

Name _____

All questions are worth 10 points. Maximum score: 100.

1. Is the following system in a safe state? If so show the “safe sequence” otherwise, list the processes that cannot be added to the safe sequence.

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

	Max			
	A	B	C	D
	2	1	1	1
	0	0	2	2
	3	4	0	1
	0	0	2	2
	3	5	1	0

Available			
A	B	C	D
1	3	1	1

2. Given a shared variable S that has an initial value of 12, the following two statements are executed in two separate processes P1 and P2. Give the final values of S and explain how each can occur.

P1

...

$S = S * 3;$

...

P2

...

$S = S * 4;$

...

3. 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)____			
		2100	1300	0400	2200
2100		13xx	61xx	13xx	81xx
1300		14xx	67xx	75xx	46xx
0400		22xx	40xx	80xx	77xx
2200		38xx	19xx	92xx	91xx

Virtual	Real
0101	
0232	
1234	
2141	
2432	
3325	
7122	
2020	
3188	
9231	

4. Given the following five processes and associated burst times, give the GANTT chart for the scheduling algorithms First Come First Served (FCFS), Shortest Job First (SJF), and Round Robin with a quantum of 4. Give the average wait time for each algorithm

Process Number	Burst Time
0	8
1	6
2	7
3	3
4	5

5. Assume that a process is assigned three page frames and that demand paging is being used. Given the following reference string, how many page faults will occur with the LRU algorithm, the FCFS algorithm and the OPT algorithm? Show your work for each algorithm

1,2,1,3,1,4,1,2,3,4,5,3,1,2,1

6. Explain the Indexed file structure supported by UNIX, including single, double and triple indirection. Explain what an Inode is and how they are used with directory entries.

9. A file has been assigned to the following sectors, in the order given: 10, 11, 12, 43, 92, 93, 13, 14, 15 16. The name of the file is Xeriscape.txt. Show a typical directory entry, *including the allocation information*, for the three file organizations linked-list, indexed, and multiple contiguous blocks.
10. Explain how NTFS directories differ from the directories used in the FAT (12, 16, and 32) file systems.