21BDS0340

Abhinav Dinesh Srivatsa

Microprocessors and Microcontrollers Lab

Lab Task – II

Question 1

Aim:

Write a program to transfer a string of data from code space starting at address 200H to RAM locations starting at 50H. The data is as shown below: 0200H: DB "Your Name and Register Number" e.g., Gordon Moore (12ABC3456)

Tools Required:

8051 microcontroller

Keil microcontroller software

Program:

Memory Locations	Label	Mnemonics	Comments
		ORG 0200H	
		DB "Abhinav Dinesh Srivatsa (21BDS0340)"	Creating data at 200H
		ORG 0000H	
0000H		MOV DPTR, #200H	Moving to data start location
0003H		MOV R0, #50H	Moving to transfer start location
0005H		MOV R1, #23H	Need to loop 23H times, for 35 characters in string
0007H		CLR A	Clearing accumulator
0008H	LOOP:	MOVC A, @A+DPTR	Moving data to accumulator
0009H		MOV @R0, A	Moving accumulators data to R0's address
000AH		INC DPTR	Increment DPTR for next space
000BH		INC R0	Increment R0 for next space
000CH		CLR A	Clearing accumulator
000D		DJNZ R1, LOOP	Decrement R0 and jump to LOOP if not zero
		END	

Manual Calculations:

There are no manual calculations necessary to verify data transfer

Output Before/After:

Before:

```
0x50: ................................................................................
```

After:

```
0x50: Abhinav Dinesh Srivatsa (21BDS0340)..............#.............................
```

Result:

This program moves data from the ROM locations starting from 200H to the RAM locations starting from 50H

Question 2

Aim:

Write a program to add 10 bytes of data and store the result in registers R2 and R3. The bytes are stored in the ROM space starting at 200H

Tools Required:

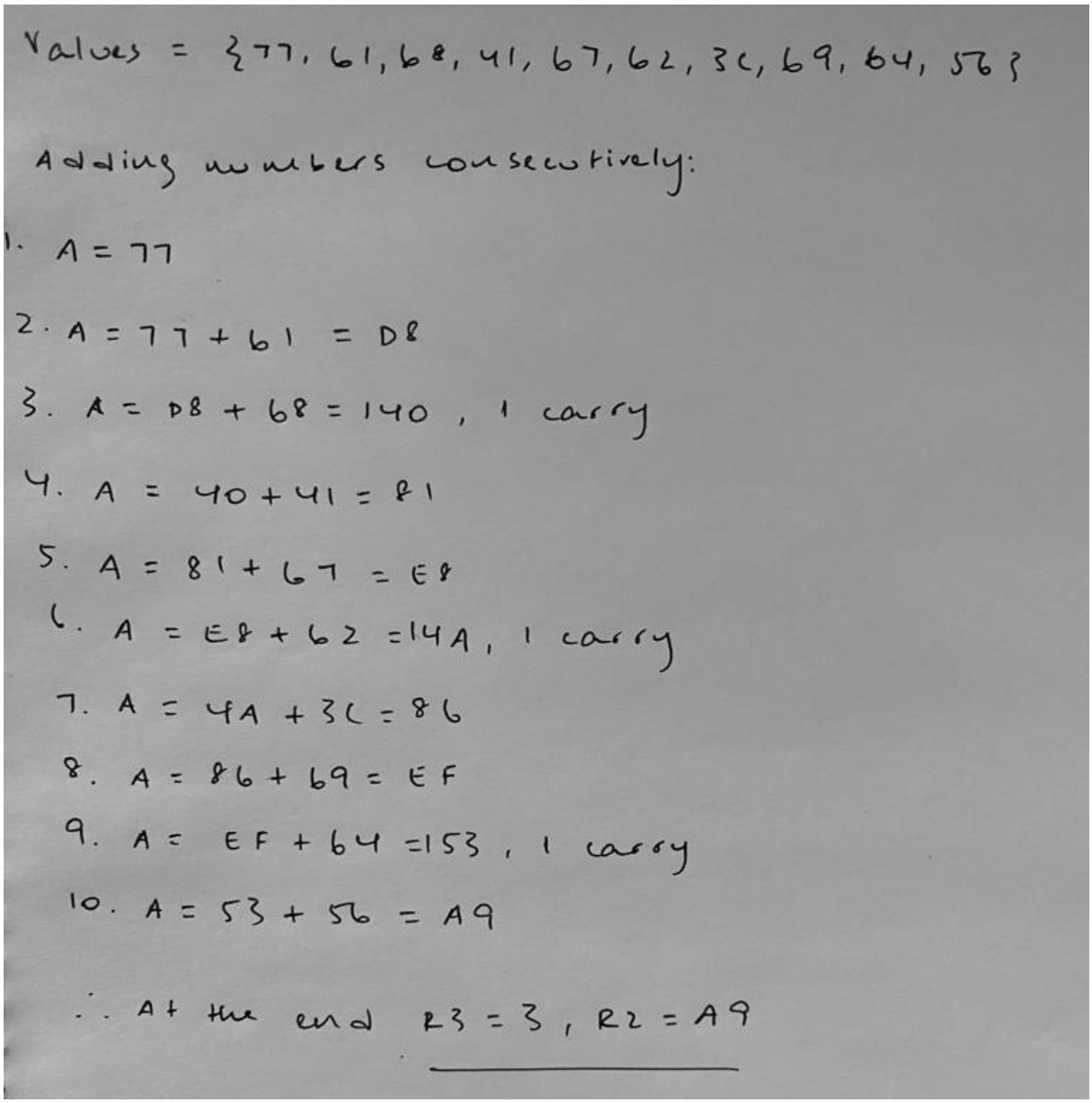
8051 microcontroller

Keil microcontroller software

Program:

Memory Locations	Label	Mnemonics	Comments
		ORG 0200H	
		DB "wahAgb<idV"	Creating data at 200H
		ORG 0000H	
0000H		MOV DPTR, #200H	Moving to data start location
0003H		MOV R0, #10	Need to loop 10 times for each number
0005H		CLR A	Clearing accumulator
0006H	LOOP:	MOVC A, @A+DPTR	Moving data to accumulator
0007H		ADD A, R2	Adding R2 to A
0008H		JNC NADA	Jump to NADA if no carry
000AH		INC R3	Increment R3 if carry
000BH	NADA:	MOV R2, A	Move data from A to R2
000CH		INC DPTR	Increment DPTR for next data
000DH		CLR A	Clear accumulator
000EH		DJNZ R0, LOOP	Decrement R0 and jump to LOOP if not zero
		END	

Manual Calculations:



Values = {77, 61, 68, 41, 67, 62, 3C, 69, 64, 56}

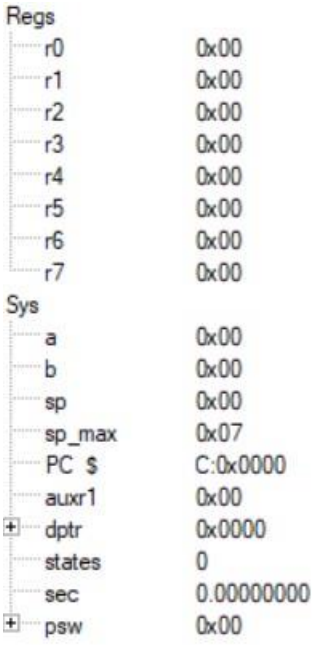
Adding numbers consecutively:

1. A = 77
2. A = 77 + 61 = D8
3. A = D8 + 68 = 140, 1 carry
4. A = 40 + 41 = 81
5. A = 81 + 67 = E8
6. A = E8 + 62 = 14A, 1 carry
7. A = 4A + 3C = 86
8. A = 86 + 69 = EF
9. A = EF + 64 = 153, 1 carry
10. A = 53 + 56 = A9

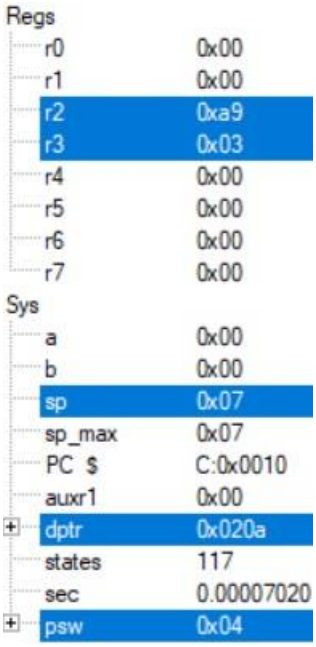
∴ At the end R3 = 3, R2 = A9

Output Before/After:

Before:



After:



Result:

This program allows for the addition of ten numbers stored starting from the location 200H and keeps the carry in R3 and sum in R2

Question 3:

Aim:

Write a program to get a byte of hex data from P1, convert it to unpacked BCD, and then to ASCII. For example, if P1 has 72H, after conversion (packed to unpacked BCD) we will have 37H and 32H. Place the ASCII result in RAM locations starting at 40H

Tools Required:

8051 microcontroller

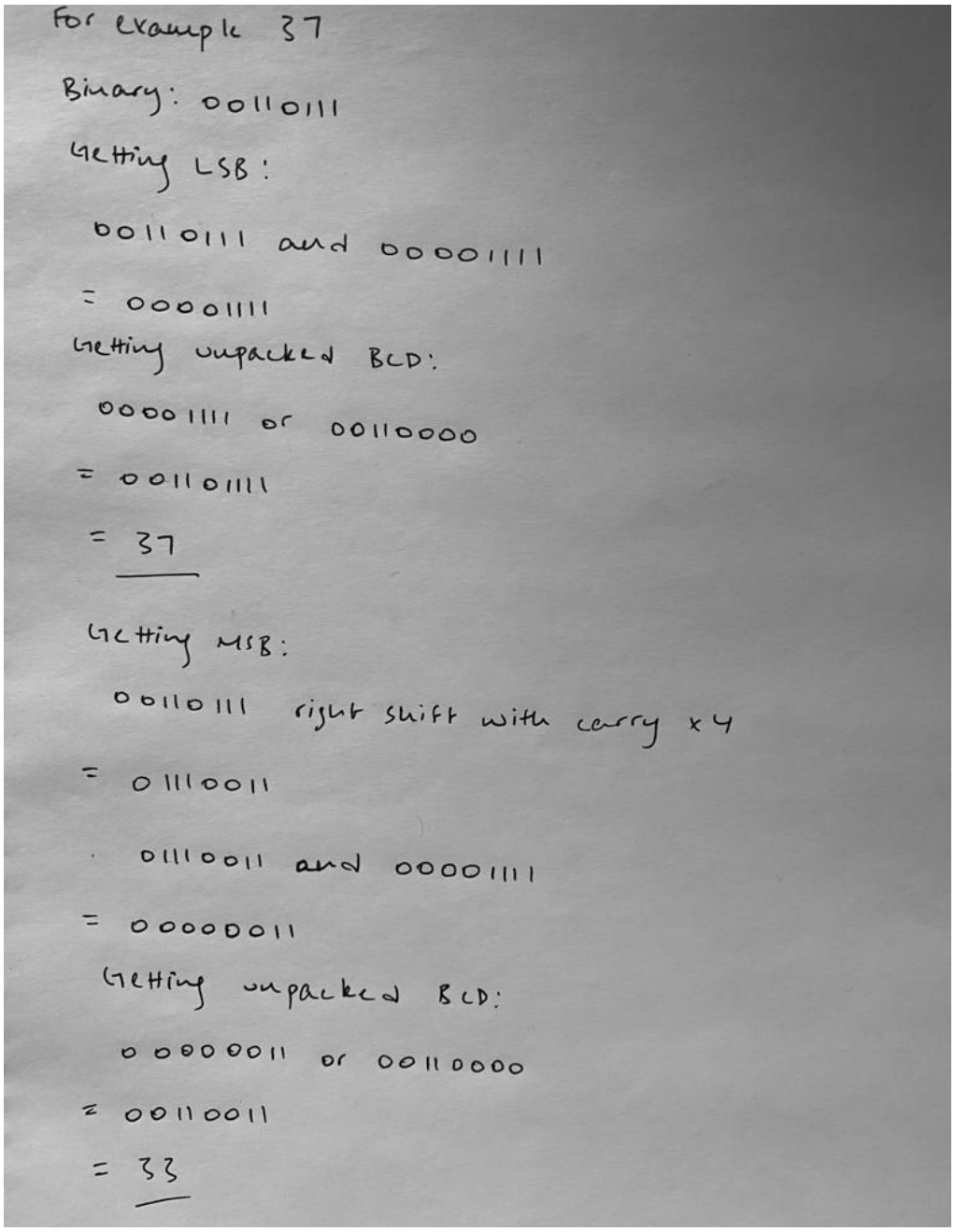
Keil microcontroller software

Program:

Memory Locations	Label	Mnemonics	Comments
		ORG 0000H	
0000H		MOV A, P1	Moving data from input P1 to accumulator
0002H		MOV R1, A	Moving A to R1 to keep copy
0003H		ANL A, #0FH	Getting LSB of accumulator
0005H		ORL A, #30H	Unpacking BCD
0007H		MOV R0, A	Moving unpacked BCD of the LSB to R0
0008H		MOV A, R1	Reinitialising the value of accumulator
0009H		RRC A	Right rotating with carry x4 to shift LSB and MSB

000AH		RRC A	
000BH		RRC A	
000CH		RRC A	
000DH		ANL A, #0FH	Getting LSB of accumulator
000FH		ORL A, #30H	Unpacking BCD
0011H		MOV R1, A	Moving unpacked BCD of the LSB to R1
0012H		MOV 40H, R0	Moving the unpacked LSB to 40H
0014H		MOV 41H, R1	Moving the unpacked MSB to 41H
		END	

Manual Calculations:



Output Before/After:

Before:

```
0x40: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
```

After:

```
0x40: 39 37 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
```

After (ASCII):

```
0x40: 97..............................................................................y...
```

Result:

This program reads input from P1 and converts the packed BCD to unpacked BDC and stores in locations 40H and 41H

Question 4

Aim:

Write and assemble a program for the DS89C4x0 (90ns for one MC) chip to toggle all the bits of P0 and P1 continuously by sending 55H and AAH to these ports for every 1/4 of a second

Tools Required:

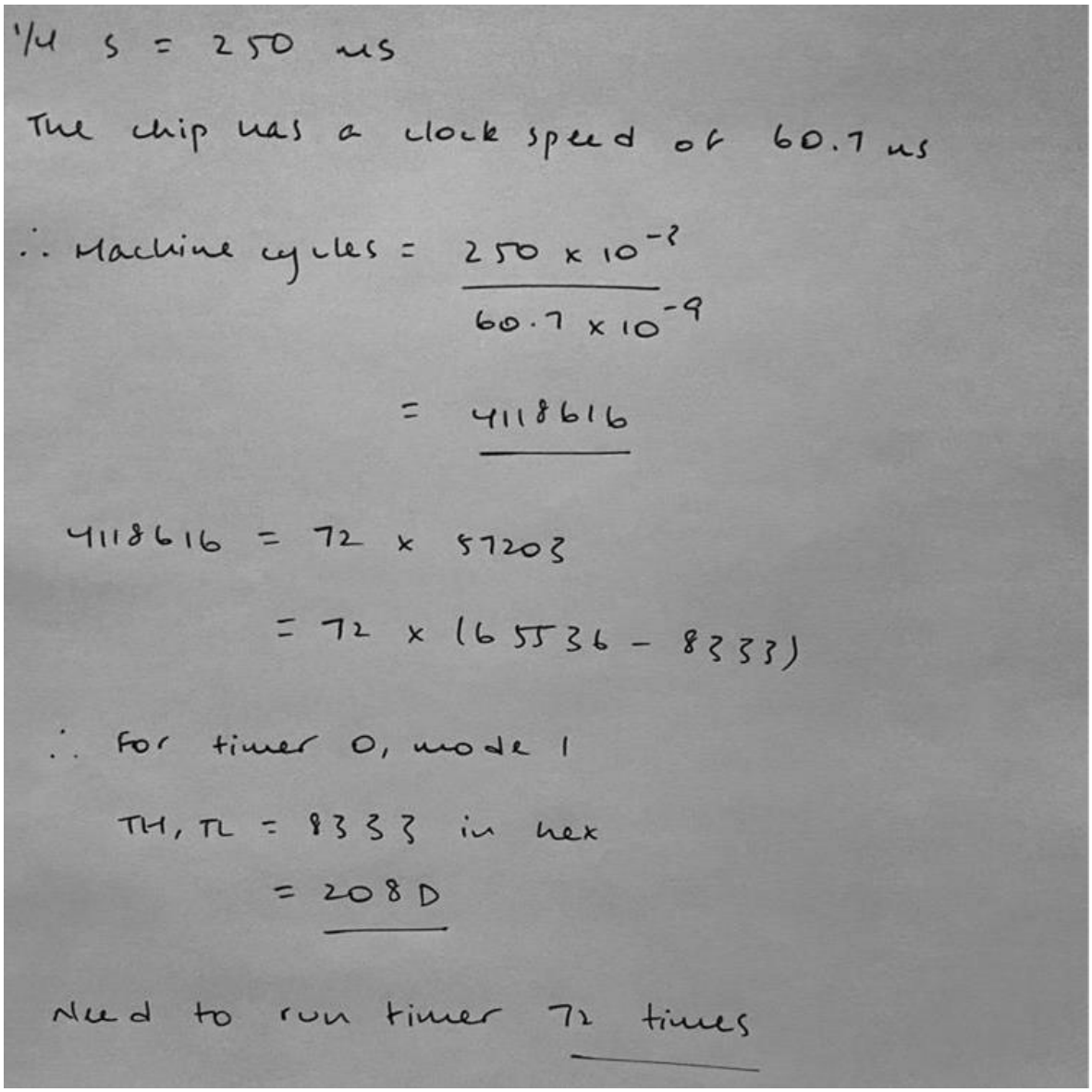
DS89C450 8051 microcontroller

Keil microcontroller software

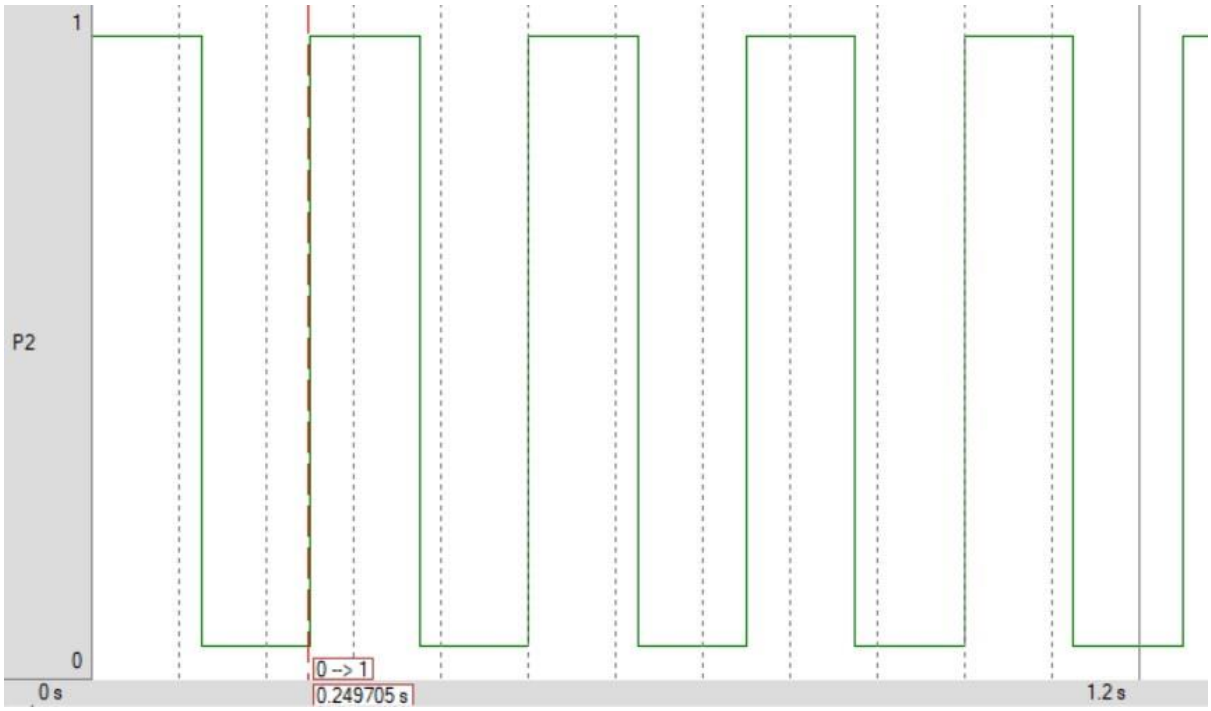
Program:

Memory Locations	Label	Mnemonics	Comments
		ORG 0000H	
0000		MOV TMOD, #01H	Setting TMOD for timer 0, mode 1
0003		SETB P2.3	Set signal on P2.3 bit
0005	QSEC:	MOV R0, #48H	Moving 72 to R0 to cycle 72 times
0007	LOOP:	MOV TL0, #8DH	Moving value 208DH, 8333 to initialise the timer
000A		MOV TH0, #20H	
000D		SETB TR0	Starting timer 0
000F	AGAIN:	JNB TF0, AGAIN	Remain here until flag 0 becomes 1
0012		CLR TR0	Clear timer 0 start
0014		CLR TF0	Clear flag 0
0016		DJNZ R0, LOOP	Decrement R0 and jump to LOOP if not zero
0018		CPL P2.3	Compliment P2.3, changes signal value
001A		SJMP QSEC	Jump to QSEC to restart timer
		END	

Manual Calculations:



Output:



Result:

This program creates a 50% duty cycle square wave that has a frequency of 0.25 milliseconds approximately

Question 5

Aim:
Write and assemble a program to perform half adder and half subtractor using Keil simulator. Use acc.0 and acc.1 as input, acc.2 as sum output and acc.3 as carry output

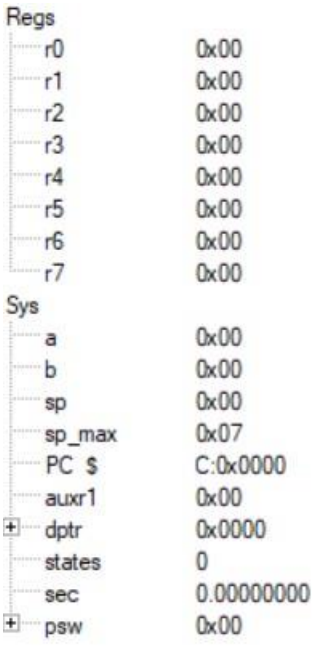
Program:

Memory Locations	Label	Mnemonics	Comments
		ORG 0000H	
0000		MOV A, #11B	Moving bits to create half adder
0002		MOV C, ACC.0	Steps to find sum
0004		CPL ACC.1	
0006		ANL C, ACC.1	
0008		CPL ACC.1	
000A		MOV ACC.2, C	
000C		MOV C, ACC.1	
000E		CPL ACC.0	
0010		ANL C, ACC.0	
0012		CPL ACC.0	
0014		ORL C, ACC.2	
0016		MOV ACC.2, C	Moving sum to accumulator's bit 2
0018		MOV C, ACC.0	Steps to find carry

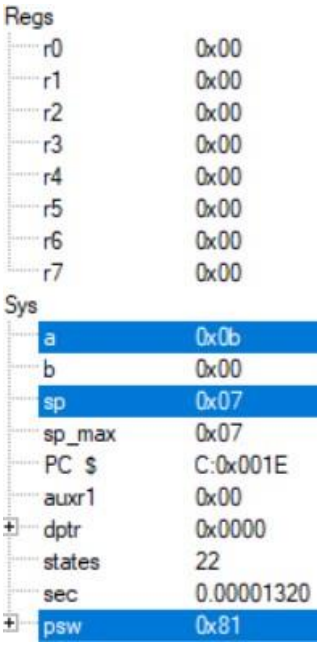
001A		ANL C, ACC.1	
001C		MOV ACC.3, C	Moving carry to accumulator's bit 3
		END	

Output Before/After:

Before:



After:



Result:

This program allows to use the first two bits of the accumulator and perform the operations of a half adder and assign to the second two bits of the accumulator