KHALIFA UNIVERSITY

CMPE333 - Microprocessor Systems Laboratory

Pre-lab Report #2 : Development & Testing of HCS12 Programs Using Branching and Loops

Shamsah Al Ali - 100037059

Fatima Alzaabi - 100036968

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1. Pre-lab Tasks

Task 1: Write a set of instructions to compare the contents of Accumulator A and Accumulator B. Your program should assign the highest value in the memory location $1000.

i. Load Acc A = #$10 and Acc B = #$20. Use BGT or BLE branch instructions.

```
; Include derivative-specific definitions

INCLUDE 'derivative.inc'

XDEF Entry

Larger EQU $1000

ORG $4000

Entry:

CLRA

CLRB
LDAA #$10 ; ($10)--> A
LDAB #$20 ; ($20)--> B
CBA ; compare the values of registers A and B
BLE TRUTH ; branch to  TRUTH if A is less than B

STAA Larger ; store the value of A into the address location $1000

BRA OUTT; end the if statement case

TRUTH STAB Larger; store the value of B into the address location $1000

OUTT BRA Exit
```

The command used here is the BLE, where it checks the value of register A is less than register B. After checking, it will branch to the STORE statement where the value of B will be assigned to the memory location $1000. Otherwise, the value of A will be stored in $1000.

ii. Load Acc A = #$93 and Acc B = #$56. Use BMI or BPL branch instructions.

```
; Include derivative-specific definitions INCLUDE 'derivative.inc'
XDEF Entry

Larger EQU $1000

ORG $4000

Entry:

CLRA

CLRB
LDAA #$93 ; ($93) -> A
LDAB #$56 ; ($56) -> B
CBA ; compare A to B ( A - B)
BPL TRUTH ; branch to Larger if plus
STAB Larger ; assign address location $1000 with value of B

BRA OUTT ; exit the program

TRUTH STAA Larger ; assign address location $100 with value of B

OUTT BRA Exit
```

In this code, the command BPL will look at whether the resulting value of the comparison is positive or negative, since the idea of this comparison command is to subtract B from A, therefore, if the result is negative, this means that B has the greater value. If the result is positive, this means that A has the greater value.

iii. Load Acc A = #$85 and Acc B = #$92. Use BCC or BCS branch instructions.

```
; Include derivative-specific definitions

INCLUDE 'derivative.inc'

XDEF Entry

Larger EQU $1000

ORG $4000

Entry:
```

```
CLRA
CLRB
LDAA #$85 ; ($85) -> A
LDAB #$92 ; ($92) -> B
CBA ; compare A to B
BCS TRUTH; branch if there is a carry bit set
STAA Larger; assign memory location $1000 with value of A

BRA OUTT; exit the program

TRUTH STAB Larger ; assign memory location $1000 with value of B

OUTT BRA Exit
```

In this code, the BCS instruction checks whether there is a carry bit after the comparison operation, if there is a carry bit, then B has the larger value, otherwise if there is no carry bit, A has the larger value.

2. Pre-Lab Questions:

1. What is the value of the operand register (i.e., IX, IY, and Acc A) after the execution of each of the following individual instructions? Assume LOC is the label on memory location $1000 and the contents of memory location $1000 is $15 and $1001 is $24.

A) LDX # LOC

Loop starts at the memory location $1000

therefore IX: $1000 which has the memory location but not the value

and the value of the accumulator is CB.

while IY: FFFF

B) LDX LOC

In this part, the IX will hold the actual value 15.

Accumulator A is CB while IY if FFFF

C) LDY #(LOC-1)

the value of IY will be 1000-1 which is IY: $999

D) LDAA (LOC+1) this will store the value of 24 in accumulator A since the address is starting at 1000 so LOC+1 is 1001.