

**CSMSS's**  
**Chh. Shahu College of Engineering,**  
Kanchanwadi, Chh. Sambhaji Nagar



Affiliated to

**Dr. Babasaheb Ambedkar Technological University**

**Lab Manual**

of

**Microprocessor and Microcontroller**  
**(BTEEC502)**

for

**BTech EE Semester V**

**Department of Electrical Engineering**

## **Class: BTech Electrical Engineering**

**Subject: Microprocessor and Microcontroller (BTEEC502)**

**Teaching Scheme**

**Practical: 02 hrs/week**

**Exam Scheme**


**Practical: 40 marks**

### **List of Practical's**

<b>Practical No</b>	<b>Title</b>
1	To Study of 8085 Microprocessor Trainer Kit used in Laboratory.
2	To write an assembly language program for adding two 8 bit number.
3	To write an assembly language program for adding two 16 bit number.
4	To write an assembly language program for Substation two 8 bit number.
5	To write an assembly language program for adding two 16 bit number.
6	To write an assembly language program to sort 'n' numbers in ascending order.
7	To write an assembly language program to sort 'n' numbers in descending order.
8	To write an assembly language program to make stepper motor run in forward and reverse direction
9	To Study of 8051 Microcontroller Trainer Kit used in Laboratory.
10	To write an assembly language program to transfer content of internal RAM to external RAM.
11	To write an assembly language program to for adding two 8 bit numbers.
12	To write an assembly language program to for subtracting two 8 bit numbers.
13	To write an assembly language program to for multiply and divide two numbers stored in internal RAM

Note:- Any 8 Practical's form above list of experiment

**Experiment No.**

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	<b>Practical Experiment Instruction Sheet</b>			
<b>EXPERIMENT TITLE:</b> Study of Microprocessor Kit				
<b>EXPERIMENT NO. :</b> CSMSS/ECT/MPLAB/MP/01				
<b>CLASS:</b> TE		<b>DEPARTMENT:</b> ELECTRICAL ENGG.		
<b>LABORATORY:</b> MICROPROCESSORS AND MICROCONTROLLER LAB		<b>YEAR:</b> 2021-22	<b>PART:</b> I	<b>PAGE:</b> 1

### Experiment No. 1

**Aim:-** To Study of 8085 Microprocessor Kit used in laboratory.

**Apparatus required:**

8085 micro processor kit

**General Description:**

MX85-0X LCD kit is a single board Microprocessor Training kit based on 8085 Microprocessor. It provides powerful monitor EPROM and user's RAM with battery backup. The kit has 101 IBM compatible PC keyboard and 20 x 2 LCD display for any data entry or display. This kit has line assemble feature so that one can enter the program in assembly language.

The Input/Output structure of MX85-0X LCD kit provides 48 programmable I/O lines using 2 ICs of 8255. It has got 16 bit 3 channel programmable Timer/Counter using 8253.

**System Capabilities:**

1. Examine the contents of any memory location.
2. Examine/Modify the contents of any of the Microprocessor internal registers.
3. Modify the contents of any of the RAM location.
4. Move a block of data from one location to another location.
5. Insert one or more instructions in the user program.
6. Delete one or more instructions from the user program.
7. Relocate a program written for some memory area to some other memory area.
8. Find out string of data lying at a particular address.
9. Fill the particular memory area with a constant.
10. Compare two blocks of memory.

Prepared By : Mr. N.N. Nikam	Approved By : Prof. A. N. Mudiraj
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11. Insert one or more data bytes in the user's program/data area.
12. Delete one or more data bytes from the user's program/data area.
13. Enter any program in a mnemonics form using Assembler.
14. Examine any program in a mnemonics as well as intel hex code using disassembler.
15. Execute a program at full clock speed.
16. Execute a program in single step i.e., instruction by instruction.
17. Print the content of any memory location.

**Entering the program using assembler mode software as follows:**

Step1: The kit is powered on and we get the display

**8085 LCD TRAINER KIT**

**M85-0X \_**

Press 1

Step 2: Display changes to

**A – ASSEMBLE MODE**

**C – DISASSEMBLE MODE**

Press A

Step 3: Display changes to

**RAM ADR:**

Here enter the starting address of the program (example 2000)

Step 4: Now start entering the program. The address of instruction will be displayed automatically.

Example:

**2000 MVI A 10**

**2002 MVI B 20**

**2004 ADD B**

**2005 RST 5**

**2006 END**

**Execute the program:**

Step1: After entering the program, we get the display

**8085 LCD TRAINER KIT**

**M85-0X \_**

Press G

Step 2: Display changes to

**G0000:00**

Here enter starting address of program that has to be executed (2000).

Press **DOT(.)**

**Examine or Modify the contents of register:**

Step1: After execution of the program, we get the display

**8085 LCD TRAINER KIT**

**M85-0X \_**

Press R

Press 'Register Identifier' (The Register Identifier table is given below)

Register Identifier	Register
A	Register A
B	Register B
C	Register C
D	Register D
E	Register E
F	Flag byte
I	Interrupt Mask
H	Register H
L	Register L
S	Stack Point MSB & LSB
P	Program Counter MSB & LSB

Step 2: Display changes to

**A= 04 -**

Here enter the data you want to store or press Enter for next register.

Press .

**Examine or Modify the contents of register:**

Step1: After execution of the program, we get the display

**8085 LCD TRAINER KIT**

**M85-0X \_**

Press M

Step 2: Display changes to

**M**


Here enter the address of memory location (2500)

Step 3: Display changes to

**2500 45 -**

Here enter the data you want to store or press Enter for next location.

At last press .

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	<b>Practical Experiment Instruction Sheet</b>			
<b>EXPERIMENT TITLE: Adding two 8 bit numbers</b>				
<b>EXPERIMENT NO. : CSMSS/EE/MPLAB/MP/02</b>				
<b>CLASS: TE</b>		<b>DEPARTMENT: ELECTRICAL ENGG.</b>		
<b>LABORATORY: MICROPROCESSORS AND MICROCONTROLLER LAB</b>		<b>YEAR: 2021-22</b>	<b>PART:I</b>	<b>PAGE:1</b>

### Experiment No. 2

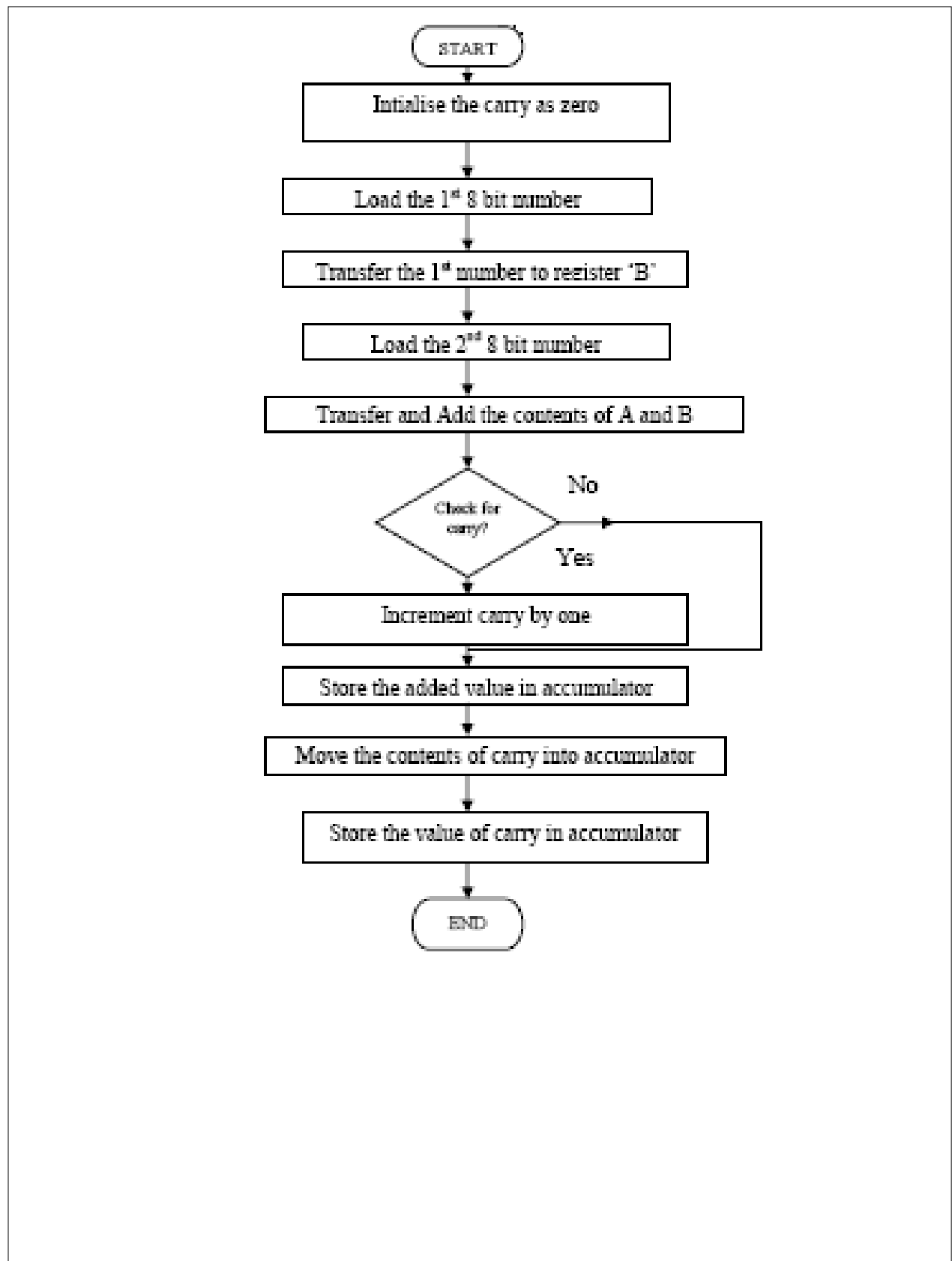
**Aim:-** To write an assembly language for adding two 8 bit numbers

**Apparatus required:**

8085 micro processor kit

**Algorithm:**

- Step 1 : Start the microprocessor
- Step 2 : Initialize the carry as 'Zero'
- Step 3 : Load the first 8 bit data into the accumulator
- Step 4 : Copy the contents of accumulator into the register 'B'
- Step 5 : Load the second 8 bit data into the accumulator.
- Step 6 : Add the 2 - 8 bit data and check for carry.
- Step 7 : Jump on if no carry
- Step 8 : Increment carry if there is
- Step 9 : Store the added request in accumulator
- Step 10 : More the carry value to accumulator
- Step 11 : Store the carry value in accumulator
- Step 12 : Stop the program execution.



Address	Label	Mnemonics	Machine code	Comments
2000		LXI H 2501	21,01,25	Get address of 1 <sup>st</sup> number in H-L pair
2003		MOV A,M	7E	1 <sup>ST</sup> no in accumulator
2004		INX H	23	Increment content of H-L pair
2005		ADD M	86	Add 1 <sup>st</sup> and 2 <sup>nd</sup> numbers
2006		STA 2503	32,03,25	Store sum in 2503 H
2007		RST 5	EF	Stop
		END		

Input :-


Input Address	Value
2501	49
2502	56

Output :-

Output Address	Value
2503	9F

**Result:**

The assembly language program for 8 bit addition of two numbers was executed successfully by using 8085 microprocessor kit.

	<b>CSMSS's CHH. Shahu College of Engineering, Aurangabad</b>		<b>LABORATORY MANUAL</b>	
	<b>Practical Experiment Instruction Sheet</b>			
	<b>EXPERIMENT TITLE: Adding two 16 bit numbers</b>			
<b>EXPERIMENT NO. : CSMSS/EE/MPLAB/MP/03</b>				
<b>CLASS: TE</b>		<b>DEPARTMENT: ELELECTRICAL ENGG.</b>		
<b>LABORATORY: MICROPROCESSORS AND MICROCONTROLLER LAB</b>		<b>YEAR: 2021-22</b>	<b>PART:I</b>	<b>PAGE:4</b>
	<b>CSMSS's CHH. Shahu College of Engineering, Aurangabad</b>		<b>LABORATORY MANUAL</b>	

### Experiment No. 3

**Aim:**

To write an assembly language program for adding two 16 bit numbers

**Apparatus required:**

8085 micro processor kit

**Algorithm:**

- Step 1 : Start the microprocessor
- Step 2 : Get the 1<sup>st</sup> 8 bit in 'C' register (LSB) and 2<sup>nd</sup> 8 bit in 'H' register (MSB) of 16 bit number.
- Step 3 : Save the 1<sup>st</sup> 16 bit in 'DE' register pair
- Step 4 : Similarly get the 2<sup>nd</sup> 16 bit number and store it in 'HL' register pair.
- Step 5 : Get the lower byte of 1<sup>st</sup> number into 'L' register
- Step 6 : Add it with lower byte of 2<sup>nd</sup> number
- Step 7 : Store the result in 'L' register
- Step 8 : Get the higher byte of 1<sup>st</sup> number into accumulator
- Step 9 : Add it with higher byte of 2<sup>nd</sup> number and carry of the lower bit addition.
- Step 10 : Store the result in 'H' register
- Step 11 : Store 16 bit addition value in 'HL' register pair
- Step 12 : Stop program execution



**EXPERIMENT TITLE:** Subtracting two 8 bit numbers

Label	Mnemonics	Hex code	Comments
2000	MVI C 00	0E, 00	C = 00H
2002	LHLD 2501	2A, (01, 25)	HL - 1 <sup>ST</sup> NO
2005	XCHG	EB	HL – DE
2006	LHLD 2503	2A (03, 25)	HL – 2 <sup>ND</sup> NO
2009	DAD D	19	Double Addition DE + HL
200A	JNC 200E	D2 (0E, 20)	If Cy = 0, Go to 200E
200D	INR C	0C	C = C + 01
200E	AHEAD SHLD 2505	22 (05, 25)	HL – 2505 (Sum)
2011	MOV A,C	79	Cy – A
2012	STA 2507	32 (07, 25)	Cy – 2507
2015	RST 5	EF	Stop Execution
	END		

**Input**

Without carry:-

Input Address	Value
2501	98 H
2502	5B H
2503	4C H
2504	8E H

Output :-

Output Address	Value
2505	E4 (Sum)
2506	E9 (Sum)
2507	00 (Carry)

**Input**

With carry:-

Input Address	Value
2501	45 H
2502	A6 H
2503	23 H
2504	9B H

Output :-

Output Address	Value
2505	68 (Sum)
2506	41 (Sum)
2507	01 (Carry)

**Result:**

The assembly language program for addition of two 16 bit numbers was executed using

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<b>EXPERIMENT NO. : CSMSS/EE/MPLAB/MP/04</b>			
<b>CLASS: TE</b>		<b>DEPARTMENT: ELECTRICAL ENGG.</b>	
<b>LABORATORY: MICROPROCESSORS AND MICROCONTROLLER LAB</b>		<b>YEAR: 2021-22</b>	<b>PART:I</b>
			<b>PAGE:7</b>

### Experiment No. 4

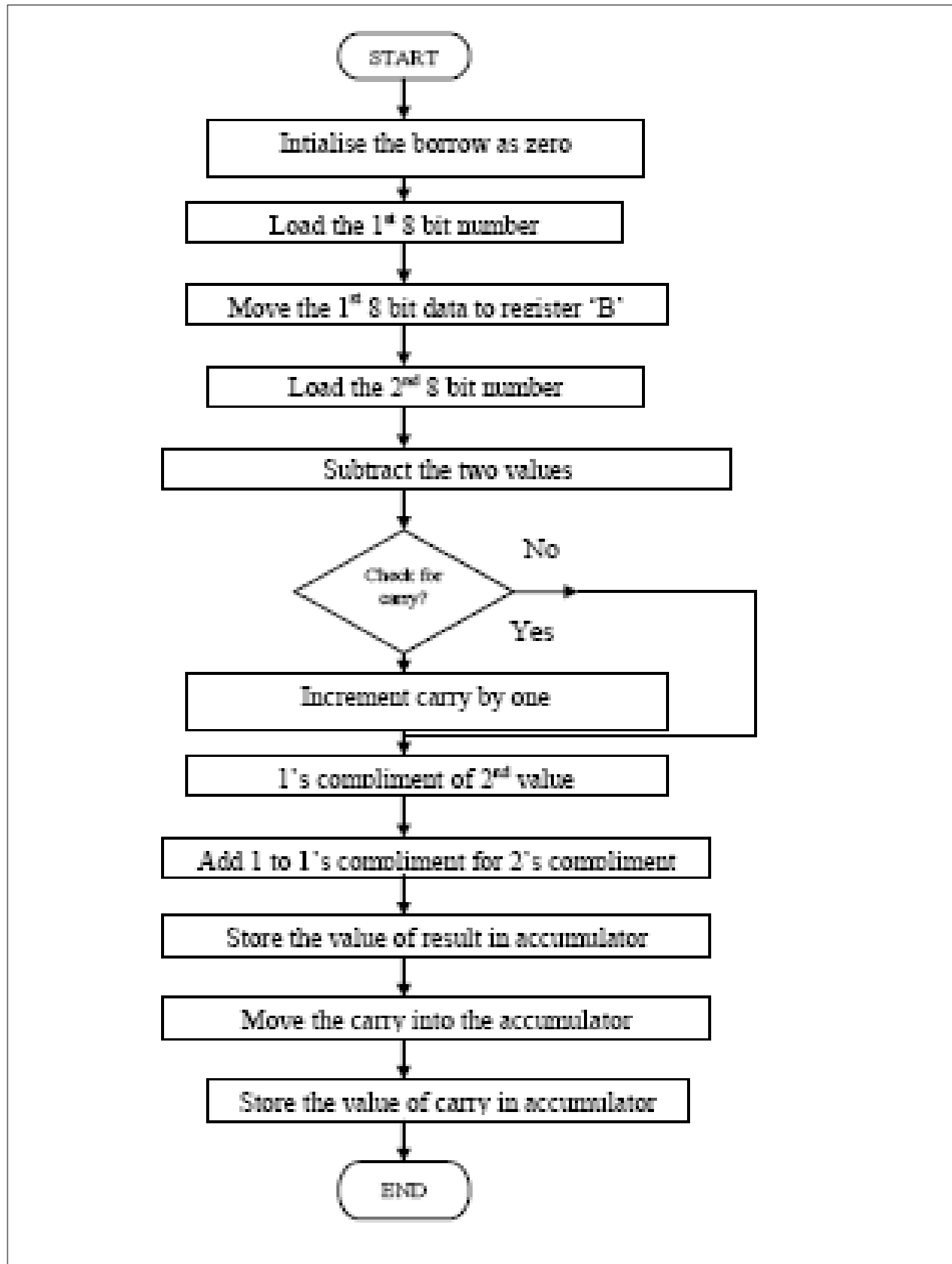
**Aim:-** To write an assembly language for subtracting two 8 bit numbers

**Apparatus required:**

8085 micro processor kit

**Algorithm:**

- Step 1 : Start the microprocessor
- Step 2 : Initialize the carry as 'Zero'
- Step 3 : Load the first 8 bit data into the accumulator
- Step 4 : Copy the contents of contents into the register 'B'
- Step 5 : Load the second 8 bit data into the accumulator.
- Step 6 : Subtract the 2 8 bit datas and check for borrow.
- Step 7 : Jump on if no borrow
- Step 8 : Increment borrow if there is
- Step 9 : 2's compliment of accumulator is found out
- Step 10 : Store the result in the accumulator
- Step 11 : More the borrow value from 'c' to accumulator
- Step 12 : Store the borrow value in the accumulator
- Step 13 : Stop program execution



Address	Label	Mnemonics	Machine code	Comments
2000		LXI H 2501	21,01,25	Get address of 1 <sup>st</sup> number in H-L pair
2003		MOV A,M	7E	1 <sup>ST</sup> number in accumulator
2004		INX H	23	Content of H-L pair increases from 2501 to 2502 H
2005		SUB M	96	1 <sup>ST</sup> NUMBER – 2 <sup>ND</sup> NUMBER
2006		INX H	23	CONTENT OF H-L PAIR BECOMS 2503 H
2007		MOV M,A	77	STORE RESULT IN 2503 H
2008		RST 5	EF	HALT
		END		

Input :-

Input Address	DATA
2501	49 H
2502	32 H

Output :-

Output Address	DATA
2503	17 H

Input :-


Input Address	DATA
2501	F8 H
2502	9B H

Output :-

Output Address	DATA
2503	5D H

**Result:**

The assembly language program subtraction of two 8 bit numbers was executed successfully by using 8085 microprocessor kit.

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	<b>Practical Experiment Instruction Sheet</b>			
<b>EXPERIMENT TITLE:</b> Subtracting two 16 bit numbers				
<b>EXPERIMENT NO. :</b> CSMSS/EE/MPLAB/MP/05				
<b>CLASS:</b> TE		<b>DEPARTMENT:</b> ELECTRICAL ENGG.		
<b>LABORATORY:</b> MICROPROCESSORS AND MICROCONTROLLER LAB		<b>YEAR:</b> 2021-22	<b>PART:</b> I	<b>PAGE:</b> 10

### Experiment No. 5

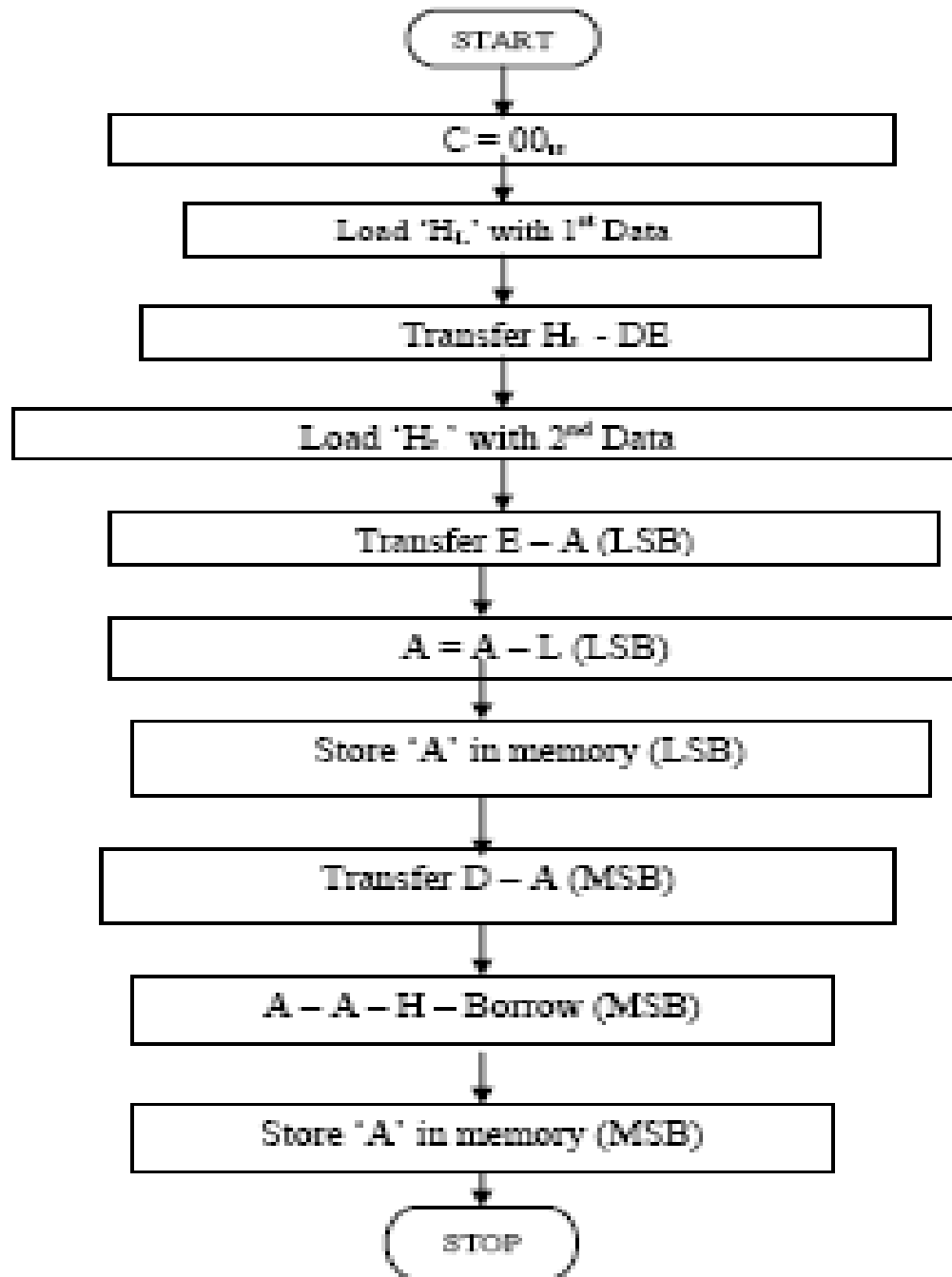
**Aim:-** To write an assembly language for subtracting two 16 bit numbers

**Apparatus required:**

8085 micro processor kit

**Algorithm:**

- Step 1 : Start the microprocessor
- Step 2 : Get the 1<sup>st</sup> 16 bit in 'HL' register pair
- Step 3 : Save the 1<sup>st</sup> 16 bit in 'DE' register pair
- Step 4 : Get the 2<sup>nd</sup> 16 bit number in 'HL' register pair
- Step 5 : Get the lower byte of 1<sup>st</sup> number
- Step 6 : Get the subtracted value of 2<sup>nd</sup> number of lower byte by subtracting it with lower byte of 1<sup>st</sup> number
- Step 7 : Store the result in 'L' register
- Step 8 : Get the higher byte of 2<sup>nd</sup> number
- Step 9 : Subtract the higher byte of 1<sup>st</sup> number from 2<sup>nd</sup> number with borrow
- Step 10 : Store the result in 'HL' register
- Step 11 : Stop the program execution



Address	Label	Mnemonics	Hex code	Comments
2000		MVI C 00	0E, 00	C = 00H
2002		LHLD 2501	2A, (01, 25)	HL – 1 <sup>st</sup> No
2005		XCHG	EB	HL – DE
2006		LHLD 2503	2A, (02, 25)	HL – 2 <sup>nd</sup> No
2009		MOV A,E	7B	LSB of ‘1’ to ‘A’
200A		SUB L	95	A = A – L
200B		STA 2505	32 (04, 25)	A - Memory
200E		MOV A,D	7A	MSB of 1 to A
200F		SBB H	9C	A = A – H
2010		STA 2506	32 (05, 25)	A – Memory
2013		RST 5	EF	Stop the program execution
		END		


**Input**

Without borrow:-	Input Address	Value
	2501	07
	2502	08
	2503	05
	2504	06

Output :-	Output Address	Value
	2505	02
	2506	02

**Result:**

The assembly language program subtraction of two 16 bit numbers was executed successfully by using 8085 microprocessor kit.

	<b>CSMSS's CHH. Shahu College of Engineering, Aurangabad</b>		<b>LABORATORY MANUAL</b>	
	<b>Practical Experiment Instruction Sheet</b>			
	<b>EXPERIMENT TITLE: Ascending Order</b>			
<b>EXPERIMENT NO. : CSMSS/EE/MPLAB/MP/06</b>				
<b>CLASS: TE</b>		<b>DEPARTMENT: ELECTRICAL ENGG.</b>		
<b>LABORATORY: MICROPROCESSORS AND MICROCONTROLLER LAB</b>		<b>YEAR: 2021-22</b>	<b>PART:II</b>	<b>PAGE:19</b>

### Experiment No. 6

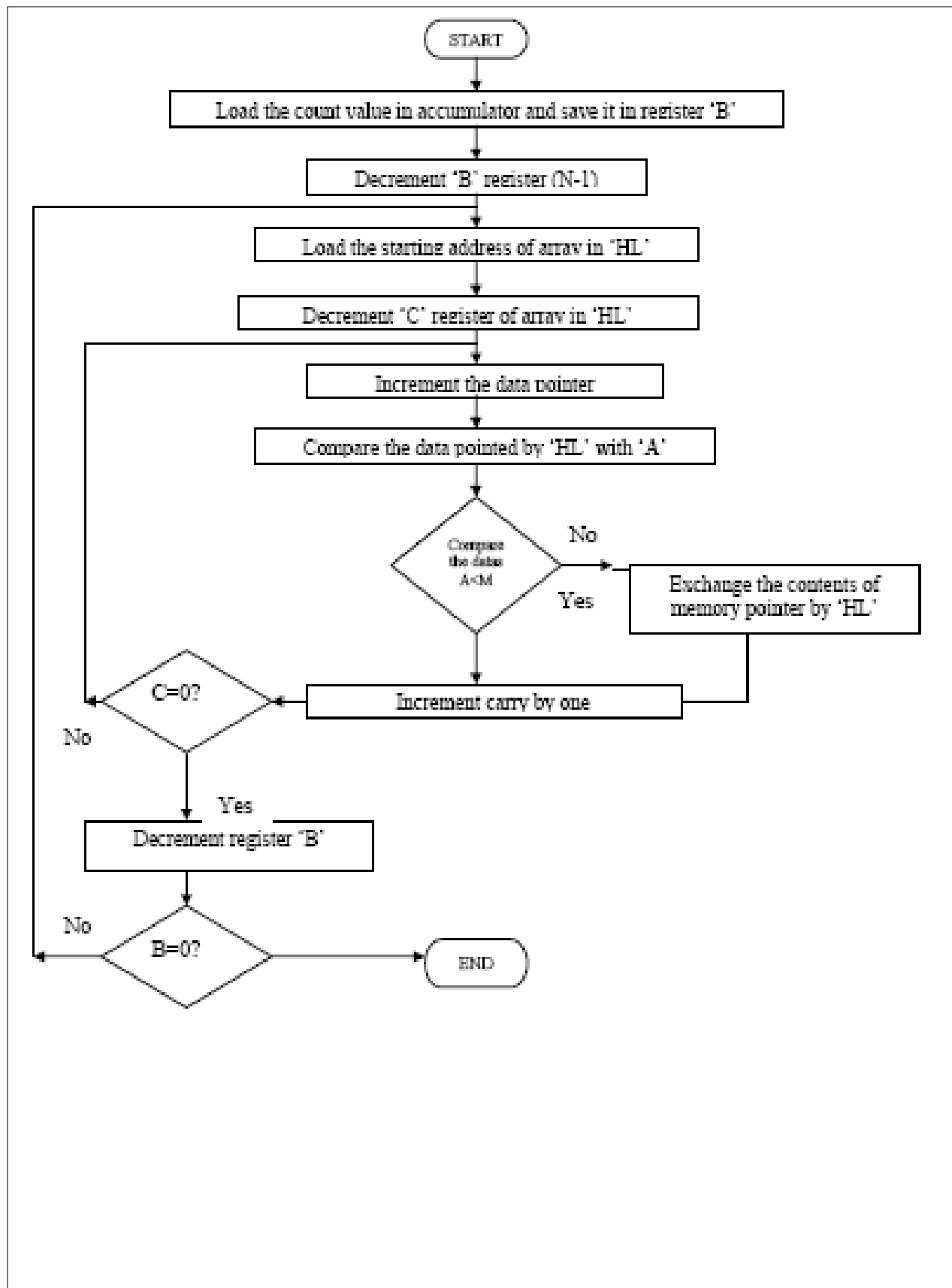
**Aim:-** To write a program to sort given 'n' numbers in ascending order

**Apparatus required:**

8085 micro processor kit

**Algorithm:**

- Step 1 : Start the microprocessor
- Step 2 : Accumulator is loaded with number of values to sorted and it is saved
- Step 3 : Decrement 8 register (N-1) Repetitions)
- Step 4 : Set 'HL' register pair as data array
- Step 5 : Set 'C' register as counter for (N-1) repetitions
- Step 6 : Load a data of the array in accumulator
- Step 7 : Compare the data pointed in 'HL' pair
- Step 8 : If the value of accumulator is smaller than memory, then jump to step 10.
- Step 9 : Otherwise exchange the contents of 'HL' pair and accumulator
- Step 10 : Decrement 'C' register, if the of 'C' is not zero go to step 6
- Step 11 : Decrement 'B' register, if value of 'B' is not zero, go step 3
- Step 12 : Stop the program execution



Address	Label	Mnemonics	Hex code	Comments
2100		LDA 2000	3A, 00,20	Load the number of values
2103		MOV B,A	47	Move it 'B' register
2104		DCR B	05	For (N-1) comparisons
2105	Loop 3	LXI H, 2000	21, 00,20	Set the pointer for array
2108		MOV C,M	4E	Count for (N-1) comparisons
2109		DCR C	0D	For (N-1) comparisons
210A		INX H	23	Increment pointer
210B	Loop 2	MOV A,M	7E	Get one data in array 'A'
210C		INX H	23	Increment pointer
210D		CMP M	BE	Compare next with accumulator
210E		JC 2116	DA, 16, 21	If content less memory go ahead
2111		MOV D,M	56	If it is greater than interchange it
2112		MOV M,A	77	Memory content
2113		DCX H	2B	Exchange the content of memory pointed by 'HL' by previous location
2114		MOV M,D	72	One in by 'HL' and previous location
2115		INX H	23	Increment pointer
2116	Loop 1	DCR C	0D	Decrement 'C' register
2117		JNZ 210B	C2, 0B, 21	Repeat until 'C' is zero
211A		DCR B	05	Decrement in 'B' values
211B		JNZ 2105	C2, 05, 21	Repeat till 'B' is zero
211E		RST 5	EF	Stop the program execution
		END		

#### Input


Input Address	Value
2000	04
2001	AB
2002	BC
2003	01
2004	0A

#### Output :-

Output Address	Value
2000	04
2001	01
2002	0A
2003	AB
2004	BC

**Result:** The assembly language program for sorting numbers in ascending order was executed by microprocessor kit.

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	<b>CSMSS's CHH. Shahu College of Engineering, Aurangabad</b>		<b>LABORATORY MANUAL</b>	
	<b>Practical Experiment Instruction Sheet</b>			
<b>EXPERIMENT TITLE:</b> Descending Order				
<b>EXPERIMENT NO. :</b> CSMSS/EE/MPLAB/MP/07				
<b>CLASS:</b> TE		<b>DEPARTMENT:</b> ELECTRICAL ENGG.		
<b>LABORATORY:</b> MICROPROCESSORS AND MICROCONTROLLER LAB		<b>YEAR:</b> 2021-22	<b>PART:</b> I	<b>PAGE:</b> 22

### Experiment No. 7

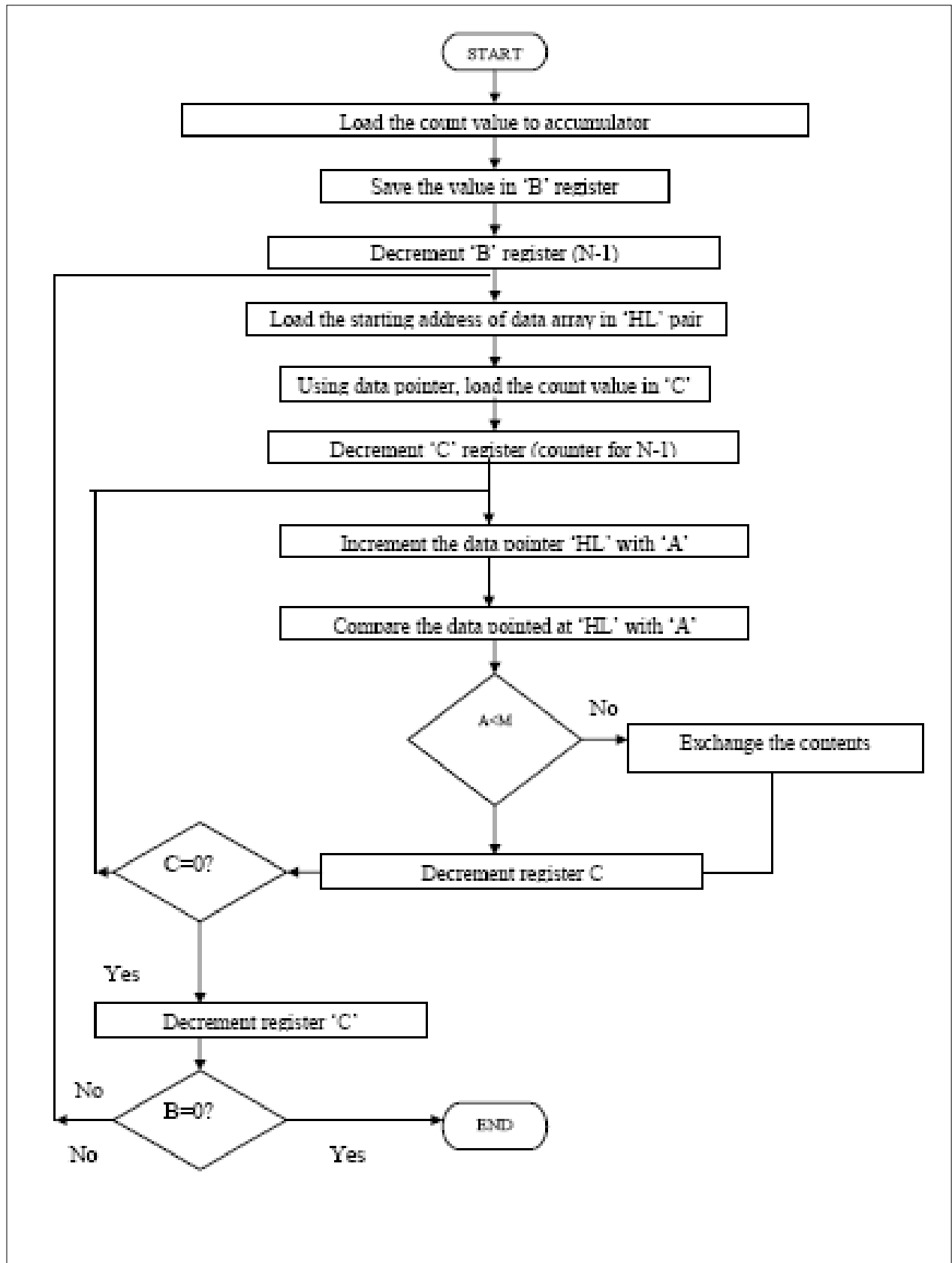
**Aim:-** To write a program to sort given 'n' numbers in descending order

**Apparatus required:**

8085 micro processor kit

**Algorithm:**

- Step 1 : Start the microprocessor
- Step 2 : Load the number of values into accumulator and save the number of values in register 'B'
- Step 3 : Decrement register 'B' for (N-1) Repetitions
- Step 4 : Set 'HL' register pair as data array address pointer and load the data of array in accumulator
- Step 5 : Set 'C' register as counter for (N-1) repetitions
- Step 6 : Increment 'HL' pair (data address pointer)
- Step 7 : Compare the data pointed by 'HL' with accumulator
- Step 8 : If the value of accumulator is larger than memory, then jump to step 10, otherwise next step.
- Step 9 : Exchange the contents of memory pointed by 'HL' and accumulator
- Step 10 : Decrement 'C' register, if the of 'C' is not zero go to step 6, otherwise next step.
- Step 11 : Decrement 'B' register, if 'B' is not zero, go step 3, otherwise next step.
- Step 12 : Stop the program execution



Address	Label	Mnemonics	Hex code	Comments
2100		LDA 4500	3A, 00,20	Load the number of values in accumulator
2103		MOV B,A	47	Move it to 'B' register
2104		DCR B	05	For (N-1) comparisons
2105	Loop 3	LXI H, 4500	21, 00,20	Set the pointer for array
2108		MOV C,M	4E	Count for (N-1) comparisons
2109		DCR C	0D	For (N-1) comparisons
210A		INX H	23	Increment pointer
210B	Loop 2	MOV A,M	7E	Get one data from array
210C		INX H	23	Increment pointer
210D		CMP M	BE	Compare next with number
210E		ICE, 2116	D2, 16,21	If content 'A' is greater than content of 'HL' pair
2111		MOV D,M	56	If it is greater than interchange the datas
2112		MOV M,A	77	Accumulator to memory value
2113		DCX H	2B	Decrement memory pointer
2114		MOV M,D	72	Move the old to 'HL' and previous location
2115		INX H	23	Increment pointer
2116	Loop 1	DCR C	0D	Decrement 'C' register
2117		JNZ 210B	C2, 0B, 21	Repeat till 'C' is zero
211A		DCR B	05	Decrement in 'B' values
211B		JNZ 2105	C2, 05, 21	Jump to loop till the value of 'B' be
211E		RST 5	EF	Stop the program execution
		END		

Input

Input Address	Value
2000	04
2001	AB
2002	BC
2003	01
2004	0A


Output :-

Output Address	Value
2000	04
2001	BC
2002	AB
2003	0A
2004	01

**Result:**

The assembly language program for sorting numbers in descending order was executed by microprocessor kit.

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	<b>Practical Experiment Instruction Sheet</b>			
	<b>EXPERIMENT TITLE: Speed control of Stepper Motor</b>			
<b>EXPERIMENT NO. : CSMSS/EE/MPLAB/MM/08</b>				
<b>CLASS: TE</b>		<b>DEPARTMENT: ELECTRICAL ENGG.</b>		
<b>LABORATORY: MICROPROCESSORS AND MICROCONTROLLER LAB</b>		<b>YEAR: 2021-22</b>	<b>PART:I</b>	<b>PAGE:25</b>

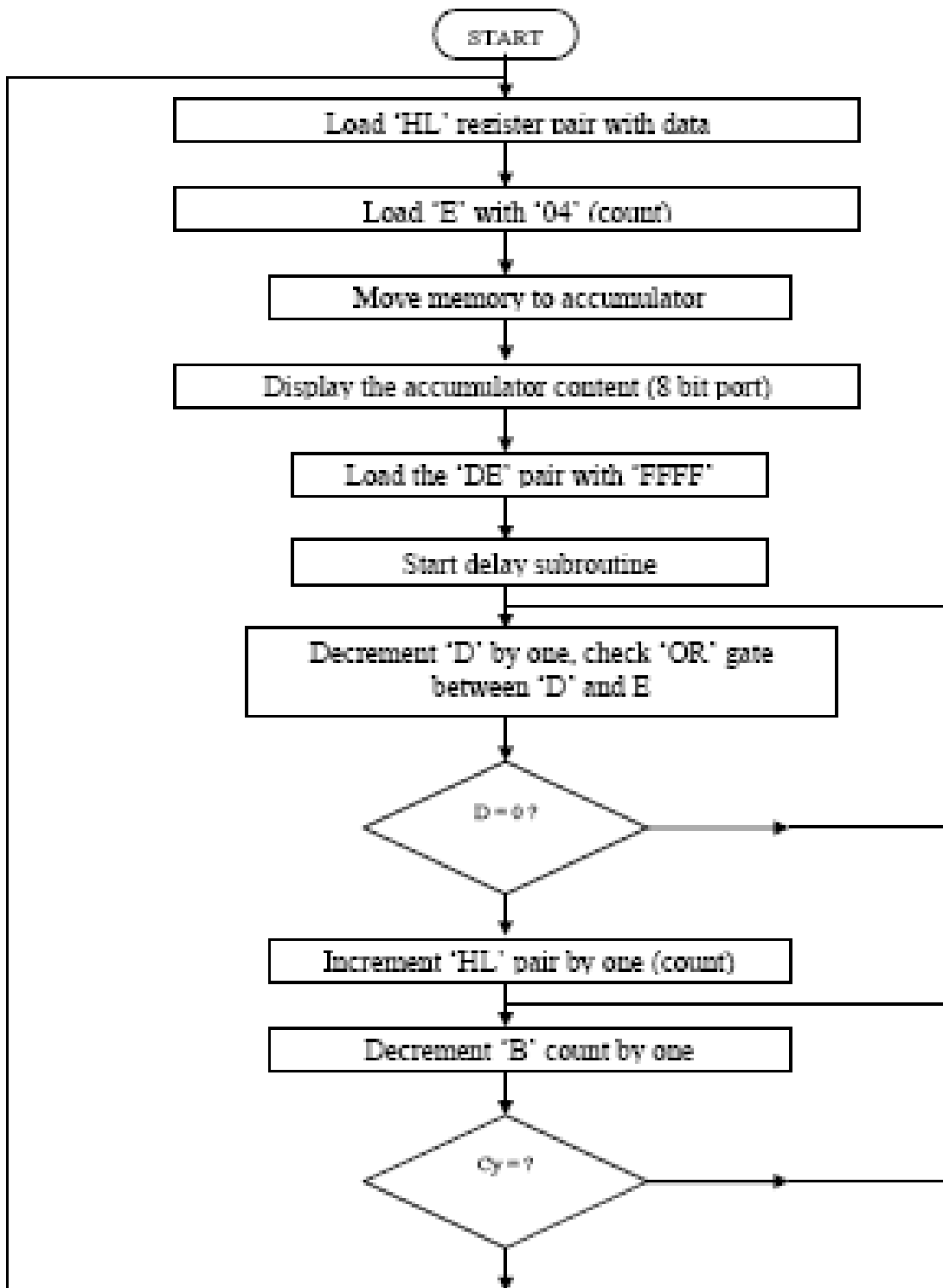
### Experiment No. 8

**Aim:-** To write an assembly program to make the stepper motor run in forward and reverse direction.

**Apparatus required:**  
8085 micro processor kit

**Algorithm:**

- Step 1 : Load the 'HL' pair with value from table
- Step 2 : Move it to 'B' register for setting the counter
- Step 3 : Move the memory value to accumulator and display it by control word
- Step 4 : Load 'DE' register pair with FFFF for starting delay subroutine
- Step 5 : Run the delay loop control D-register becomes zero.
- Step 6 : Increment 'H' address for next value from table
- Step 7 : Jump on no zero
- Step 8 : When B = 0, go to start and restart the program



Address	Label	Mnemonics	Hex code	Comments
2100	Start	LXI 211A	21,1A,41	Load the 'HL' with data
2103		MVI B 04	06,04	B = 04
2105	Repeat	MOV A,M	7E	Memory value to 'A'
2106		OUT	C0	Display it
2108		LXI 0303	D,03,03	Load 'DE' with FFFF
210B		Delay	NOP	Start delay loop
210C		DCX D	1B	Decrement DE by 1
210D		MOV A,E	7B	Move 'E' to 'A'
210E		ORA D	B2	Check De = 0 or not
210F		JNZ DELAY	C2, 0B, 21	Jump on zero
2112		INX H	23	Increment HL by 1
2113		DCR B	05	Decrement B by 1
2114		JNZ Repeat	C2, 05, 21	Jump on no zero
2117		JMP START	C3, 00, 21	Jump to start
		END		

#### Input


Input Address	Value
211A	0A
211B	06
211C	05
211D	09

#### Reverse Direction :-

Output Address	Value
211A	09
211B	05
211C	06
211D	0A

#### Result:

Thus, an assembly language program to control of stepper motor was written using 8085 microprocessor kit.

	<b>CSMSS's CHH. Shahu College of Engineering, Aurangabad</b>		<b>LABORATORY MANUAL</b>	
	<b>Practical Experiment Instruction Sheet</b>			
<b>EXPERIMENT TITLE:</b> Study of Microcontroller Programming Kit				
<b>EXPERIMENT NO. :</b> CSMSS/EE/MCLAB/MC/09				
<b>CLASS:</b> TE		<b>DEPARTMENT:</b> ELECTRICAL ENGG.		
<b>LABORATORY:</b> MICROPROCESSORS AND MICROCONTROLLER LAB		<b>YEAR:</b> 2021-22	<b>PART:</b> I	<b>PAGE:</b> 1

### Experiment No. 9

**Aim:-** To Study of 8051 Microcontroller Kit used in laboratory.

**Apparatus required:**

8051 microcontroller kit

**General Description:**

XPO 8051 series micro trainer kit is double board Microcontroller Training kit based on 8051 Microcontroller. It consist of top board called as MB or mother board and piggyback called as MPU connected under it.

**The MPU** consist of 8- bit microcontroller IC two or three PAL's to implement memory and IO address space decoder logic. Tow EPROM (27512) containing monitor program.

**The MB** consist of Two PPI (8255) One PTC (8253) One USART (8251) with one RS232 port. One RTC (58167) provides powerful monitor EPROM and user's RAM. The kit has 101 IBM compatible PC keyboard and 16 x 2 LCD display for any data entry or display. This kit has line assemble feature so that one can enter the program in assembly language.

**System Capabilities:**

11. Examine the contents of any memory location.
12. Examine/Modify the contents of any of the Microcontroller internal registers.
13. Modify the contents of any of the RAM location.
14. Move a block of data from one location to another location.
15. Insert one or more instructions in the user program.
16. Delete one or more instructions from the user program.
17. Relocate a program written for some memory area to some other memory area.
18. Find out string of data lying at a particular address.
19. Fill the particular memory area with a constant.

Prepared By : Mr. N.N. Nikam	Approved By : Prof. A. N. Mudiraj
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18. Insert one or more data bytes in the user's program/data area.
19. Delete one or more data bytes from the user's program/data area.
20. Enter any program in a mnemonics form using Assembler.
21. Examine any program in a mnemonics as well as intel hex code using disassembler.
22. Execute a program at full clock speed.
23. Execute a program in single step i.e., instruction by instruction.
24. Print the content of any memory location.

**Entering the program using assembler mode software as follows:**

**Step 1:** The kit is powered on and we get the display

**ANSHUMAN**

Now it is in command mode.

Press **E**

**Step 2:** Display changes to

**A – ASSEMBLE MODE**

**C – DISASSEMBLE MODE**

Press **A**

**Step 3:** Display changes to

**ADR:**

**6000**

Here we can change the starting address. Enter the starting address of the program (example **ORG 6150H**)

**Step 4:** Now start entering the program. The address of instruction will be displayed

Automatically

**Example:**


Address	Mnemonics
6000	MOV A,#20H
6002	MOV 0F0H,#21H
6005	ADD A,0F0H
600B	RET

**Execute the program:**

Step	Press Key	Display	Description
1	<b>Esc</b>	<b>COMMAND=</b>	Come to command mode.
2	<b>G</b>	<b>GO TO?</b>	Use Goto command to execute program
3	<b>CR (ENTER)</b>	<b>BRUST</b>	Use go to burst mode.
4	<b>CR (ENTER)</b>	<b>ADDR</b>	Asks program address.
Here enter starting address of program that has to be executed (Ex 6000).			
5	<b>CR (ENTER)</b>	<b>WAIT DONE</b>	Program executed.

**Examine or modify the contents of registers:**

**Result:** Thus we have studied the 8051 microcontroller programming kit. To perform assembly programming and execution.

	<b>CSMSS's CHH. Shahu College of Engineering, Aurangabad</b>		<b>LABORATORY MANUAL</b>	
	<b>Practical Experiment Instruction Sheet</b>			
	<b>EXPERIMENT TITLE: Transfer Data From Internal RAM To External RAM Location</b>			
<b>EXPERIMENT NO. : CSMSS/EE/MC LAB/MC/10</b>				
<b>CLASS: TE</b>		<b>DEPARTMENT: ELECTRICAL ENGG.</b>		
<b>LABORATORY: MICROPROCESSORS AND MICROCONTROLLER LAB</b>		<b>YEAR: 2021-22</b>	<b>PART:I</b>	<b>PAGE:1</b>

### **Experiment No. 10**

**Aim:-** To write an assembly language program to transfer content of internal RAM to external RAM

**Apparatus required:**  
8051 micro controller kit

**Algorithm:**

- Step 1 : start the 8051 microcontroller kit.
- Step 2 : initialize External data memory pointer
- Step 3 : Copy the content of address 20 H to Acc.
- Step 4 : Copy the content of Acc. To external data pointer pointed by DPTR
- Step 5 : Increment DPTR by one
- Step 6 : Copy the content of address 21 H to Acc.
- Step 7 : Copy the content of Acc. To external data pointer pointed by DPTR
- Step 8 : Increment DPTR by one
- Step 9 : Copy the content of address 22 H to Acc.
- Step 10 : Copy the content of Acc. To external data pointer pointed by DPTR
- Step 11 : Increment DPTR by one
- Step 12 : Copy the content of address 23 H to Acc.
- Step 13 : Copy the content of Acc. To external data pointer pointed by DPTR

Address	Label	Mnemonics	Machine code	Comments
7000		MOV DPTR,#7400 H	90,74,00	External data memory pointer
7003		MOV A,20 H	E5,20	Copy the content of address 20 H to Acc.
7005		MOVX @DPTR,A	F0	Copy the content of Acc. To external data pointer pointed by DPTR
7006		INC DPTR	A3	Increment DPTR by one
7007		MOV A,21 H	E5,21	Copy the content of address 21 H to Acc.
7009		MOVX @DPTR,A	F0	Copy the content of Acc. To external data pointer pointed by DPTR
700A		INC DPTR	A3	Increment DPTR by one
700B		MOV A,22 H	E5,22	Copy the content of address 22 H to Acc.
700D		MOVX @DPTR,A	F0	Copy the content of Acc. To external data pointer pointed by DPTR
700E		INC DPTR	A3	Increment DPTR by one
700F		MOV A,23 H	E5,23	Copy the content of address 23 H to Acc.
7011		MOVX @DPTR,A	F0	Copy the content of Acc. To external data pointer pointed by DPTR
7012		RET	22	


**Input :-**

Address	Data
20	
21	
23	
24	

**Output :-**

Address	Data
7400	
7401	
7402	
7403	

**Result:** The assembly language program to transfer content of internal RAM to external RAM was executed successfully by using 8051 microcontroller kit.

	<b>CSMSS's CHH. Shahu College of Engineering, Aurangabad</b>		<b>LABORATORY MANUAL</b>	
	<b>Practical Experiment Instruction Sheet</b>			
	<b>EXPERIMENT TITLE: Adding two 8 bit numbers</b>			
<b>EXPERIMENT NO. : CSMSS/EE/MCLAB/MC/11</b>				
<b>CLASS: TE</b>		<b>DEPARTMENT: ELELECTRICAL ENGG.</b>		
<b>LABORATORY: MICROPROCESSORS AND MICROCONTROLLER LAB</b>		<b>YEAR: 2021-22</b>	<b>PART:I</b>	<b>PAGE:3</b>

### Experiment No.11

**Aim:**

To write an assembly language program for adding two 8 bit numbers

**A) With carry**

**B) without carry.**

**Apparatus required:**

8085 micro processor kit

**Algorithm:**

**A) Addition of 8 bit no with carry.**

Step 1 : External data memory pointer

Step 2 : Load the content in Acc. pointed by DPTR

Step 3 : Increment DPTR by one

Step 4 : Copy the content of Acc. to R0

Step 5 : Load the content in Acc. pointed by DPTR

Step 6 : Add the content of Acc. And R0 , store result in Acc.

Step 7 : Increment DPTR by one

Step 8 : Store result in external RAM

Address	Label	Mnemonics	Hex code	Comments
7000		MOV DPTR,#7400 H	90,74,00	External data memory pointer
7003		MOVX A,@DPTR	E0	Load the content in Acc. pointed by DPTR
7004		INC DPTR	A3	Increment DPTR by one
7005		MOV R0,A	F8	Copy the content of Acc. to R0
7006		MOVX A,@DPTR	E0	Load the content in Acc. pointed by DPTR
7007		ADD A,R0	28	Add the content of Acc. And R0 , store result in Acc.
7008		INC DPTR	A3	Increment DPTR by one
7009		MOVX @DPTR,A	F0	Store result in external RAM
700A		RET	22	

**Input :-**

Address	Data
7400	
7401	

**Output :-**

Address	Data
7402	

**B) Addition of 8 bit no with carry.**

Step 1 : Clear the content of internal RAM address 31 H

Step 2 : Copy the content of address 20 H to Acc.

Step 3 : Add the content of Acc. And internal RAM location 21 H store the result in Acc.

Step 4 : Store LSB of result

Step 5 : Clear Acc. Register

Step 6 : MSB of result

Step 7 : Store MSB of result

Address	Label	Mnemonics	Hex code	Comments
7000		MOV 31,#00H	75,31,00	Clear the content of internal RAM address 31 H
7003		MOV A,20H	E5,20	Copy the content of address 20 H to Acc.
7005		ADD A,21H	25,21	Add the content of Acc. And internal RAM location 21 H store the result in Acc.
7007		MOV 30H,A	F5,30	Store LSB of result.
7009		MOV A,#00H	74,00	Clear Acc. Register
700B		ADDC A,31H	35,31	MSB of result
700D		MOV 31,A	F5,31	Store MSB of result
700F		RET	22	


**Input :-**

Address	Data
20	
21	

**Output :-**

Address	Data
30 (LSB)	
31 (MSB)	

**Result:** The assembly language program for addition of two 8 bit numbers was executed using 8051 microcontroller kit.

	<b>CSMSS's CHH. Shahu College of Engineering, Aurangabad</b>		<b>LABORATORY MANUAL</b>	
	<b>Practical Experiment Instruction Sheet</b>			
	<b>EXPERIMENT TITLE: Subtracting two 8 bit numbers</b>			
<b>EXPERIMENT NO. : CSMSS/EE/MCLAB/MC/12</b>				
<b>CLASS: TE</b>		<b>DEPARTMENT: ELECTRICAL ENGG.</b>		
<b>LABORATORY: MICROPROCESSORS AND MICROCONTROLLER LAB</b>		<b>YEAR: 2021-22</b>	<b>PART:I</b>	<b>PAGE:7</b>

### Experiment No. 12

**Aim:-** To write an assembly language for subtracting two 8 bit numbers

- A) Data is stored in external RAM location.**
- B) Data is stored in internal RAM location.**

**Apparatus required:**

8051 microcontroller kit

**Algorithm:**

- A) Data is stored in external RAM location.**

- Step 1 : Clear Carry
- Step 2 : External memory data pointer
- Step 3 : Load data in Acc.
- Step 4 : Increment DPTR by one
- Step 5 : Copy the content of Acc. to R0
- Step 6 : Load the data in Acc.
- Step 7 :  $(A)-(R0)-(CF)=A$
- Step 8 : Increment DPTR by one
- Step 9 : Store result

Address	Label	Mnemonics	Hex code	Comments
7000		MOV 0D0H,#00H	75,D0,00	Clear Carry
7003		MOV DPTR,#7400 H	90,74,00	External memory data pointer
7006		MOVX A,@DPTR	E0	Load data in Acc.
7007		INC DPTR	A3	Increment DPTR by one
7008		MOV R0,A	F8	Copy the content of Acc. to R0
7009		MOVX A,@DPTR	E0	Load the data in Acc.
700A		SUBB A,R0	98	(A)-(R0)-(CF)=A
700B		INC DPTR	A3	Increment DPTR by one
700C		MOVX @DPTR,A	F0	Store result
700D		RET	22	

**Input :-**

Address	Data
7400	
7401	

**Output :-**

Address	Data
7402	

**B) Data is stored in internal RAM location.**

Step 1 : Clear Carry

Step 2 : Load data in Acc.

Step 3: (A)-(21H)-(CF)=A

Step 4 : Store result

Address	Label	Mnemonics	Hex code	Comments
7000		MOV 0D0H,#00H	75,D0,00	Clear Carry
7003		MOV A,20 H	E5,20	Load data in Acc.
7005		SUBB A,21 H	95,21	(A)-(21H)-(CF)=A
7007		MOV 22H,A	F5,22	Store result
7009		RET	22	

**Input :-**


Address	Data
20	
21	

**Output :-**

Address	Data
22	

**Result:**

The assembly language program subtraction of two 8 bit numbers was executed successfully by using 8051 microcontroller kit.

	<b>CSMSS's CHH. Shahu College of Engineering, Aurangabad</b>		<b>LABORATORY MANUAL</b>	
	<b>Practical Experiment Instruction Sheet</b>			
	<b>EXPERIMENT TITLE:</b> Multiply and divide two numbers number			
<b>EXPERIMENT NO. :</b> CSMSS/EE/MCLAB/MC/13 (A)				
<b>CLASS:</b> TE		<b>DEPARTMENT:</b> ELECTRICAL ENGG.		
<b>LABORATORY:</b> MICROPROCESSORS AND MICROCONTROLLER LAB		<b>YEAR:</b> 2021-22	<b>PART:</b> I	<b>PAGE:</b> 09

### Experiment No. 13(A)

**Aim:-A)** To write an assembly language for multiply two numbers stored in internal RAM

**Apparatus required:**

8051 microcontroller kit

**Algorithm:**

Step 1 : Load data in Acc.

Step 2 : load data in B

Step 3 :  $A \times B$  (multiply)

Step 4 : store LSB of result

Step 5 : Store MSB of result

Address	Label	Mnemonics	Hex code	Comments
7000		MOV A,15H	E5,15	Load data in Acc.
7002		MOV 0F0H,22H	85,22,F0	load data in B
7005		MUL AB	A4	A×B (multiply)
7006		MOV 23,A	F5,23	store LSB of result
7008		MOV 24H,0F0H	85,F0,24	Store MSB of result
700B		RET	22	

**Input :-**


Address	Data
15	
22	

**Output :-**

Address	Data
23	
24	

**Result:**

The assembly language program assembly language for multiply two numbers stored in internal RAM was executed successfully by using 8051 microcontroller kit.

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	<b>Practical Experiment Instruction Sheet</b>			
	<b>EXPERIMENT TITLE: Divide two number stored in internal RAM location</b>			
<b>EXPERIMENT NO. : CSMSS/EE/MCLAB/MC/13(B)</b>				
<b>CLASS: TE</b>		<b>DEPARTMENT: ELECTRICAL ENGG.</b>		
<b>LABORATORY: MICROPROCESSORS AND MICROCONTROLLER LAB</b>		<b>YEAR: 2021-22</b>	<b>PART:I</b>	<b>PAGE:11</b>

### Experiment No. 13(B)

**Aim:-** To write an assembly language for Divide two numbers stored in internal RAM.

**Apparatus required:**

8051 microcontroller kit

**Algorithm:**

Step 1 : Load data in Acc.

Step 2 : load data in B

Step 3 : Divide A by B

Step 4 : store quotient

Step 5 : Store reminder

Address	Label	Mnemonics	Hex code	Comments
7000		MOV A,20H	E5,20	Load data in Acc.
7002		MOV 0F0H,21H	85,21,F0	load data in B
7005		DIV AB	84	Divide A by B
7006		MOV 22,A	F5,22	store quotient
7008		MOV 23H,0F0H	85,F0,23	Store reminder
700B		RET	22	

**Input :-**

Address	Data
20	
21	

**Output :-**

Address	Data
22(quotient)	
23(reminder)	

**Result:**

The assembly language program assembly language for divide two numbers stored in internal RAM was executed successfully by using 8051 microcontroller kit.