CS/COE 0447 Fall 2009
Lab 7: Bit Manipulation
Due Date: October 29, 2009

To get started on this lab, attend recitation on 10/23. Each of you should submit your own solution, according to these instructions: http://www.cs.pitt.edu/~sab104/teaching/cs447/submission.html. You may collaborate with your partner, but each person must turn in their own copy of the lab, with the name of their partner. The lab is due on 10/29 at 11:59pm.

In this lab, we will write 4 functions that manipulate individual bits in a register. To test your code, use the code available at http://www.cs.pitt.edu/~sab104/teaching/cs447/labs/testCodeLab7.asm.

1) Set bits in a range

Write a function that sets the bits (makes them 1) of a number in a range.

Function definition: int setbits(int src, int start, int end)

Parameters:
src: the number that will be modified
start: start position (including) of range
end: end position (including) of range

Return value:
The number with the specified bits set

Registers contain 32 bits. Bit positions are from 0 to 31. So, if you are asked to set bits from index 3 to index 10, you have to make those 8 bits 1.

Example:

src: 0000 0000 0000 0000 1011 0**011 0011 0**110b
start: 3
end: 10

Return value: 0000 0000 0000 0000 1011 0**111 1111 1**110

2) Clear bits in a range

Write a function that clears the bits (makes them 0) of a number in a range.

Function definition: int clearbits(int src, int start, int end)

Parameters:
src: the number that will be modified
start: start position (including) of range
end: end position (including) of range

Return value:
The number with the specified bits cleared

If you are asked to clear bits from index 3 to index 10, you have to make those 8 bits 0.

Example:

src: 0000 0000 0000 0000 1011 0**011 0011 0**110b
start: 3
end: 10

Return value: 0000 0000 0000 0000 1011 0**000 0000 0**110

3) Copy bits in a range

Write a function that copies the bits of a number in a range into another number (the return value).

Function definition: int copybits(int src, int start, int end)

Parameters:
src: the source from where to copy the bits
start: start position (including) of range
end: end position (including) of range

Return value:
The number with the specified bits copied

If you are asked to copy bits from index 3 to index 10, you extract those 8 bits from *src* and put them at the beginning of the return value.

Example:

src: 0000 0000 0000 0000 1011 0**011 0011 0**110b
start: 3
end: 10

Return value: 0000 0000 0000 0000 0000 0000 **0110 0110**

4) Insert bits in a range

Write a function that copies the bits of a number in a range into another number without modifying the other values of the destination.

Function definition: int insertbits(int src, int dest, int start, int end)

Parameters:
src: the source from where to copy the bits
dest: the destination where the bits will be copied
start: start position (including) of range
end: end position (including) of range

Return value:
The dest with the specified bits copied, all other bits unchanged

If you are asked to insert bits into *dest* from index 3 to index 10 (8 bits), you extract the first 8 bits of *src* and put them in *dest* from index 3 to index 10 without modifying the other bits of *dest*.

Example:

src: 1010 1010 1010 1010 1010 1010 **1010 1010**b
dest: 0000 0000 1001 0010 0101 0**011 0001 0**011b
start: 3
end: 10

Return value: 0000 0000 1001 0010 0101 0**101 0101 0**011b