

<b>Name</b>	<b>UBID</b>	<b>Seat</b>	<b>Side</b>

Question:	1	2	3	4	5	6	7	8	Total
Points:	10	5	5	5	5	5	5	20	50
Score:									

## CSE 421/521 Midterm Exam

25 Mar 2015

Please fill out your name and UB ID number above. Also write your UB ID number at the bottom of each page of the exam in case the pages become separated.

This midterm exam consists of three types of questions:

1. **10 multiple choice** questions worth 1 point each. These are drawn directly from lecture slides and intended to be easy.
2. **6 short answer** questions worth 5 points each. You can answer as many as you want, but we will give you credit for your best four answers for a total of up to 20 points. You should be able to answer the short answer questions in four or five sentences.
3. **2 long answer** questions worth 20 points each. **Please answer only one long answer question.** If you answer both, we will only grade one. Your answer to the long answer should span a page or two.

Please answer each question as **clearly** and **succinctly** as possible. Feel free to draw pictures or diagrams if they help you to do so. **No aids of any kind are permitted.**

The point value assigned to each question is intended to suggest how to allocate your time. So you should work on a 5 point question for roughly 5 minutes.

There are **three** scratch pages at the end of the exam if you need them. If you use them, please clearly indicate which question you are answering.

**I have neither given nor received help on this exam.**

Sign and Date: \_\_\_\_\_

## Multiple Choice

1. (10 points) Answer all **ten** of the following questions. Each is worth **one** point.

- (a) What singer was *not* played before class this semester?  
 Tony Rio    Amanda Banana    Stacy Keys    Lisa Lee
- (b) All of the following are critical section requirements *except*  
 mutual exclusion.    concurrency.    progress.    performance.
- (c) Interprocess communication is harder than intra-process communication.  
 True    False
- (d) All of the following are private to each process thread *except*  
 stack.    file handles.    registers.
- (e) What action does *not* require the kernel?  
 Switching between two threads.    Reading from a file.    Creating a new process.    Altering a virtual address mapping.
- (f) What part of the address space is not initialized using information from the ELF file?  
 Code segment.    The heap.    Uninitialized static data.    Initialized static data.
- (g) The Rotating Staircase Deadline Scheduler is most similar to which other scheduling algorithm?  
 Lottery scheduling.    Round-robin.    Multi-level feedback queues.  
 Random.
- (h) Which of the following is *not* a part of making a system call?  
 Arranging the arguments in registers or on the stack.    Loading the system call number into a register.    Generating a software interrupt.  
 Allocating memory in the heap using `malloc`.
- (i) What information would probably *not* be stored in a page table entry?  
 The location on disk.    Read, write or execute permissions.    The process ID.    The physical memory address.
- (j) Paging using fixed-size pages can suffer from internal fragmentation.  
 True.    False.







```
1 #include <stdio.h>
2 #include <stdlib.h>
3
4 int32_t foo[1024];
5
6 int
7 main(int argc, const char * argv) {
8     buffer = (char *) malloc(10240); // You can assume that malloc succeeds.
9     int32_t bar[1024];
10    // <-- Here -->
11    struct foer[24];
12 }
```

5. (5 points) Examine the simple program above. At the point in its execution indicated, *at minimum* how many 4K pages of memory will it require in each segment: code, stack and heap? Justify your answer (5 points).

Note that you can ignore dynamically-loaded libraries, and assume that `malloc` does not consume any memory for its own data structures (if only).

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