Final Exam

CSE 3320

Spring 2022

Name: _____

UTA ID:_____

T.rex Edition

"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 an open book, open notes exam. Please answer the questions briefly but completely. Write your answers legibly. Unreadable answers will be counted wrong. You may write on back if needed. There is a powers of two tables on the last page.

1. 8pts Consider the following system of processes and resources. Is the system deadlocked? If not, in what order do the processes need to be run?

	Max				Allocation				Need				Available			
	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D
P0	6	0	1	2	4	0	0	1	2	0	1	1				
P1	1	7	5	0	1	1	0	0	0	6	5	0				
P2	2	3	5	6	1	2	5	4	1	1	0	2				
P3	1	6	5	3	0	6	3	3	1	0	2	0				
P4	1	6	5	6	1	4	1	2	0	2	4	4				
													2	0	1	1

Process ID	Arrival Time	Runtime (seconds)	Priority
1	0	6	3
2	1	4	4
3	3	4	1
4	6	2	4
5	10	2	1
6	13	6	2
7	14	2	1

2. 9pts You are tasked with implementing the preemptive job scheduler for new touch screen tablet for artists. Due to the tactile nature of the consumer use cases a responsive GUI is your key characteristic. Given a representative set of tasks in the table above, determine what the optimal scheduling algorithm is for your device. Quantify your choice with Gannt charts and other calculations. In case of a tie choose the process with the lowest PID.

Extra Space If Needed

3. 6pts Suppose you had a computer that supported virtual memory and had 16-bit virtual addresses and 4 KB pages. If a process actually uses 1024 pages of its virtual address space, how much space would be occupied by the page table for that process if a single-level page table was used?

4. 4pts You are given an index allocated file system with disk blocks that are 8 KB in size and a pointer to a disk block is 16 bit. This file system's index nodes have 12 direct disk blocks, as well as 5 indirect disk blocks, 4 double indirect blocks and a triple indirect blocks. What is the largest file that can be held using this inode layout?

5. 9pts Consider a reference string 1,2,3,4,2,5,6,2,3,2,1,6,7; and a system with only 3 frames, pure demand paging, and all frames initially empty.

(a) How many page faults would occur with an LRU replacement scheme?

(b) How many page faults would occur with a FIFO replacement scheme?

(c) Would increasing the number of frames always decrease the number of page faults for a particular reference string for LRU? for Optimal? Why or why not? You need not provide "proof", just an explanation.

Extra Space If Needed

6. 8pts True/False. Mark each of the following statements as true or false

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(a) A smaller page size leads to fewer page faults

(b) A context switch from one process to another can be accomplished without executing OS code in kernel mode.

(c) An advantage of implementing threads in user space is that they don't incur the overhead of having the OS schedule their execution.

(d) A smaller page size leads to more TLB misses

(e) A smaller page size leads to smaller page tables

(f) TLB miss could occur even though the requested page was in memory.

7. 4pts These points are free. Take a deep breath and relax.

8. 4pts Which of the following are multi-factor authentication? Select all that apply.

A. Username, password and PIN

B. Fingerprint and PIN

C. Access card and PIN

D. Access card and a hardware token

E. Retina scan and fingerprint

F. Gait recognition of your walk and hardware token

G. The eyeball Loki stole from the museum guy in the Avengers movie

H. Key and access card

9. 6pts Given a page request reference string of A B C A D B E B F B C D F A B C A D and a page table size of four, calculate how many page faults will occur with the Optimal page replacement algorithm.

11. 4pts A disk rotates a single revolution in 4ms. It has 1000 sectors of 512 bytes each round the outer cylinder. Given a seek time of 3 ms, calculate the average data rate to read 30,000 bytes.

12 . 14pts List the 7 layers of the OSI network model and give an example of each.

13. 6pts What is authentication and authorization. How do they differ?

14. 10pts Describe demand based paging. You should consider addresses spaces, pages, frames, page tables, and Memory Management Units in your answer. What are the benefits?

15. 2pt Contiguous allocation of files leads to disk fragmentation because some space in the last disk block will be wasted in files whose length is not an integral number of blocks. Is this internal fragmentation or external fragmentation?

16. 6pts A user types www.uta.edu into their web browser. How does the fully qualified domain name get translated into the unique identifier for the remote machine?

n	2^n	n	2^n	n	2^n
0	1	11	2,048	22	4,194,304
1	2	12	4,096	23	8,388,608
2	4	13	8,192	24	16,777,216
3	8	14	16,384	25	33,554,432
4	16	15	32,768	26	67,108,864
5	32	16	65,536	27	134,217,728
6	64	17	131,072	28	268,435,456
7	128	18	262,144	29	536,870,912
8	256	19	524,288	30	1,073,741,824
9	512	20	1,048,576	31	2,147,483,648
10	1,024	21	2,097,152	32	4,254,967,296