

## Add Instructions and Logic

### Lab Goal

Understand the effect of addition instructions on the status bits and results.

### Instructions/Questions:

1 Open the Add.doc file to see the add project code.

2 Indicate what the values of the registers **will be** when the code is run:

|                            |         | Destination (dst) |        |        |        | Source (src) |        |        |        | N | Z | C |
|----------------------------|---------|-------------------|--------|--------|--------|--------------|--------|--------|--------|---|---|---|
|                            |         | R5                | R4     | R7     | R6     | R9           | R8     | R11    | R10    |   |   |   |
| After line 30 has executed |         | 0x1000            | 0xFFFC | 0x1000 | 0xFFFC | 0x0000       | 0x0001 | 0x0000 | 0x0001 |   |   |   |
| Loop 1                     | line 35 |                   | 0xFFFD |        |        |              | 0x0001 |        |        | 1 | 0 | 0 |
|                            | line 36 | 0x1000            |        |        |        | 0x0000       |        |        |        | 0 | 0 | 0 |
|                            | line 39 |                   |        |        | 0xFFFF |              |        |        | 0x0001 | 1 | 0 | 0 |
|                            | line 40 |                   |        | 0x1000 |        |              |        | 0x0000 |        | 0 | 0 | 0 |
| Loop 2                     | line 35 |                   | 0xFFFE |        |        |              | 0x0001 |        |        | 1 | 0 | 0 |
|                            | line 36 | 0x1000            |        |        |        | 0x0000       |        |        |        | 0 | 0 | 0 |
|                            | line 39 |                   |        |        | 0xFFFE |              |        |        | 0x0001 | 1 | 0 | 0 |
|                            | line 40 |                   |        | 0x1000 |        |              |        | 0x0000 |        | 0 | 0 | 0 |
| Loop 3                     | line 35 |                   | 0xFFFF |        |        |              | 0x0001 |        |        | 1 | 0 | 0 |
|                            | line 36 | 0x1000            |        |        |        | 0x0000       |        |        |        | 0 | 0 | 0 |
|                            | line 39 |                   |        |        | 0xFFFF |              |        |        | 0x0001 | 1 | 0 | 1 |
|                            | line 40 |                   |        | 0x1000 |        |              |        | 0x0000 |        | 0 | 0 | 0 |
| Loop 4                     | line 35 |                   | 0x0000 |        |        |              | 0x0001 |        |        | 0 | 1 | 1 |
|                            | line 36 | 0x1000            |        |        |        | 0x0000       |        |        |        | 0 | 0 | 0 |
|                            | line 39 |                   |        |        | 0x0000 |              |        |        | 0x0001 | 0 | 1 | 1 |
|                            | line 40 |                   |        | 0x1000 |        |              |        | 0x0000 |        | 0 | 0 | 0 |
| Loop 5                     | line 35 |                   | 0x0001 |        |        |              | 0x0001 |        |        | 0 | 0 | 0 |
|                            | line 36 | 0x1000            |        |        |        | 0x0000       |        |        |        | 0 | 0 | 0 |
|                            | line 39 |                   |        |        | 0x0001 |              |        |        | 0x0001 | 0 | 0 | 0 |

|  |         |  |  |        |  |  |  |        |  |   |   |   |
|--|---------|--|--|--------|--|--|--|--------|--|---|---|---|
|  | line 40 |  |  | 0x1000 |  |  |  | 0X0000 |  | 0 | 0 | 0 |
|--|---------|--|--|--------|--|--|--|--------|--|---|---|---|

### Table convert Hexadecimal (base 16) to Binary (base 2)

|      |      |      |      |      |      |      |      |      |      | 10   | 11   | 12   | 13   | 14   | 15   |
|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| 0    | 1    | 2    | 3    | 4    | 5    | 6    | 7    | 8    | 9    | A    | B    | C    | D    | E    | F    |
| 0000 | 0001 | 0010 | 0011 | 0100 | 0101 | 0110 | 0111 | 1000 | 1001 | 1010 | 1011 | 1100 | 1101 | 1110 | 1111 |

### Syntax for ADD instruction in Assembly language (Double Operand Instructions)

**ADD[.B] src, dst**      **src + dst => dst**

#### Rule Addition Binary Numbers Using Place Value

if sum of two digits :

= 0 , write a 0

= 1 , write a 1

= 2 , write a 0 , carry 1 ( result is 10 )

= 3 , write a 1 , carry 1 ( result is 11 )  
(if carried 1)

#### Conversion Binary to Decimal to Hexadecimal

| a 8-bit           | Eight  | Four        | Two         | One         |
|-------------------|--|-------------|-------------|-------------|
|                   | $2^3$  | $2^2$       | $2^1$       | $2^0$       |
| Binary number     | 1  | 1           | 0           | 1           |
|                   | ( 8 x 1 ) =  | ( 4 x 1 ) = | ( 2 x 0 ) = | ( 1 x 1 ) = |
| Decimal number    | 8 +  | 4 +         | 0 +         | 1           |
| Hexadecimal value | 1101 <sub>(2)</sub> = 13 <sub>(10)</sub> = D <sub>(16)</sub> |             |             |             |

= 13<sub>(10)</sub>



## Loop 1

line 35

ADD.W R8,R4

|    |    | Hex |        | Binary (base 2) |   |
|----|----|-----|--------|-----------------|---|
|    | R8 | =   | 0x0001 | =               | 0000 0000 0000 0001                         |
|    | R4 | =   | 0xFFFC | =               | 1111 1111 1111 1100                         |
| => | R4 | =   | 0xFFFF | <=>             | 1111 1111 1111 1101 = 13 decimal ≈ D (1101) |

line 36

ADD.W R9,R5

|    |    |   |        |     |                     |
|----|----|---|--------|-----|---------------------|
|    | R9 | = | 0x0000 | =   | 0000 0000 0000 0000 |
|    | R5 | = | 0x1000 | =   | 0001 0000 0000 0000 |
| => | R5 | = | 0x1000 | <=> | 0001 0000 0000 0000 |

line 39

ADD.W R10,R6

|    |     |   |        |     |   |
|----|-----|---|--------|-----|---|
|    | R10 | = | 0x0001 | =   | 0000 0000 0000 0001                         |
|    | R6  | = | 0xFFFC | =   | 1111 1111 1111 1100                         |
| => | R6  | = | 0xFFFF | <=> | 1111 1111 1111 1101 = 13 decimal ≈ D (1101) |

line 40

ADD.W R11,R7

|    |     |   |        |     |                     |
|----|-----|---|--------|-----|---------------------|
|    | R11 | = | 0x0000 | =   | 0000 0000 0000 0000 |
|    | R7  | = | 0x1000 | =   | 0001 0000 0000 0000 |
| => | R7  | = | 0x1000 | <=> | 0001 0000 0000 0000 |



## Loop 2

line 35

ADD.W R8,R4

|    | Hex             | Binary (base 2)                             |
|----|-----------------|---|
|    | R8 = 0x0001 =   | 0000 0000 0000 0001                         |
|    | R4 = 0xFFFF     | 1111 1111 1111 1101                         |
| => | R4 = 0xFFFE <=> | 1111 1111 1111 1110 = 14 decimal ≈ E (1110) |

line 36

ADD.W R9,R5

|    |                 |                     |
|----|-----------------|---------------------|
|    | R9 = 0x0000 =   | 0000 0000 0000 0000 |
|    | R5 = 0x1000     | 0001 0000 0000 0000 |
| => | R5 = 0x1000 <=> | 0001 0000 0000 0000 |

line 39

ADD.W R10,R6

|    |                 |   |
|----|-----------------|---|
|    | R10 = 0x0001 =  | 0000 0000 0000 0001                         |
|    | R6 = 0xFFFF     | 1111 1111 1111 1101                         |
| => | R6 = 0xFFFE <=> | 1111 1111 1111 1110 = 14 decimal ≈ E (1110) |

line 40

ADD.W R11,R7

|    |                 |                     |
|----|-----------------|---------------------|
|    | R11 = 0x0000 =  | 0000 0000 0000 0000 |
|    | R7 = 0x1000     | 0001 0000 0000 0000 |
| => | R7 = 0x1000 <=> | 0001 0000 0000 0000 |



### Loop 3

|         |              | Hex                |     | Binary (base 2)                             |  |
|---------|--------------|--------------------|-----|---|--|
| line 35 |              |                    |     |   |  |
|         | ADD.W R8,R4  | R8 = 0x0001        | =   | 0000 0000 0000 0001                         |  |
|         |              | <u>R4 = 0xFFFE</u> | =   | <u>1111 1111 1111 1110</u>                  |  |
| =>      |              | R4 = 0xFFFF        | <=> | 1111 1111 1111 1111 = 15 decimal ≈ F (1111) |  |
| line 36 |              |                    |     |   |  |
|         | ADD.W R9,R5  | R9 = 0x0000        | =   | 0000 0000 0000 0000                         |  |
|         |              | <u>R5 = 0x1000</u> | =   | <u>0001 0000 0000 0000</u>                  |  |
| =>      |              | R5 = 0x1000        | <=> | 0001 0000 0000 0000                         |  |
| line 39 |              |                    |     |   |  |
|         | ADD.W R10,R6 | R10 = 0x0001       | =   | 0000 0000 0000 0001                         |  |
|         |              | <u>R6 = 0xFFFE</u> | =   | <u>1111 1111 1111 1110</u>                  |  |
| =>      |              | R6 = 0xFFFF        | <=> | 1111 1111 1111 1111 = 15 decimal ≈ F (1111) |  |
| line 40 |              |                    |     |   |  |
|         | ADD.W R11,R7 | R11 = 0x0000       | =   | 0000 0000 0000 0000                         |  |

$$\Rightarrow \begin{array}{l} \text{R7} = 0x1000 \\ \text{R7} = 0x1000 \end{array} = \begin{array}{l} 0001\ 0000\ 0000\ 0000 \\ 0001\ 0000\ 0000\ 0000 \end{array}$$



## Loop 4

line 35

ADD.W R8,R4

|    | Hex                | Binary (base 2)                        |                   |
|----|--------------------|--|-------------------|
|    | R8 = 0x0001        | = 0000 0000 0000 0001                  |                   |
|    | <b>R4 = 0xFFFF</b> | <b>= 1111 1111 1111 1111</b>           |                   |
| => | <b>R4 = 0x0000</b> | <b>&lt;=&gt; 1 0000 0000 0000 0000</b> | ( C = 1 , Z = 1 ) |
|    |                    | (Carry 1 )                             |                   |

line 36

ADD.W R9,R5

|    |                    |                                      |  |
|----|--------------------|--------------------------------------|--|
|    | R9 = 0x0000        | = 0000 0000 0000 0000                |  |
|    | <b>R5 = 0x1000</b> | <b>= 0001 0000 0000 0000</b>         |  |
| => | <b>R5 = 0x1000</b> | <b>&lt;=&gt; 0001 0000 0000 0000</b> |  |

line 39

ADD.W R10,R6

|    |                    |  |                   |
|----|--------------------|--|-------------------|
|    | R10 = 0x0001       | = 0000 0000 0000 0001                  |                   |
|    | <b>R6 = 0xFFFF</b> | <b>= 1111 1111 1111 1111</b>           |                   |
| => | <b>R6 = 0x0000</b> | <b>&lt;=&gt; 1 0000 0000 0000 0000</b> | ( C = 1 , Z = 1 ) |
|    |                    | (Carry 1 )                             |                   |

line 40

```
ADD.W    R11,R7
```

|    |           |   |               |     |                            |
|----|-----------|---|---------------|-----|----------------------------|
|    | R11       | = | 0x0000        | =   | 0000 0000 0000 0000        |
|    | <b>R7</b> | = | <b>0x1000</b> | =   | <b>0001 0000 0000 0000</b> |
| => | <b>R7</b> | = | <b>0x1000</b> | <=> | 0001 0000 0000 0000        |



Loop 5

Hex Binary (base 2)

line 35

```
ADD.W    R8,R4
```

|    |           |   |               |     |                            |
|----|-----------|---|---------------|-----|----------------------------|
|    | R8        | = | 0x0001        | =   | 0000 0000 0000 0001        |
|    | <b>R4</b> | = | <b>0x0000</b> | =   | <b>0000 0000 0000 0000</b> |
| => | <b>R4</b> | = | <b>0x0001</b> | <=> | <b>0000 0000 0000 0001</b> |

line 36

```
ADD.W    R9,R5
```

|    |           |   |               |     |                            |
|----|-----------|---|---------------|-----|----------------------------|
|    | R9        | = | 0x0000        | =   | 0000 0000 0000 0000        |
|    | <b>R5</b> | = | <b>0x1000</b> | =   | <b>0001 0000 0000 0000</b> |
| => | <b>R5</b> | = | <b>0x1000</b> | <=> | <b>0001 0000 0000 0000</b> |

line 39

```
ADD.W    R10,R6
```

|    |           |   |               |     |                            |
|----|-----------|---|---------------|-----|----------------------------|
|    | R10       | = | 0x0001        | =   | 0000 0000 0000 0001        |
|    | <b>R6</b> | = | <b>0xFFFF</b> | =   | <b>1111 1111 1111 1111</b> |
| => | <b>R6</b> | = | <b>0x0001</b> | <=> | <b>0000 0000 0000 0001</b> |

line 40

ADD.W R11,R7

=> R11 = 0x0000 = 0000 0000 0000 0000  
R7 = 0x1000 = 0001 0000 0000 0000  
R7 = 0x1000 <=> 0001 0000 0000 0000





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## Add Instructions and Logic

### Lab Goal

Understand the effect of addition instructions on the status bits and results.

3 Open Add.eww workspace

4 Show me your work on instruction 3 then debug the "add" project. Select "add" tab in Workspace window.

5 Indicate what the values of the registers **are** when the code is stepped through:

After completing Lab\_6a\_Add. Download Attached File: [Lab File - Add.zip \(33.612 KB\)](#) in the Lab 6b (Add) folder.  
and Unzip the entire "Add.zip" file. Save it in the LAB\_CET 453 folder.

Then open the  add file IAR IDE Workbench workspace (1 KB)

Click **Project =>** Download and Debug ( Ctrl + D ) for run

**Project =>** Clean

**Use key F11 for run Loop**

The values of the registers are the same as those implemented in Lab\_6a\_add. When the code is executed step by step.  
And the Professor confirmed that it is correct.



The values of the registers in the [ams.s43](#) file when the code is executed step by step.

add - IAR Embedded Workbench IDE - MSP430 7.21.1

File Edit View Project Debug Simulator Tools Window Help

Workspace msp430.h msp430f149.h add.evww **asm.s43** x

Debug

Files

- Add - Debug
- asm.s43
- Output

```
1 #include "msp430.h"           ; #define controlled include file
2
3     NAME    main              ; module name
4
5     PUBLIC  main              ; make the main label visible
6                               ; outside this module
7
8     ORG     0FFFFh            ; set reset vector to 'init' label
9
10    RSEG     CSTACK            ; pre-declaration of segment
11    RSEG     CODE              ; place program in 'CODE' segment
12
13    ;init: MOV     #SPH(CSTACK), SP      ; set up stack
14           MOV.W   #WDTPW+WDTHOLD,&WDCTL ; Stop watchdog timer
15
16           ; 32 bit variable A
17           MOV.W   #0FFFCh, R4
18           MOV.W   #01000h, R5
19
20           ; 32 bit variable B
21           MOV.W   #0FFFCh, R6
22           MOV.W   #01000h, R7
23
24           ; 32 bit variable C
25           MOV.W   #0001h, R8
26           MOV.W   #0000h, R9
27
28           ; 32 bit variable D
29           MOV.W   #0001h, R10
30           MOV.W   #0000h, R11
31           MOV.W   #0001h, R12      ; loop counter
32           ; main program
33    main:
34           ; math routine 1, add variable C to variable A
35           ADD.W   R8,R4           ; ADD LSDs with no carry in
36           ADD.W   R9,R5           ; ADD MSDs with no carry in
37
38           ; math routine 2, add variable D to variable B
39           ADD.W   R10,R6          ; ADD LSDs with no carry in
40           ADDC.W  R11,R7          ; ADD MSDs with carry in
```

Registers 1

Find: Group: CPU Registers

| Name         | Value  | Access    |
|--------------|--------|-----------|
| PC           | 0x1100 | ReadWrite |
| SP           | 0x0000 | ReadWrite |
| SR           | 0x0000 | ReadWrite |
| Reserved     | 0x0    | ReadWrite |
| V            | 0      | ReadWrite |
| SCG1         | 0      | ReadWrite |
| SCG0         | 0      | ReadWrite |
| OscOff       | 0      | ReadWrite |
| CPUOff       | 0      | ReadWrite |
| GIE          | 0      | ReadWrite |
| N            | 0      | ReadWrite |
| Z            | 0      | ReadWrite |
| C            | 0      | ReadWrite |
| R4           | 0xcdcd | ReadWrite |
| R5           | 0xcdcd | ReadWrite |
| R6           | 0xcdcd | ReadWrite |
| R7           | 0xcdcd | ReadWrite |
| R8           | 0xcdcd | ReadWrite |
| R9           | 0xcdcd | ReadWrite |
| R10          | 0xcdcd | ReadWrite |
| R11          | 0xcdcd | ReadWrite |
| R12          | 0xcdcd | ReadWrite |
| R13          | 0xcdcd | ReadWrite |
| R14          | 0xcdcd | ReadWrite |
| R15          | 0xcdcd | ReadWrite |
| CYCLECOUNTER | 0      | ReadOnly  |
| CCTIMER1     | 0      | ReadWrite |
| CCTIMER2     | 0      | ReadWrite |
| CCSTEP       | 0      | ReadOnly  |

Debug Log



The values of the registers in the [ams.s43](#) file when the code is executed step by step. are the same as the values implemented in [Lab\\_6a\\_add](#).

|                            |         | Destination (dst) |        |        |        | Source (src) |        |        |        | N | Z | C |
|----------------------------|---------|-------------------|--------|--------|--------|--------------|--------|--------|--------|---|---|---|
| After line 30 has executed |         | R5                | R4     | R7     | R6     | R9           | R8     | R11    | R10    |   |   |   |
| Loop 1                     | line 35 |                   | 0xFFFD |        |        |              | 0x0001 |        |        | 1 | 0 | 0 |
|                            | line 36 | 0x1000            |        |        |        | 0x0000       |        |        |        | 0 | 0 | 0 |
|                            | line 39 |                   |        |        | 0xFFFD |              |        |        | 0x0001 | 1 | 0 | 0 |
|                            | line 40 |                   |        | 0x1000 |        |              |        | 0x0000 |        | 0 | 0 | 0 |
| Loop 2                     | line 35 |                   | 0xFFFE |        |        |              | 0x0001 |        |        | 1 | 0 | 0 |
|                            | line 36 | 0x1000            |        |        |        | 0x0000       |        |        |        | 0 | 0 | 0 |
|                            | line 39 |                   |        |        | 0xFFFE |              |        |        | 0x0001 | 1 | 0 | 0 |
|                            | line 40 |                   |        | 0x1000 |        |              |        | 0x0000 |        | 0 | 0 | 0 |
| Loop 3                     | line 35 |                   | 0xFFFF |        |        |              | 0x0001 |        |        | 1 | 0 | 0 |
|                            | line 36 | 0x1000            |        |        |        | 0x0000       |        |        |        | 0 | 0 | 0 |
|                            | line 39 |                   |        |        | 0xFFFF |              |        |        | 0x0001 | 1 | 0 | 1 |
|                            | line 40 |                   |        | 0x1000 |        |              |        | 0x0000 |        | 0 | 0 | 0 |
| Loop 4                     | line 35 |                   | 0x0000 |        |        |              | 0x0001 |        |        | 0 | 1 | 1 |
|                            | line 36 | 0x1000            |        |        |        | 0x0000       |        |        |        | 0 | 0 | 0 |
|                            | line 39 |                   |        |        | 0x0000 |              |        |        | 0x0001 | 0 | 1 | 1 |
|                            | line 40 |                   |        | 0x1000 |        |              |        | 0x0000 |        | 0 | 0 | 0 |
| Loop 5                     | line 35 |                   | 0x0001 |        |        |              | 0x0001 |        |        | 0 | 0 | 0 |
|                            | line 36 | 0x1000            |        |        |        | 0x0000       |        |        |        | 0 | 0 | 0 |
|                            | line 39 |                   |        |        | 0x0001 |              |        |        | 0x0001 | 0 | 0 | 0 |

|  |         |  |  |        |  |  |        |  |   |   |   |
|--|---------|--|--|--------|--|--|--------|--|---|---|---|
|  | line 40 |  |  | 0x1000 |  |  | 0X0000 |  | 0 | 0 | 0 |
|--|---------|--|--|--------|--|--|--------|--|---|---|---|



|        |                     | R5     | R4     | R7     | R6     | R9     | R8     | R11    |
|--------|---------------------|--------|--------|--------|--------|--------|--------|--------|
|        | After line 30 has e | 0x1000 | 0xFFFC | 0x1000 | 0xFFFC | 0x0000 | 0x0001 | 0x0000 |
| Loop 1 | line 35             |        | 0xFFFD |        |        |        | 0x0001 |        |
|        | line 36             | 0x1000 |        |        |        | 0x0000 |        |        |
|        | line 39             |        |        |        | 0xFFFD |        |        |        |
|        | line 40             |        |        | 0x1000 |        |        |        | 0x0000 |
| Loop 2 | line 35             |        | 0xFFFE |        |        |        | 0x0001 |        |
|        | line 36             | 0x1000 |        |        |        | 0x0000 |        |        |
|        | line 39             |        |        |        | 0xFFFE |        |        |        |
|        | line 40             |        |        | 0x1000 |        |        |        | 0x0000 |
| Loop 3 | line 35             |        | 0xFFFF |        |        |        | 0x0001 |        |
|        | line 36             | 0x1000 |        |        |        | 0x0000 |        |        |
|        | line 39             |        |        |        | 0xFFFF |        |        |        |
|        | line 40             |        |        | 0x1000 |        |        |        | 0x0000 |
| Loop 4 | line 35             |        | 0x0000 |        |        |        | 0x0001 |        |
|        | line 36             | 0x1000 |        |        |        | 0x0000 |        |        |
|        | line 39             |        |        |        | 0x0000 |        |        |        |
|        | line 40             |        |        | 0x1000 |        |        |        | 0x0000 |
| Loop 5 | line 35             |        | 0x0001 |        |        |        | 0x0001 |        |
|        | line 36             | 0x1000 |        |        |        | 0x0000 |        |        |
|        | line 39             |        |        |        | 0x0000 |        |        |        |
|        | line 40             |        |        | 0x1000 |        |        |        | 0x0000 |

Study the assembly Code in the attached word document and answer question 3 i

3 Open Add.eww workspace

4 Show me your work on instruction 3 then debug the "add" project. Select "add" tab in Workspace

5 Indicate what the values of the registers **are** when the code is stepped through:

|  |                     | R5     | R4     | R7     | R6     | R9     | R8     | R11    |
|--|---------------------|--------|--------|--------|--------|--------|--------|--------|
|  | After line 30 has e | 0x1000 | 0xFFFC | 0x1000 | 0xFFFC | 0x0000 | 0x0001 | 0x0000 |

|        |         |        |        |        |        |        |        |        |
|--------|---------|--------|--------|--------|--------|--------|--------|--------|
|        |         |        |        |        |        |        |        |        |
| Loop 1 | line 35 |        | 0xFFFD |        |        |        | 0x0001 |        |
|        | line 36 | 0x1000 |        |        |        | 0x0000 |        |        |
|        | line 39 |        |        |        | 0xFFFD |        |        |        |
|        | line 40 |        |        | 0x1000 |        |        |        | 0X0000 |
|        |         |        |        |        |        |        |        |        |
| Loop 2 | line 35 |        | 0xFFFE |        |        |        | 0x0001 |        |
|        | line 36 | 0x1000 |        |        |        | 0x0000 |        |        |
|        | line 39 |        |        |        | 0xFFFE |        |        |        |
|        | line 40 |        |        | 0x1000 |        |        |        | 0X0000 |
|        |         |        |        |        |        |        |        |        |
| Loop 3 | line 35 |        | 0xFFFF |        |        |        | 0x0001 |        |
|        | line 36 | 0x1000 |        |        |        | 0x0000 |        |        |
|        | line 39 |        |        |        | 0xFFFF |        |        |        |
|        | line 40 |        |        | 0x1000 |        |        |        | 0X0000 |
|        |         |        |        |        |        |        |        |        |
| Loop 4 | line 35 |        | 0x0000 |        |        |        | 0x0001 |        |
|        | line 36 | 0x1000 |        |        |        | 0x0000 |        |        |
|        | line 39 |        |        |        | 0x0000 |        |        |        |
|        | line 40 |        |        | 0x1000 |        |        |        | 0X0000 |
|        |         |        |        |        |        |        |        |        |
| Loop 5 | line 35 |        | 0x0001 |        |        |        | 0x0001 |        |
|        | line 36 | 0x1000 |        |        |        | 0x0000 |        |        |
|        | line 39 |        |        |        | 0x0000 |        |        |        |
|        | line 40 |        |        | 0x1000 |        |        |        | 0X0000 |
|        |         |        |        |        |        |        |        |        |

Study the assembly Code in the attached word document and answer question 3 i

| R10    | N | Z | C |
|--------|---|---|---|
| 0x0001 | 0 | 0 | 0 |
|        |   |   |   |
|        | 0 | 0 | 1 |
|        | 0 | 0 | 0 |
| 0x0001 | 0 | 0 | 1 |
|        | 0 | 0 | 0 |
|        |   |   |   |
|        | 0 | 0 | 1 |
|        | 0 | 0 | 0 |
| 0x0001 | 0 | 0 | 1 |
|        | 0 | 0 | 0 |
|        |   |   |   |
|        | 0 | 0 | 1 |
|        | 0 | 0 | 0 |
| 0x0001 | 0 | 0 | 1 |
|        | 0 | 0 | 0 |
|        |   |   |   |
|        | 0 | 0 | 1 |
|        | 0 | 0 | 0 |
| 0x0001 | 1 | 0 | 1 |
|        | 0 | 0 | 0 |
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| 0x0001 | 0 | 0 | 1 |
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|        | 0 | 0 | 1 |
|        | 0 | 0 | 0 |
| 0x0001 | 0 | 0 | 1 |
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|        | 0 | 0 | 0 |
| 0x0001 | 0 | 0 | 1 |
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|        | 0 | 0 | 1 |
|        | 0 | 0 | 0 |
| 0x0001 | 1 | 0 | 1 |
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|        | 0 | 0 | 1 |
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| 0x0001 | 0 | 0 | 1 |
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