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Final Exam Solutions
15-213 / 18-213 Fall 2012

*********
Problem 1
*********
01-b 02-a 03-c 04-d 05-a 06-e 07-b 08-a 09-c 10-b
11-d 12-d 13-b 14-(d or e) 15-c 16-d 17-a 18-b

1pt each

For 1.14, we allowed e, even though it's not strictly true, because if
appears in the lecture notes and textbook.

*********
Problem 2
*********
      | A         | B
Three | 0 100 10  | 0 10 100   Exact in both formats
7/8   | 0 010 11  | 0 00 111   Exact in both formats, norm in A, denorm in B
15/8  | 0 100 00  | 0 01 111   Format A round to even, format B exact
1pt each

*********
Problem 3
*********
H=15
J=10
3 pts each, 1/2 credit if reversed

*********
Problem 4
*********
int loop (int a[], int n) {
    int i, sum;

    sum = 0; // 1pt
    for (i = 0; i < n; i++) { //3 pts
        sum += a[i]/4;  // 3pts
        or
        sum += (a[i] < 0 ? a[i] + 3 : a[i]) >> 2;
    }
        return sum; //1 pt
}
Negative integers must be biased before using shift right to divide by
a power of two

*********
Problem 5
*********
Stack      The diagram starts with the
addresss   arguments for foo()
          +-----------------------------------+
0xffffd830| 4                                 |
          +-----------------------------------+
0xffffd82c| caller ra: 0x080483e6             |
          +-----------------------------------+
0xffffd828| old ebp: 0xffffd848               |
          +-----------------------------------+
0xffffd824| ebx                               |
          +-----------------------------------+
0xffffd820| 3                                 |
          +-----------------------------------+
0xffffd81c| caller ra: 0x80483be              |
          +-----------------------------------+
0xffffd818| old ebp: 0xffffd828               | <- %ebp = 0xffffd818
          +-----------------------------------+
0xffffd814| ebx (or 4)                        |
          +-----------------------------------+
```

```
0xffffd810| 2                                  | <- %esp = 0xffffd810
          +-----------------------------------+
```

1 pt each

****
Problem 6
****
A.

src	dst
m m	m m
m h	m m

B.

src	dst
m h	m h
m h	m h

1 pt each

****
Problem 7
****
a=5 b=2 c=4
2 pts each

****
Problem 8
****
A. N
B. Y
C. Y
D. N
E. Y
2pts correct, -1 incorrect, 0 blank

****
Problem 9
****
Part 1. Not graded. Only there to help you organize your work
A: VPN: [19-10] VPO: [9-0]
   TLBT: [19-13] TLBI: [12-10]
B: PPN: [17-10] PPO: [9-0]

Part 2.
//Part A not graded. Provided to help you organize your work

Address: 078E6
A: 0000 0111 1000 1110 0110

B: VPN: 01E //5 pts
    TLBI: 6
    TLBT: 03
    TLB hit? N
    page fault? N
    PPN: 57

C: 01 0101 1100 1110 0110 //1 pt

Address: 04AA4
A: 0000 0100 1010 1010 0100

B: VPN: 012 //5 pts
    TLBI: 2
    TLBT: 02
    TLB hit? Y
    page fault? N
    PPN: 68

C: 01 1010 0010 1010 0100 //1 pt

```
**********
Problem 10
**********
A. No, each thread has its own heap variable for myid.
B. Yes, both threads can point to myid.
C. No, myid is passed in on the stack.
D. Yes, the mutex doesn't protect myid.
E. No, the mutex protects the assignment of myid.
```