CS2323: HW-1

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1.

(a) addi $x_8, x_5, -5$

This instruction adds -5 to value in register x_5 and stores the result in x_8.

(b) slli $x_5, x_3, 3$

This instruction left shifts the value in register x_3 by 3 positions (which is equivalent to multiplying by 2^3) and stores result in x_5.

(c) add x_{19}, x_{19}, x_{10}

This adds the value in x_{10} to value in x_{19} and stores in x_{19}.

(d) addi $x_{15}, x_{15}, 1$

This adds 1 to value in x_{15} and stores in x_{15}

(e) srli $x_9, x_{15}, 2$

This right shifts by 2 positions in x_{15} value (which is equivalent to dividing by 2^2) and stores in x_9.

(f) addi $x_{12}, x_{10}, 24$

This adds 24 to value in x_{10} (which is zero) and stores in x_{12}.

2.

(a)
```
ld   x13, 8x20(x5)
addi x13, x13, 100
sd   x13, 12x8(x5)
```

(b)
```
ld   x21, 8x20(x5)
addi x21, x21, 1
sd   x21, 8x20(x5)
```

(c) ld x6, 40(x5)

ld x13, 96(x5)

sd x6, 96(x5)

sd x13, 40(x5)

(d) ld x6, 32(x5)

andi x6, x6, 0x00000000FFFFFFFF

sd x6, 32(x5)

(e) ld x6, 16(x5)

srli x7, x6, 32

srai x6, x6, 32

or x6, x6, x7

sd x6, 16(x5)

3. (a) Binary representation of 23 is 00010111.
Since, it is a positive number, the 2's complement is the same as above. i.e 00010111.

(b) Binary representation of 1 is 00000001.
Since, it is a negative number we have to invert the bits and add 1.
By inverting we get 11111110.
By adding 1 we get 11111111.

(c) Binary representation of 255 is 11111111.
Since, its a positive, the 2's complement representation is the same as above by adding trailing 0's to the left as it is a positive number by which we get 011111111 which 9 bits. (whose significant bit should be 0)
Hence, not possible with 8 bits

(d) Binary representation of 128 is 10000000
Since, it is a negative number we have to invert the bits and add 1.
By inverting we get 01111111
By adding 1 we get 10000000

4(a) 11010100

Most significant ~~nu~~ bit is 1, so its negative. To find 2's complement, invert the ~~to~~ bits and add 1.

Inverting : 00101011

Add 1 : 00101100

Decimal conversion $= -(2^5+2^3+2^2) = \underline{-44}$

(b) 00101011:

Most significant bit is 0, so it's positive. So, we can directly convert which is $2^5+2^3+2^1+1 = \underline{+43}$

(c) 11111110:

Most significant bit is 1; so it's negative. To find 2's complement, invert the bits and add 1.

inversion: 00000001

add 1 : 00000010

Decimal conversion - $-(2^1) = \underline{-2}$