1 makes a request of (0,0,1) will this cause a deadlock?

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

	Req		
	A	B	C
P0	0	0	2
P1	0	0	0
P2	3	0	0
P3	0	2	0
P4	0	0	4

	Free		
	A	B	C
	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

11xx
12xx
23xx
31xx
22xx
99xx
19xx
14xx
61xx
01xx
47xx

Virtual	Real
1121	
0427	
0951	
9922	
0131	
0044	
1011	
0422	
0111	
0222	

- 5 Determine the number of page faults that will occur with the following reference string using the algorithms OPT, FIFO, and LRU. Simulate each algorithm for three page frames.

1 2 3 4 1 2 3 5 6 1 2 3

- 6 What sorts of things would you expect to find on a hard disk, regardless of the file system being used?

7. Translate the following real addresses into virtual addresses using the following hierarchical page table. Addresses are specified in decimal, with four digits per address. The first digit indexes the first-level table while the second indexes the second-level table. If an address can't be translated, write "Page Fault" in the real address box.

First-Level Table.		Secondary table addresses (and contents)			
		3122	1456	2238	4488
3122		22xx	61xx	80xx	40xx
1456		21xx	82xx	55xx	00xx
2238		14xx	19xx	73xx	
4488		66xx		97xx	
				33xx	

Virtual	Real
0422	
3148	
1321	
2433	
0366	
4101	
2209	
1001	
1222	
3000	