4.1 Translate the following assembly language instructions to their corresponding machine language codes as they would be represented in hexadecimal.

loop: addu $a0, $0, $t0

4, 0, 8

000000 00000 01000 00100 00000 100001

0000 0000 0000 1000 0010 0000 0010 0001

0x00082021

ori $v0, $0, 4

2, 0, 4

001101 00000 00010 0000000000000100

0011 0100 0000 0010 0000 0000 0000 0100

0x34020004

syscall

0x0000000c

addi $t0, $t0, -1

8, 8, -1

0010 0001 0000 1000 ffff

0x2108ffff

---

bnez $t0, loop

[bne Rs, $0, Label]

000101 01000 00000 16

0x

andi $s0, $s7, 0xffc0

16, 23, 0xffc0

001100 10111 10000 ffc0

0011 0010 1111 0000 ffc0

0x32f0ffc0

or $a0, $t7, $s0

4, 15, 16

000000 01111 10000 00100 00000 100101

0000 0001 1111 0000 0010 0000 0010 0101

0x01f02025

sb $a0, 4($s6)

4, 4(22) = 4, 22, 4

001101 00100 10110 0000000000000100

0011 0100 1001 0110 0000 0000 0000 0100

0x34960004

srl $s7, $s7, 4

23, 23, 4

000000 00000 10111 10111 00100 000010

0000 0000 0001 0111 1011 1001 0000 0010

0x0017b902

Altogether the code would be:

0x00082021
0x34020004
0x0000000c
0x2108ffff
0x
0x32f0ffc0
0x01f02025
0x34960004
0x0017b902

4.3 Use the following program to estimate the instruction execution rate for PCSpim running on your computer (you may have to adjust the "time factor"):

```
#################################################################

#Reports elapsed time every 5 seconds over a period of one minute.

#################################################################

                .data                                   #Data declaration section
msg:            .asciiz   *\n Elapsed Time = *
                .text
main:                                                   #Start of code section
                li              $s1, 0
countdown:
                li              $s0, 2500000            #adjustable time factor
waitloop:
                addi            $s0, $s0, -1
                bnez            $s0, waitloop
                addi            $s1, $s1, 5
                li              $v0, 4                  # Print message
```

```
        la      $a0, msg
        syscall
        move    $a0, $s1
        li      $v0, 1
        syscall                         #Print Amount
        addi    $t1, $s1, -60
        bnez    $t0, countdown
        li      $v0, 10
syscall
```