Homework 2

> February 10^{th}, 2016
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1.

> Translate the following 32 bit binary number to decimal (show how you would do that and yes you can use a calculator)
>
> > 0000 0000 0000 0000 0000 0000 1010 1010
>
> Negate the number and write it in twos compliment

Answer: 170

$$2^1 + 2^3 + 2^5 + 2^7 = 170$$

$$1111\ 1111\ 1111\ 1111\ 1111\ 1111\ 0101\ 0101_{\text{binary}}$$

2.9

> Translate the following C code to MIPS Assume that the variables f, g, h, i, and j are assigned to registers $s0, $s1, $s2, $S3, and $s4, respectively. Assume that the base address of the arrays A and B are in registers $s6 and $s7, respectively. Assume that the elements of the arrays are 4 byte words:
>
> ```
> B[8] = A[i] + A[j];
> ```

Answer:

```
sll $t0, $s3, 2
sll $t1, $s4, 2
add $t0, $t0, $s6
add $t1, $t1, $s6
lw $t0, 0($t0)
lw $t1, 0($t1)
add $t0, $t1, $t0
addi $t1, $s7, 32
sw $t0, 0($t1)
```

2.12

> Assume that registers $s0 and $s1 hold values 0x80000000 and 0xD0000000, respectively

2.12.1

> What is the value of $t0 for the following assembly code?
>
> ```
> add $t0, $s0, $s1
> ```

Answer: 5637144576

$$0x80000000 + 0xD0000000 = 0x150000000$$

$$0001\ 0101\ 0000\ 0000\ 0000\ 0000\ 0000\ 0000\ 0000_{\text{binary}}$$

2.12.2

Is the result in $t0 the desired result, or has there been an overflow?

Answer: No, there has been an overflow

2.12.3

> For the contents of registers $s0 and $s1 as specified above, what is the value of $t0 for the following assembly code?
>
> ```
> sub $t0, $s0, $s1
> ```

Answer: -1342177280

$$0x80000000 - 0xD0000000 = -50000000$$

$$1101\ 0000\ 0000\ 0000\ 0000\ 0000\ 0000\ 0000_{\text{binary}}$$

2.12.4

> Is the result in $t0 the desired result, or has there been an overflow?

Answer: There is no overflow

2.12.5

> For the contents of registers $s0 and $s1 as specified above, what is the value of $t0 for the following assembly code?
>
> ```
> add $t0, $s0, $s1
> add $t0, $t0, $ts0
> ```

Answer: 14987979559889010688

$$(80000000 \cdot 2) + D0000000 = d000000000000000$$

$$0001\ 1101\ 0000\ 0000\ 0000\ 0000\ 0000\ 0000\ 0000_{\text{binary}}$$

2.12.6

> is the result in $t0 the desired result, or has there been an overflow?

Answer: There has been an overflow

2.19

> Assume the following register contents
>
> $t0 = 0xAAAAAAAA, $t1 = 0x12345678

2.19.1

> For the registers values shown above, what is the value of $t2 for the following sequence of instructions?

```
sll $t2, $t0, 44
or $t2, $t2, $t1
```

Answer 0xBABEFEF8

2.19.2

> For the register values shown above, what is the value of $t2 for the following sequence of instructions
>
> ```
> sll $t2, $t0, 3
> andi $t2, $t2, -1
> ```

Answer: -0x45412988

2.19.3

> For the following register values shown above, what is the value of $t2 for the following sequence of instructions?
>
> ```
> srl $t2, $t0, 3
> andi $t2, $t2, 0xFFFEF
> ```

Answer: 0x5545

2.23

> Assume $t0 hold the value 0x00101000 what is the value of $t2 after the following instructions?
>
> ```
>     slt $t2,  $0,  $t0
>     bne $t2,  $0,  ELSE
>     j DONE
> ELSE:   addi     $t2,   $t2,  2
> DONE:
> ```

Answer: 1