Final Exam

CSE 3320.002

Spring 2015

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 notecard with notes. Please answer the questions briefly. Complete sentences are not necessary. Write your answers legibly. Unreadable answers will be counted wrong. You may write on back if needed.

1. 5pts. Briefly explain the difference between UDP and TCP?

2. 5pts. How many possible IPv4 addresses are there?

3. 5pts. How many possible IPv6 addresses are there?

4. 5pts. Draw the process used to translate from the logical address generated by the CPU to the physical address. You do not need to include the TLB or MMU.

5. 5pts. For the following code, describe what happens, in what order, and what will get printed (in what order). For return values from fork use any integer that makes sense from a system standpoint.

```
pid = fork();
if (pid == 0)
{
  execl( "/bin/gcc", "/bin/gcc", "main.c", NULL );
  printf("Compilation finished\n");
}
else
{
  printf("Your executable is compiling.\n");
}

int status;
wait( &status );

pid = fork();
if (pid == 0)
{
  execl( "/bin/rm", "/bin/rm", "main.c", NULL );
  execl( "/bin/cp", "/bin/cp", "a.out", "main", NULL );
}
else
{
  int status;
  wait( &status );
  printf("Build process done!\n");
  exit( 0 );
}
```

6. 5pts. Explain the difference between external fragmentation and internal fragmentation.

7. 5pts. A page table can be used to eliminate external fragmentation. How can you use the page table to reduce internal fragmentation?

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

8. 5pts. Show the GANTT chart for a Shortest Job Next (SJN) with preemption scheduler.

9. 5pts. What is the average wait time?

10. 10pts. In a virtual memory environment with 4 GB addressable space, where pages are 1KB bytes in size:

1. How many entries are in the page table (maximum)?
2. How would 32-bit addresses be used? Give you answers in bits.

11. 10pts. Given a file system that uses inodes to represent files. Disk blocks are 4 KB in size, and a pointer to a disk block requires 4 bytes. This file system's index nodes have 32 direct disk blocks, as well as 4 indirect disk blocks. What is the largest file that can be held using this inode layout?

12. 5pts. Given a page request reference string of:

A C D A C B A E A C B E

and a page table size of four, calculate how many page faults will occur with the optimal page replacement algorithm. Assume no pages initially loaded into the page table automatically. If all pages are equally replaceable pick the first available.

13. 5pts. Given a page request reference string of:

A B D C C E F B C D A B

and a page table size of four, calculate how many page faults will occur with the LRU page replacement algorithm. Assume no pages initially loaded into the page table automatically. If all pages are equally replaceable pick the first available.

14. 5pts. Given the following request queue -- 8, 17, 4, 76, 42, 20 90, 41, 94, 97 with the disk head initially at the track 90 initially moving in the negative direction (towards 0). The beginning of the disk at 0 and the end of the disk is at 100. Calculate the travel time for the C-SCAN algorithm. Assume all reads are made in the negative direction if applicable.

15. 5pts. Alice wants to send an encrypted message to Bob. She can choose a symmetric key (shared) or asymmetric key (public) algorithm.

For each case:

(1) how many keys, in total are used. What type of key are they?
(2) how do Alice and Bob use those keys to encrypt and then read the message?

16. 5pts. If it takes 20 milliseconds to read or write a page to disk and it takes 100 nanoseconds to execute a TLB lookup, and the hit rate of the translation look aside buffer is 94%, what is the average memory access time (EAT) 1 millisecond = 1,000,000 nanoseconds give your answer for parallel and serial.

17. 5pts. Explain the difference between cooperative and pre-emptive multitasking?

18. 5pts. Briefly explain the difference between a monolithic and microkernel. Give an example of each.