

Exam #1

CSE 3320

Spring 2022



Gryffindor Version

Name: \_\_\_\_\_

UTA ID: \_\_\_\_\_

“I certify that the following work is my work alone and I will follow the highest standards of integrity and uphold the spirit of the Honor Code”

Signature: \_\_\_\_\_

Directions: This is a closed book, closed notes exam. You may use a hand written 3x5 note card with notes. Please answer the questions briefly. Complete sentences are not necessary. Write your answers legibly. Unreadable answers will be counted wrong. There is a powers of 2 table on the last page.

1. [4pts] Give the four conditions required for a deadlock.

2. [4pts] What is a context switch?

3. [8pts] How does the kernel on an x86\_64 architecture guard kernel space?.

4. [8pts] What are the differences between a microkernel and a monolithic kernel? Give an advantage and disadvantage of each and give an example of an operating system with each kernel type.

5. [8pts] Define operating system

6. [8pts] What data structure is used by the OS to manage individual process data? How many are there?

7. [8pts] A computer has 64GB of RAM of which the operating system occupies 512 MB. The processes are all 256 MB and have the same characteristics. If the goal is 80% CPU utilization, what is the maximum I/O wait time that can be tolerated with the maximum number of processes running.

Process ID	Arrival Time	Runtime (seconds)	Priority
1	0	2	4
2	0	4	2
3	3	6	1
4	5	6	3
5	8	3	1
6	12	1	4
7	15	5	2

8. [8pts] Given the table above, show the GANTT chart for a SJN with Preemption, also known as STRF, scheduler. Lowest priority value is the highest priority if relevant.
9. [8pts] Give the average response time, average wait time, and average turnaround time.

10. [4pts] Define cooperative multitasking and preemptive multitasking. Give an advantage of each.

11. [4pts] What is a time quantum?

12. [8pts] Define a kernel

13. [4pts] What system call is used to create a new process? What are its return values?



14. [8pts] Is the following deadlocked?

$$\textit{Existing} = [2,3,4,6]$$

$$\textit{Available} = [0,1,1,2]$$

$$\textit{Allocated} \begin{bmatrix} 1 & 0 & 2 & 0 \\ 0 & 1 & 1 & 1 \\ 1 & 1 & 0 & 1 \\ 0 & 0 & 0 & 2 \end{bmatrix}$$

$$\textit{Needed} \begin{bmatrix} 0 & 0 & 0 & 3 \\ 1 & 1 & 4 & 4 \\ 0 & 0 & 1 & 1 \\ 2 & 1 & 3 & 3 \end{bmatrix}$$

15. [8pts] Explain external fragmentation, the solution we discussed for it, and why that solution is not optimal.