

Worksheet 1.3

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Branch: BE-CSE (LEET)

Section/Group: ON20BCS-809/A

Semester: 4th Sem

Date of Performance: 20/02/2022

Subject Name: MPI Lab

Subject Code: 22E-20CSP-253

1. Aim/Overview of the practical:

- Subtraction of two 8bit numbers along with considering borrow.
- Subtraction of two 16bit numbers along with considering borrow.

2. Task to be done:

Write the 8085 Micro Processor program to calculate the subtraction of two 8bit as well as 16bit numbers.

3. Apparatus/Simulator used (For applied/experimental sciences/materials-based labs):

- 8085 Jubin simulator version 2 (Microprocessor Simulator)
- Java (jdk/ jre1.8.0_321)

4. Algorithm/Flowchart (For programming-based labs):

a) Subtraction of two 8bit number:

- Load the first number from memory location 3000 to Memory.
- Move the content of memory to accumulator,
- Increase the memory location of HL pair.
- Load the second number from memory location 3001 to Memory.
- Move the content of memory to B,
- Then subtract the B from the Accumulator and store in Accumulator.
- Move the content of Accumulator to memory M,
- Exit the program.

b) Subtraction of two 16bit number

- Load the 1st pair number from memory location 3000,3001 to HL pair.
- Exchange it with the DE pairs.
- Load the 2nd pair number from memory location 3002,3003 to HL pair.

- IV. Move the content from E to accumulator.
- V. Subtract the L from accumulator.
- VI. Move the content from accumulator to L register.
- VII. Move the content from D to accumulator.
- VIII. Subtract the H from accumulator with the borrow.
- IX. Move Accumulator to H register.
- X. Move the content of HL pair Register to memory location 1004,1005,
- XI. Exit the program.

5. Description/ Code:

a) Subtraction of two 8bit number:

```
# ORG 2000H
    LXI H,3000
    MOV A,M
    INX H
    MOV B,M
    SBB B
    INX H
    MOV M,A
    HLT
# ORG 3000H
# DB 42, 34
```

b) Subtraction of two 16bit number

```
# ORG 2000H
    LHLD 3000
    XCHG
    LHLD 3002
    MOV A,E
    SUB L
    MOV L,A
    MOV A,D
    SBB H
    MOV H,A
    SHLD 1004
    HLT
# ORG 3000H
# DB 42, 35,34,21
```

6. Result/Output/Writing Summary:

a) Subtraction of two 8bit number:

8085 Simulator - E:\Personal\CodeWithVn\8085\Program\Experiment-3Q2.asm

File Edit Tools Settings Simulation Subroutine View Load Sample Program Help

Editor Assembler

8085 Assembly Language Editor

Assembler Disassembler

```
# ORG 2000H
LXI H,3000
MOV A,M
INX H
MOV B,M
SBB B
INX H
MOV M,A
HLT

# ORG 3000H
# DB 42, 34
```

Autocorrect Assemble

Registers Memory Devices

Registers :

Register	Value	7	6	5	4	3	2	1	0
Accumulator	00	0	0	0	0	0	0	0	0
Register B	00	0	0	0	0	0	0	0	0
Register C	00	0	0	0	0	0	0	0	0
Register D	00	0	0	0	0	0	0	0	0
Register E	00	0	0	0	0	0	0	0	0
Register H	00	0	0	0	0	0	0	0	0
Register L	00	0	0	0	0	0	0	0	0
Memory(M)	00	0	0	0	0	0	0	0	0

Resister	Value	S	Z	*	AC	*	P	*	CY
Flag Resister	00	0	0	0	0	0	0	0	0

Type	Value
Stack Pointer(SP)	0000
Memory Pointer (HL)	0000
Program Status Word(PSW)	0000
Program Counter(PC)	2000
Clock Cycle Counter	0
Instruction Counter	0

SOD	SID	INTR	TRAP	R7.5	R6.5	R5.5
0	0	0	0	0	0	0

For SIM instruction

SOD	SDE	*	R7.5	MSE	M7.5	M6.5	M5.5
0	0	0	0	0	0	0	0

For RIM instruction

SID	I7.5	I6.5	I5.5	IE	M7.5	M6.5	M5.5
0	0	0	0	0	0	0	0

No. Converter Tool :

Hexadecimal	Decimal	Binary
0	0	0

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Editor Assembler

Assembler

* Address	Label	Mnemonics	Hexcode	Bytes	M-Cycles	T-States
✓ 2000		LXI H,3000	21	3	3	10
✓ 2001			00			
✓ 2002			30			
✓ 2003		MOV A,M	7E	1	2	7
✓ 2004		INX H	23	1	1	6
✓ 2005		MOV B,M	46	1	2	7
✓ 2006		SBB B	98	1	1	4
✓ 2007		INX H	23	1	1	6
✓ 2008		MOV M,A	77	1	2	7
✓ 2009		HLT	76	1	2	5

Simulate

Start From → 2000

Run all At a Time Step By Step

Registers Memory Devices

Registers :

Register	Value	7	6	5	4	3	2	1	0
Accumulator	00	0	0	0	0	0	0	0	0
Register B	00	0	0	0	0	0	0	0	0
Register C	00	0	0	0	0	0	0	0	0
Register D	00	0	0	0	0	0	0	0	0
Register E	00	0	0	0	0	0	0	0	0
Register H	00	0	0	0	0	0	0	0	0
Register L	00	0	0	0	0	0	0	0	0
Memory(M)	00	0	0	0	0	0	0	0	0

Resister	Value	S	Z	*	AC	*	P	*	CY
Flag Resister	00	0	0	0	0	0	0	0	0

Type	Value
Stack Pointer(SP)	0000
Memory Pointer (HL)	0000
Program Status Word(PSW)	0000
Program Counter(PC)	2000
Clock Cycle Counter	0
Instruction Counter	0

SOD	SID	INTR	TRAP	R7.5	R6.5	R5.5
0	0	0	0	0	0	0

For SIM instruction

SOD	SDE	*	R7.5	MSE	M7.5	M6.5	M5.5
0	0	0	0	0	0	0	0

For RIM instruction

SID	I7.5	I6.5	I5.5	IE	M7.5	M6.5	M5.5
0	0	0	0	0	0	0	0

No. Converter Tool :

Hexadecimal	Decimal	Binary
0	0	0

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Editor Assembler

Assembler

* Address	Label	Mnemonics	Hexcode	Bytes	M-Cycles	T-States
✓ 2000		LXI H,3000	21	3	3	10
2001			00			
2002			30			
✓ 2003		MOV A,M	7E	1	2	7
✓ 2004		INX H	23	1	1	6
✓ 2005		MOV B,M	46	1	2	7
✓ 2006		SBB B	98	1	1	4
✓ 2007		INX H	23	1	1	6
✓ 2008		MOV M,A	77	1	2	7
✓ 2009		HLT	76	1	2	5

Simulate

Start From → 2000

Run all At a Time Step By Step

Registers Memory Devices

Memory Editor

Memory Range: 0000 ---- FFFF

Memory Address	Value
2000	21
2002	30
2003	7E
2004	23
2005	46
2006	98
2007	23
2008	77
2009	76
3000	42
3001	34

☐ Show entire memory content
☒ Show only loaded memory location
☐ Store directly to specified memory location

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Editor Assembler

Assembler

* Address	Label	Mnemonics	Hexcode	Bytes	M-Cycles	T-States
✓ 2000		LXI H,3000	21	3	3	10
2001			00			
2002			30			
✓ 2003		MOV A,M	7E	1	2	7
✓ 2004		INX H	23	1	1	6
✓ 2005		MOV B,M	46	1	2	7
✓ 2006		SBB B	98	1	1	4
✓ 2007		INX H	23	1	1	6
✓ 2008		MOV M,A	77	1	2	7
✓ 2009		HLT	76	1	2	5

Simulate

Start From → 2000

Run all At a Time Step By Step

Registers Memory Devices

Registers :

Register	Value	7	6	5	4	3	2	1	0
Accumulator	0E	0	0	0	0	1	1	1	0
Register B	34	0	0	1	1	0	1	0	0
Register C	00	0	0	0	0	0	0	0	0
Register D	00	0	0	0	0	0	0	0	0
Register E	00	0	0	0	0	0	0	0	0
Register H	30	0	0	1	1	0	0	0	0
Register L	02	0	0	0	0	0	0	1	0
Memory(M)	0E	0	0	0	0	1	1	1	0

Register	Value	S	Z	*	AC	*	P	*	CY
Flag Register	00	0	0	0	0	0	0	0	0

Type	Value
Stack Pointer(SP)	0000
Memory Pointer (HL)	3002
Program Status Word(PSW)	0E00
Program Counter(PC)	2009
Clock Cycle Counter	52
Instruction Counter	8

SOD	SID	INTR	TRAP	R7.5	R6.5	R5.5
0	0	0	0	0	0	0

For SIM instruction

SOD	SDE	*	R7.5	MSE	M7.5	M6.5	M5.5
0	0	0	0	0	0	0	0

For RIM instruction

SID	I7.5	I6.5	I5.5	IE	M7.5	M6.5	M5.5
0	0	0	0	0	0	0	0

No. Converter Tool :

Hexadecimal	Decimal	Binary
0	0	0

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Editor Assembler

Assembler

* Address	Label	Mnemonics	Hexcode	Bytes	M-Cycles	T-States
2000		LXI H,3000	21	3	3	10
2001			00			
2002			30			
2003		MOV A,M	7E	1	2	7
2004		INX H	23	1	1	6
2005		MOV B,M	46	1	2	7
2006		SBB B	98	1	1	4
2007		INX H	23	1	1	6
2008		MOV M,A	77	1	2	7
2009		HLT	76	1	2	5

Simulate

Start From → 2000

Run all At a Time Step By Step

Registers Memory Devices

Memory Editor

Memory Range: 0000 ---- FFFF

Memory Address	Value
2000	21
2002	30
2003	7E
2004	23
2005	46
2006	98
2007	23
2008	77
2009	76
3000	42
3001	34
3002	0E

☐ Show entire memory content
☒ Show only loaded memory location
☐ Store directly to specified memory location

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b) Subtraction of two 16bit number:

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Editor Assembler

8085 Assembly Language Editor

Assembler Disassembler

```

# ORG 2000H
LHLD 3000
XCHG
LHLD 3002
MOV A,E
SUB L
MOV L,A
MOV A,D
SBB H
MOV H,A
SHLD 1004
HLT

# ORG 3000H
# DB 42, 35, 34, 21
  
```

Autocorrect Assemble

Registers Memory Devices

Registers :

Register	Value	7	6	5	4	3	2	1	0
Accumulator	00	0	0	0	0	0	0	0	0
Register B	00	0	0	0	0	0	0	0	0
Register C	00	0	0	0	0	0	0	0	0
Register D	00	0	0	0	0	0	0	0	0
Register E	00	0	0	0	0	0	0	0	0
Register H	00	0	0	0	0	0	0	0	0
Register L	00	0	0	0	0	0	0	0	0
Memory(M)	00	0	0	0	0	0	0	0	0

Register	Value	S	Z	*	AC	*	P	*	CY
Flag Register	00	0	0	0	0	0	0	0	0

Type	Value
Stack Pointer(SP)	0000
Memory Pointer (HL)	0000
Program Status Word(PSW)	0000
Program Counter(PC)	2000
Clock Cycle Counter	0
Instruction Counter	0

SOD	SID	INTR	TRAP	R7.5	R6.5	R5.5
0	0	0	0	0	0	0

For SIM instruction

SOD	SDE	*	R7.5	MSE	M7.5	M6.5	M5.5
0	0	0	0	0	0	0	0

For RIM instruction

SID	I7.5	I6.5	I5.5	IE	M7.5	M6.5	M5.5
0	0	0	0	0	0	0	0

No. Converter Tool :

Hexadecimal	Decimal	Binary
0	0	0

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Editor Assembler

Assembler

* Address	Label	Mnemonics	Hexcode	Bytes	M-Cycles	T-States
✓ 2000		LHLD 3000	2A	3	5	16
✓ 2001			00			
✓ 2002			30			
✓ 2003		XCHG	EB	1	1	4
✓ 2004		LHLD 3002	2A	3	5	16
✓ 2005			02			
✓ 2006			30			
✓ 2007		MOV A,E	7B	1	1	4
✓ 2008		SUB L	95	1	1	4
✓ 2009		MOV L,A	6F	1	1	4
✓ 200A		MOV A,D	7A	1	1	4
✓ 200B		SBB H	9C	1	1	4
✓ 200C		MOV H,A	67	1	1	4
✓ 200D		SHLD 1004	22	3	5	16
✓ 200E			04			
✓ 200F			10			
✓ 2010		HLT	76	1	2	5

Simulate

Start From → 2000

Run all At a Time Step By Step

Registers **Memory** **Devices**

Registers :

Register	Value	7	6	5	4	3	2	1	0
Accumulator	00	0	0	0	0	0	0	0	0
Register B	00	0	0	0	0	0	0	0	0
Register C	00	0	0	0	0	0	0	0	0
Register D	00	0	0	0	0	0	0	0	0
Register E	00	0	0	0	0	0	0	0	0
Register H	00	0	0	0	0	0	0	0	0
Register L	00	0	0	0	0	0	0	0	0
Memory(M)	00	0	0	0	0	0	0	0	0

Register	Value	S	Z	*	AC	*	P	*	CY
Flag Register	00	0	0	0	0	0	0	0	0

Type	Value
Stack Pointer(SP)	0000
Memory Pointer (HL)	0000
Program Status Word(PSW)	0000
Program Counter(PC)	2000
Clock Cycle Counter	0
Instruction Counter	0

SOD	SID	INTR	TRAP	R7.5	R6.5	R5.5
0	0	0	0	0	0	0

For SIM instruction

SOD	SDE	*	R7.5	MSE	M7.5	M6.5	M5.5
0	0	0	0	0	0	0	0

For RIM instruction

SID	I7.5	I6.5	I5.5	IE	M7.5	M6.5	M5.5
0	0	0	0	0	0	0	0

No. Converter Tool :

Hexadecimal Decimal Binary

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Editor Assembler

Assembler

* Address	Label	Mnemonics	Hexcode	Bytes	M-Cycles	T-States
✓ 2000		LHLD 3000	2A	3	5	16
✓ 2001			00			
✓ 2002			30			
✓ 2003		XCHG	EB	1	1	4
✓ 2004		LHLD 3002	2A	3	5	16
✓ 2005			02			
✓ 2006			30			
✓ 2007		MOV A,E	7B	1	1	4
✓ 2008		SUB L	95	1	1	4
✓ 2009		MOV L,A	6F	1	1	4
✓ 200A		MOV A,D	7A	1	1	4
✓ 200B		SBB H	9C	1	1	4
✓ 200C		MOV H,A	67	1	1	4
✓ 200D		SHLD 1004	22	3	5	16
✓ 200E			04			
✓ 200F			10			
✓ 2010		HLT	76	1	2	5

Simulate

Start From → 2000

Run all At a Time Step By Step

Registers **Memory** **Devices**

Memory Editor

Memory Range: 0000 ---- FFFF

Memory Address	Value
2000	2A
2002	30
2003	EB
2004	2A
2005	02
2006	30
2007	7B
2008	95
2009	6F
200A	7A
200B	9C
200C	67
200D	22
200E	04
200F	10
2010	76
3000	42
3001	35
3002	34
3003	21

☐ Show entire memory content
☒ Show only loaded memory location
☐ Store directly to specified memory location

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Editor Assembler

Assembler

* Address	Label	Mnemonics	Hexcode	Bytes	M-Cycles	T-States
✓ 2000		LHLD 3000	2A	3	5	16
2001			00			
2002			30			
✓ 2003		XCHG	EB	1	1	4
✓ 2004		LHLD 3002	2A	3	5	16
2005			02			
2006			30			
✓ 2007		MOV A,E	7B	1	1	4
✓ 2008		SUB L	95	1	1	4
✓ 2009		MOV L,A	6F	1	1	4
✓ 200A		MOV A,D	7A	1	1	4
✓ 200B		SBB H	9C	1	1	4
✓ 200C		MOV H,A	67	1	1	4
✓ 200D		SHLD 1004	22	3	5	16
200E			04			
200F			10			
✓ 2010		HLT	76	1	2	5

Simulate

Start From → 2000

Run All At A Time Step By Step

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Registers Memory Devices

Registers :

Register	Value	7	6	5	4	3	2	1	0
Accumulator	14	0	0	0	1	0	1	0	0
Register B	00	0	0	0	0	0	0	0	0
Register C	00	0	0	0	0	0	0	0	0
Register D	35	0	0	1	1	0	1	0	1
Register E	42	0	1	0	0	0	0	1	0
Register H	14	0	0	0	1	0	1	0	0
Register L	0E	0	0	0	0	1	1	1	0
Memory(M)	00	0	0	0	0	0	0	0	0

Register	Value	S	Z	*	AC	*	P	*	CY
Flag Register	14	0	0	0	1	0	1	0	0

Type	Value
Stack Pointer(SP)	0000
Memory Pointer (HL)	140E
Program Status Word(PSW)	1414
Program Counter(PC)	2010
Clock Cycle Counter	81
Instruction Counter	11

SOD	SID	INTR	TRAP	R7.5	R6.5	R5.5
0	0	0	0	0	0	0

For SIM instruction

SOD	SDE	*	R7.5	MSE	M7.5	M6.5	M5.5
0	0	0	0	0	0	0	0

For RIM instruction

SID	I7.5	I6.5	I5.5	IE	M7.5	M6.5	M5.5
0	0	0	0	0	0	0	0

No. Converter Tool :

Hexadecimal Decimal Binary

8085 Simulator - E:\Personal\CodeWithVn\8085\Program\Experiment-3Q2.asm

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Editor Assembler

Assembler

* Address	Label	Mnemonics	Hexcode	Bytes	M-Cycles	T-States
✓ 2000		LHLD 3000	2A	3	5	16
2001			00			
2002			30			
✓ 2003		XCHG	EB	1	1	4
✓ 2004		LHLD 3002	2A	3	5	16
2005			02			
2006			30			
✓ 2007		MOV A,E	7B	1	1	4
✓ 2008		SUB L	95	1	1	4
✓ 2009		MOV L,A	6F	1	1	4
✓ 200A		MOV A,D	7A	1	1	4
✓ 200B		SBB H	9C	1	1	4
✓ 200C		MOV H,A	67	1	1	4
✓ 200D		SHLD 1004	22	3	5	16
200E			04			
200F			10			
✓ 2010		HLT	76	1	2	5

Simulate

Start From → 2000

Run All At A Time Step By Step

Created by : Jubin Mitra

Registers Memory Devices

Memory Editor

Memory Range: 0000 ---- FFFF

Memory Address	Value
1004	0E
1005	14
2000	2A
2002	30
2003	EB
2004	2A
2005	02
2006	30
2007	7B
2008	95
2009	6F
200A	7A
200B	9C
200C	67
200D	22
200E	04
200F	10
2010	76
3000	42
3001	35
3002	3A

☐ Show entire memory content
☒ Show only loaded memory location
☐ Store directly to specified memory location

Learning outcomes (What I have learnt):

1. Learnt how to do the 8085-microprocessor programming.
2. Learnt how to Subtract the two 8bit numbers with the carry.
3. Learnt how to Subtract the two 16bits numbers with the carry.

Evaluation Grid (To be created as per the SOP and Assessment guidelines by the faculty):

Sr. No.	Parameters	Marks Obtained	Maximum Marks
1.			
2.			
3.			