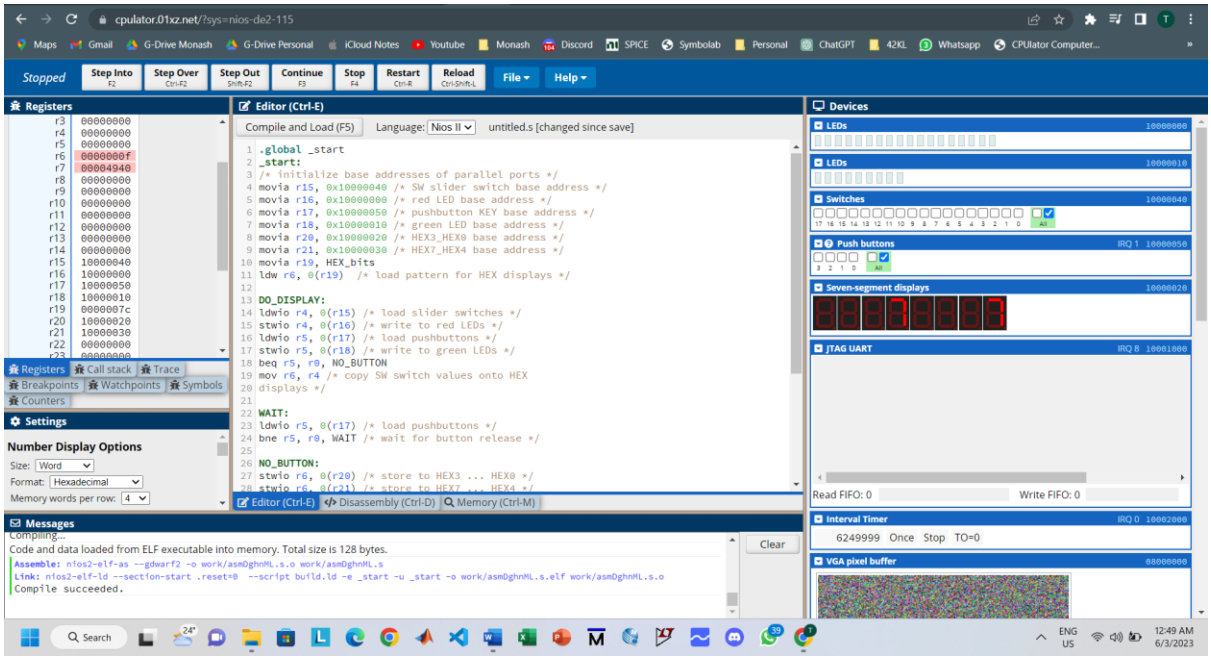
Name: Tan Jin Chun
Student ID: 32194471
Date: 5/3/2023

Second Exercise

First Screenshot (Part I)



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Third Exercise

Do_display: 0x0000003c => 79000037 (ldwio r4, 0(r15))

We have modified the machine code for br 0x90

PC_{new} = $PC_{present}$ + 4 + IMM16

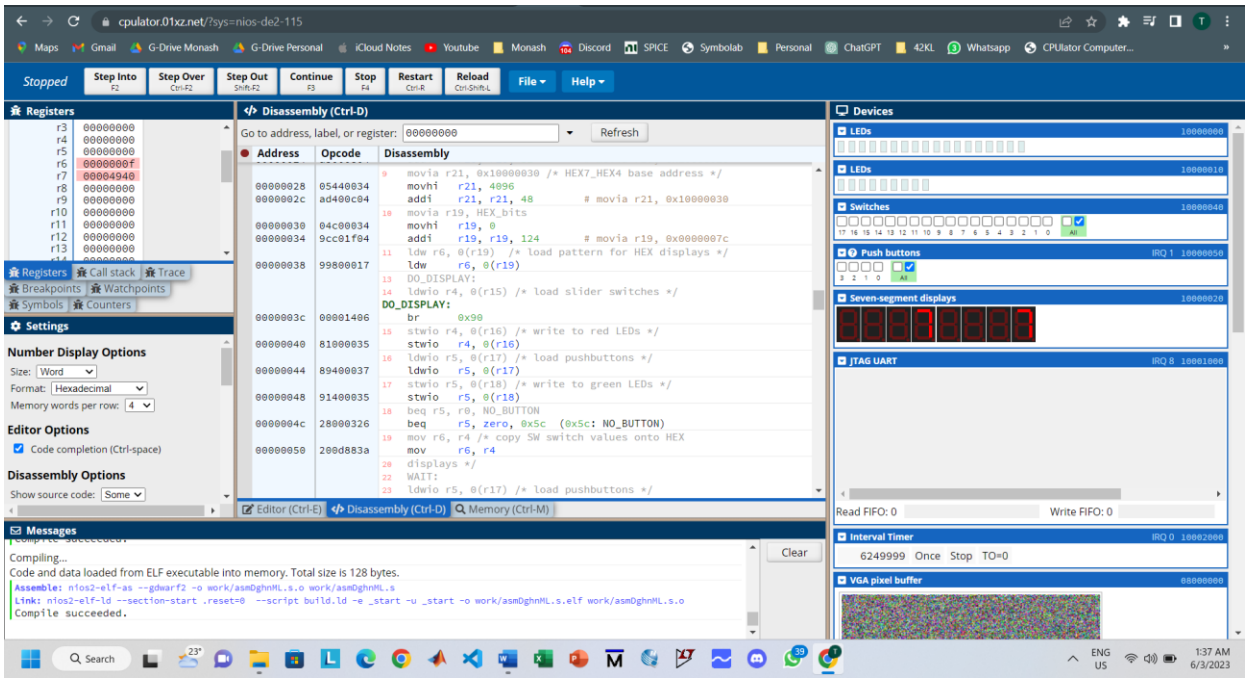
0x90 = 0x3C + 4 + IMM16

IMM16 = 0x3C + 4 + IMM16 = (54 - 4) = 50 = 0x50

= 0000000001010000

00000|00000|0000000001010000|000110

Second Screenshot



The Nios II assembler instruction

1) Inverting Bits 3 to 0
xori r4, r4, 0x0000000F
2) Set (turn on) bits 11 to 8
ori r4, r4, 0x00000F00
3) Reset (turn off bits 31 to 12 in register r4)
andi r4, r4, 0x00000FFF
4) Jump immediate to address 0x00000040
jmpi 0x00000040

In binary and hexadecimal form, it will be
1) 00100 | 00100 | 0000 0000 0000 1111 | 011100 -> 0x210003DC
2) 00100 | 00100 | 0000 1111 0000 0000 | 010100 -> 0x2103C014
3) 00100 | 00100 | 0000 1111 1111 1111 | 001100 -> 0x2103FFCC
4) 0000 0000 0000 0000 0000 0100 0000 | 000001 -> 0x00000401

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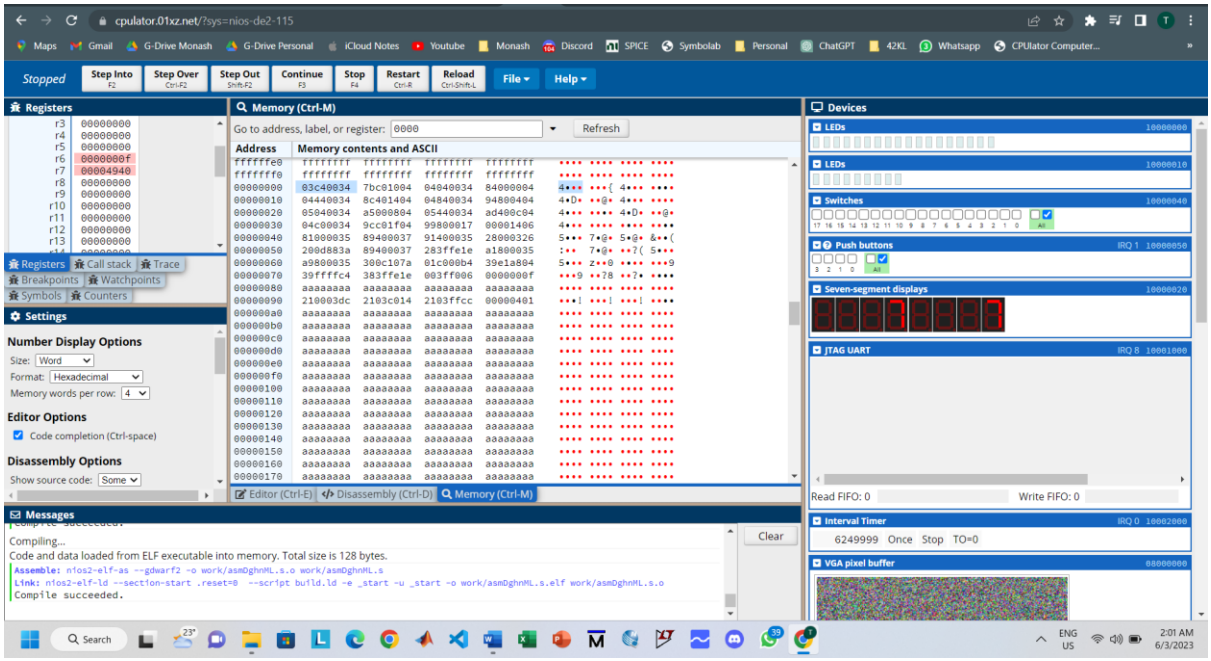
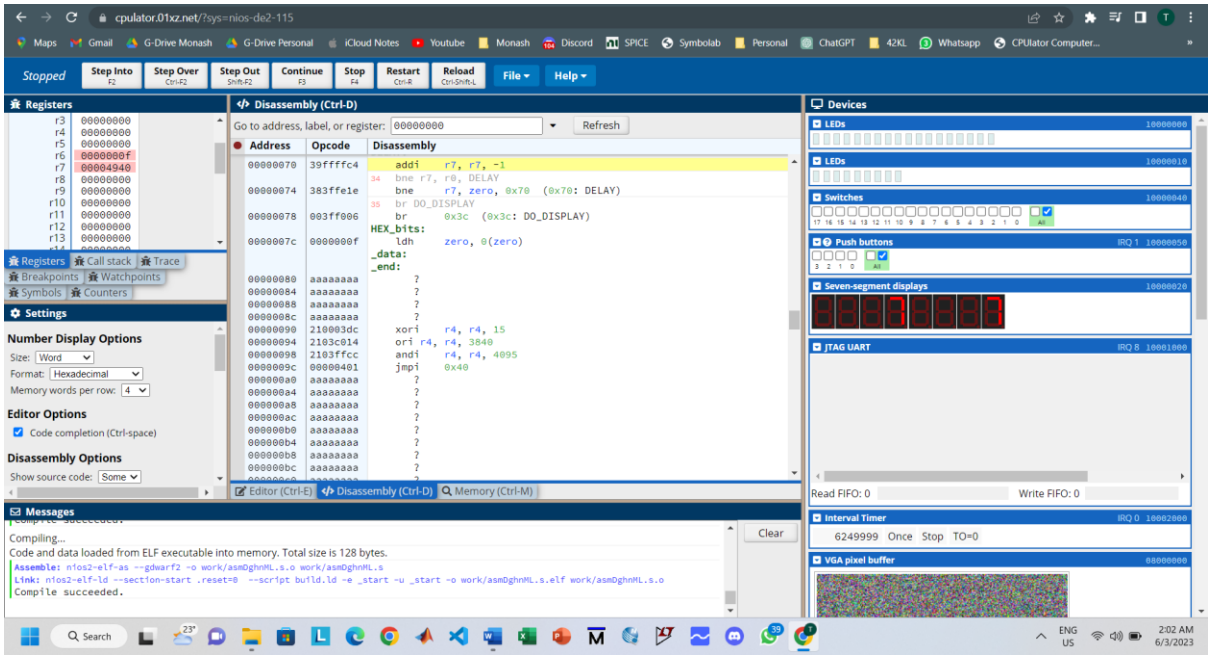
Third Screenshot



Fourth Screenshot



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Given Code

Code for above

```
.global _start
_start:
/* initialize base addresses of parallel ports */
movia r15, 0x10000040 /* SW slider switch base address */
movia r16, 0x10000000 /* red LED base address */
movia r17, 0x10000050 /* pushbutton KEY base address */
movia r18, 0x10000010 /* green LED base address */
movia r20, 0x10000020 /* HEX3_HEX0 base address */
movia r21, 0x10000030 /* HEX7_HEX4 base address */
movia r19, HEX_bits
ldw r6, 0(r19)    /* load pattern for HEX displays */

DO_DISPLAY:
ldwio r4, 0(r15) /* load slider switches */
stwio r4, 0(r16) /* write to red LEDs */
ldwio r5, 0(r17) /* load pushbuttons */
stwio r5, 0(r18) /* write to green LEDs */
beq r5, r0, NO_BUTTON
mov r6, r4 /* copy SW switch values onto HEX
displays */

WAIT:
ldwio r5, 0(r17) /* load pushbuttons */
bne r5, r0, WAIT /* wait for button release */

NO_BUTTON:
stwio r6, 0(r20) /* store to HEX3 ... HEX0 */
stwio r6, 0(r21) /* store to HEX7 ... HEX4 */
roli r6, r6, 1 /* rotate the displayed pattern */
```

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```
movia r7, 100000 /* delay counter */


DELAY:
subi r7, r7, 1
bne r7, r0, DELAY
br DO_DISPLAY

/*******************************************************************************
.data /* data follows */


HEX_bits:
.word 0x0000000F
```