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NATIONAL INSTITUTE OF TECHNOLOGY SILCHAR

CACHAR, ASSAM

# LABORATORY EXCERCISE BOOK

## B.TECH. III$^{RD}$ SEM.

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BRANCH: C.S.E. - B
SUBJECT: MICROPROCESSOR LAB
CODE : EE224

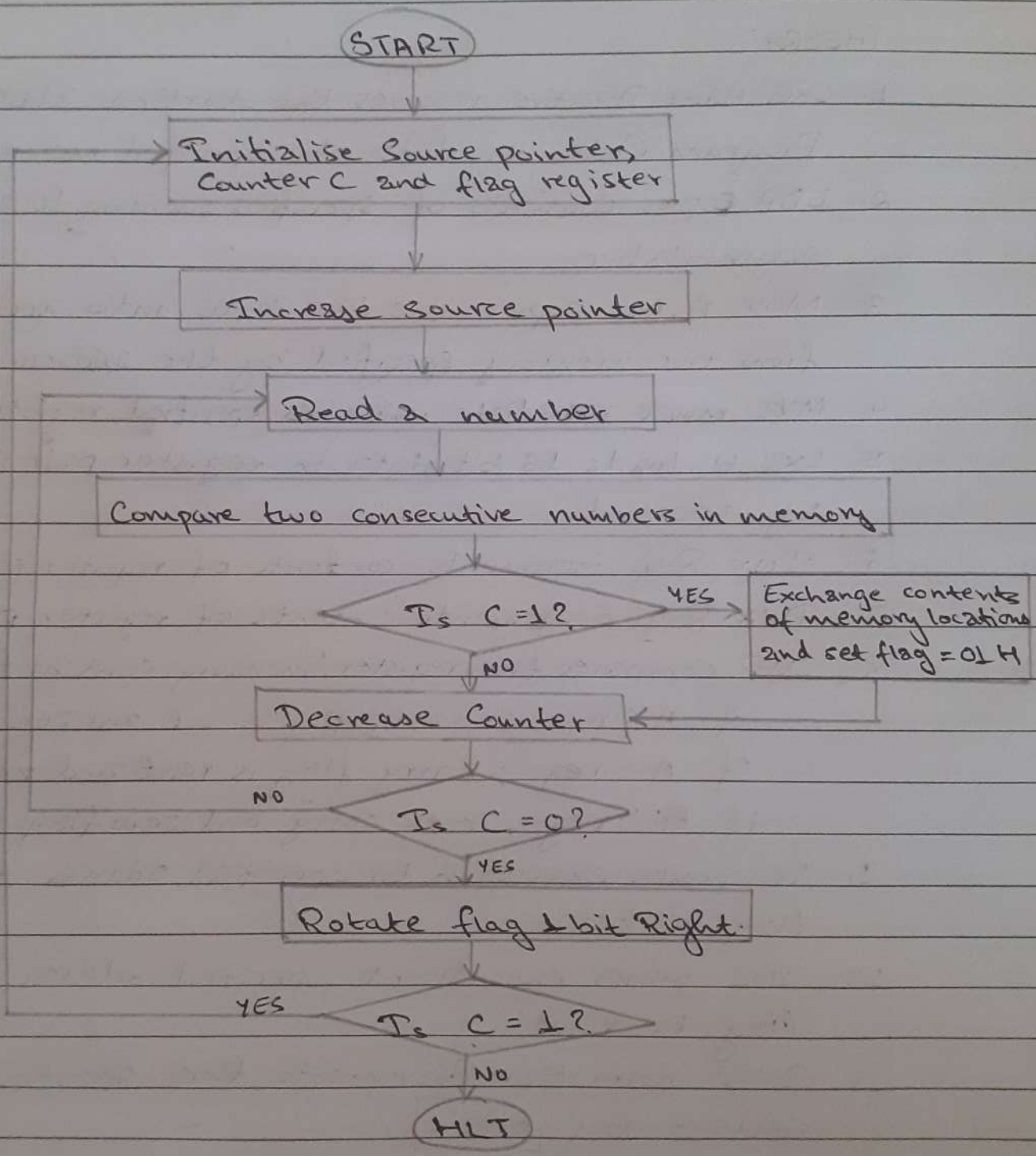
10/11/2020
Experiment-06

AIM: TO ARRANGE NUMBERS IN ASCENDING ORDER

THEORY:

1. ORG Addr. Directive reserves the starting address for Program Code or data in specified memory array.
2. LDA Copies contents of specified memory location to accumulator.
3. MOV A,M copies the data byte into accumulator from the memory specified by the address of HL pair.
4. MVI moves immediate value to specified register.
5. LXI H loads 16 bit data in register pair designated by operand.
6. INX Reg. increments contents of register pair by one.
7. DCX Reg. decrements contents of register pair by one.
8. CMP compares the register/memory content to accumulator
   if A < reg ; carry flag is set and zero flag is reset
   if A = reg ; carry flag is reset and zero flag is set
   if A > reg ; both carry and zero flag are reset.
9. JC jumps execution to specified address if carry flag is set.
10. JNZ jumps execution to specified address if zero flag is reset.
11. DCR instruction decrements the specified register content by one.
12. HLT stops any further execution.

FLOWCHART:


START
Initialise Source pointer, Counter C and flag register
Increase Source pointer
Read a number
Compare two consecutive numbers in memory
Is C = 1?
YES
Exchange contents of memory locations and set flag = 01 H
NO
Decrease Counter
Is C = 0?
NO
YES
Rotate flag 1 bit Right
Is C = 1?
YES
NO
HLT

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PROGRAM:

| Address | Label | Mnemonics | Opcode | Comment |
|---|---|---|---|---|
| | | #ORG 2000H | | |
| 2000 | | LDA F100H | 3A | Load count from F100 to Acc. |
| 2001 | | | 00 | |
| 2002 | | | F1 | |
| 2003 | | DCR A | 3D | Decrement A by 1 |
| 2004 | | MOV C,A | 4F | Moves A contents to C |
| 2005 | FRONT | MOV B,BC | 41 | Moves BC contents to B |
| 2006 | | LXI H,F200 | 21 | Loads F200 content in HL |
| 2007 | | | 00 | |
| 2008 | | | F2 | |
| 2009 | UP | MOV A,M | 7E | Moves HL pointed content to Acc |
| 200A | | INX H | 23 | Increases HL content by 1 |
| 200B | | CMP M | BE | Compares reg. M to A |
| 200C | | JC DOWN | DA | If A<M, jumps to DOWN |
| 200D | | | 14 | |
| 200E | | | 20 | |
| 200F | | MOV D,M | 56 | Moves M content to D |
| 2010 | | MOV M,A | 77 | Moves Acc. content to Memory |
| 2011 | | DCX H | 2B | Decreases HL content by 1 |
| 2012 | | MOV M,D | 72 | Moves D contents to Memory |
| 2013 | | INX H | 23 | Increases HL content by 1 |
| 2014 | DOWN | DCR B | 05 | Decreases B content by 1 |
| 2015 | | JNZ UP | C2 | If B≠0, jumps to UP |
| 2016 | | | 09 | |
| 2017 | | | 20 | |
| 2018 | | DCR C | 0D | Decrements C content by 1 |
| 2019 | | JNZ FRONT | C2 | If C≠0, jumps to FRONT |

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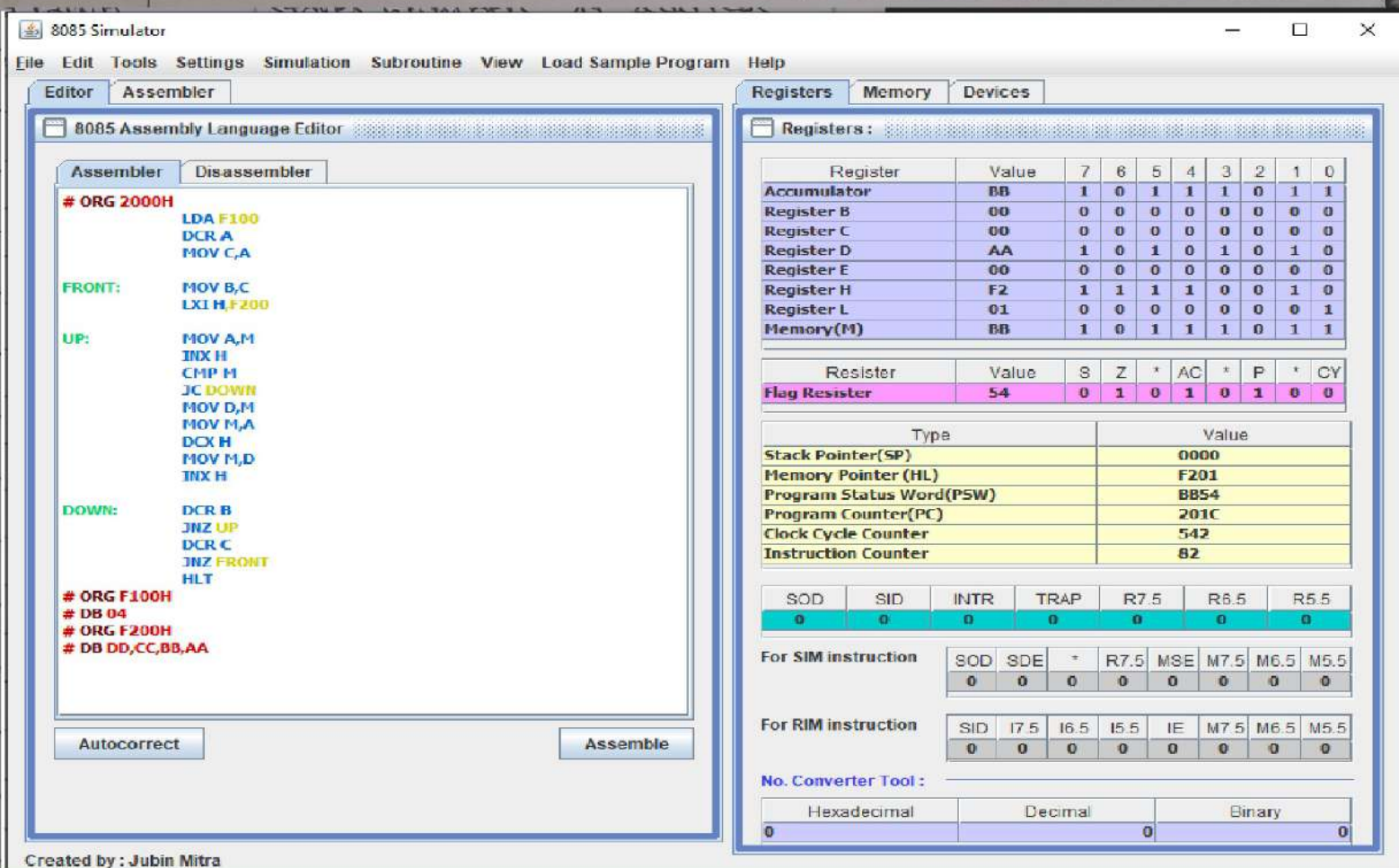
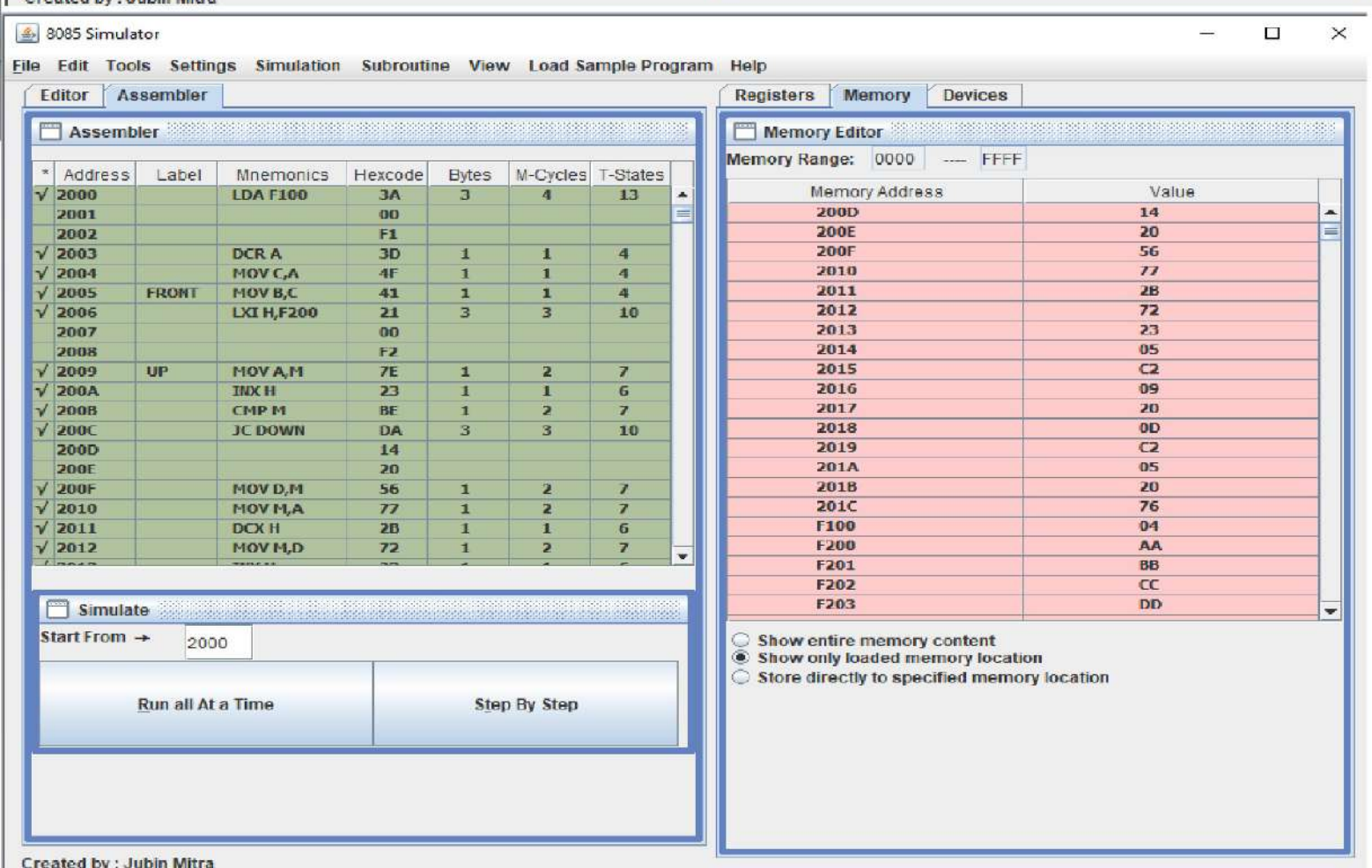
| | | | |
|---|---|---|---|
| 201A | | | |
| 201B | | | |
| 201C | HLT | 76 | Terminates further execution |
| | #ORG F100H | | Stores number count at address |
| | #DB 04 | | Gets this number when called. |
| | #ORG F200H | | Stores numbers at address |
| | #DB DD, CC, BB, AA | | Gets these numbers when add called |

RESULT:

Input: F100 - 04H; F200 - DDH;
F201 - CCH; F202 - BBH;
F203 - AAH;

Output: F200 - AAH; F201 - BBH;
F202 - CCH; F203 - DDH



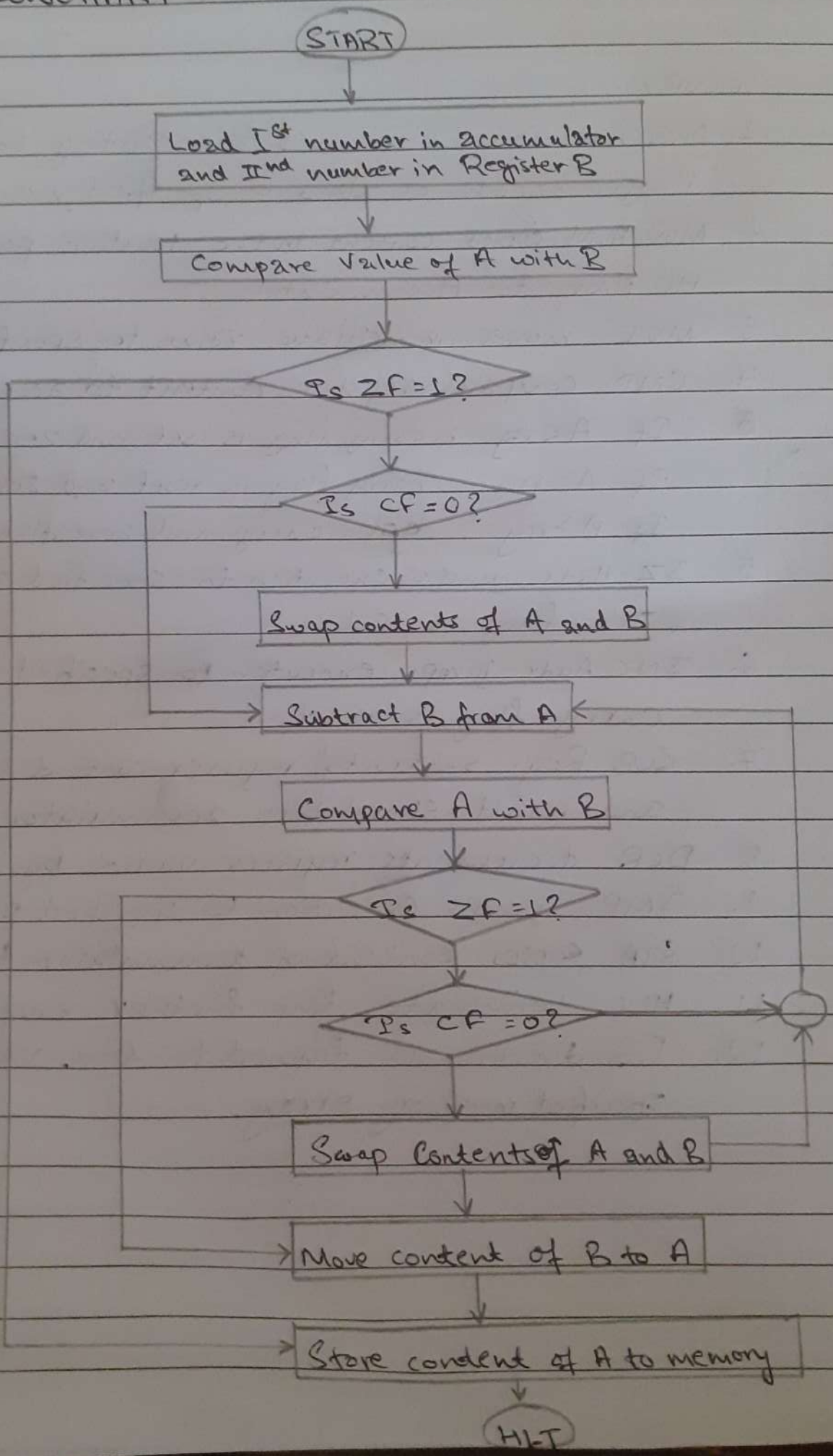
10/11/2020
Experiment-08

AIM : TO FIND GCD OF TWO NUMBERS.

THEORY:

1. ORG Addr. Directive reserves the starting address for Program Code or data in specified memory array.
2. MOV A,M copies content in the location pointed by HL pair to Accumulator.
3. MVI moves immediate value to specified register.
4. CMP compares register content to accumulator.
   If A < reg. ; carry flag is set and zero flag is reset
   If A = reg. ; carry flag is reset and zero flag is set.
   If A > reg. ; both carry and zero flags are reset.
5. JZ Addr. jumps execution to specified address if zero flag is set.
6. JNC Addr. jumps execution to specified address if carry flag is reset.
7. SUB Reg. subtracts register content by accumulator and result stored into accumulator.
8. DCR decrements register value by 1.
9. JMP jumps execution to specified address.
10. STA copies content of accumulator to address.
11. HLT terminates the further execution.
12. DB directive is defined to store values in specified memory array.

FLOWCHART:


START
Load I^st number in accumulator and II^nd number in Register B
Compare Value of A with B
Is ZF=1?
Is CF=0?
Swap contents of A and B
Subtract B from A
Compare A with B
Is ZF=1?
Is CF=0?
Swap Contents of A and B
Move content of B to A
Store content of A to memory
HLT

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PROGRAM:

| Address | Label | Mnemonics | Opcode | Comment |
|---|---|---|---|---|
| | | #ORG 2000H | | |
| 2000 | | MVI A,09 | 3E | Load first number in Accumulator |
| 2001 | | | 09 | |
| 2002 | | MVI B, 07 | 06 | Load second no in reg. B |
| 2003 | | | 07 | |
| 2004 | | CMP B | BB | Compare B to A |
| 2005 | | JZ DOWN | CA | if A=B, jumps to DOWN |
| 2006 | | | 1D | |
| 2007 | | | 20 | |
| 2008 | | INC SHIFT | D2 | if A>B, jump to SHIFT |
| 2009 | | | 0E | |
| 200A | | | 20 | |
| 200B | | MOV C,A | 4F | Move A contents to C |
| 200C | | MOV A,B | 78 | Move B contents to A |
| 200D | | MOV B,C | 41 | Move C contents to B |
| 200E | SHIFT | SUB B | 90 | Subtract B from A |
| 200F | | CMP B | 88 | Compare B to A |
| 2010 | | JZ MOVE | CA | if A=B, move to MOVE |
| 2011 | | | 1C | |
| 2012 | | | 20 | |
| 2013 | | INC SHIFT | D2 | If A>B, jump to SHIFT |
| 2014 | | | 0E | |
| 2015 | | | 20 | |
| 2016 | | MOV C,A | 4F | Move A contents to C |
| 2017 | | MOV A,B | 78 | Move B contents to A |
| 2018 | | MOV B,C | 41 | Move C contents to B |
| 2019 | | JMP SHIFT | C3 | Jump to SHIFT |

| | | | | |
|---|---|---|---|---|
| 201A | | | 0E | |
| 201B | | | 20 | |
| 201C | MOVE | MOV A,B | 78 | Move B content to Acc |
| 201D | DOWN | STA F200 | 32 | Store Acc content in F200 |
| 201E | | | 00 | |
| 201F | | | F2 | |
| 2020 | | HLT | 76 | Terminate |

RESULT:

Input: A - 09H ; B - 07H

Output: A - 01H ; F200 - 01H

8085 Simulator

File Edit Tools Settings Simulation Subroutine View Load Sample Program Help

Editor | Assembler

8085 Assembly Language Editor

Assembler | Disassembler

```
# ORG 2000H
        MVI A,09
        MVI B,07
        CMP B
        JZ DOWN
        JNC SHIFT
        MOV C,A
        MOV A,B
        MOV B,C
SHIFT:  SUB B
        CMP B
        JZ MOVE
        JNC SHIFT
        MOV C,A
        MOV A,B
        MOV B,C
        JMP SHIFT
MOVE:   MOV A,B
DOWN:   STA F200
        HLT
```

Autocorrect | Assemble

Created by : Jubin Mitra

Registers | Memory | Devices

Registers :

| Register | Value | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|---|---|---|---|---|---|---|---|---|---|
| Accumulator | 01 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| Register B | 01 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| Register C | 01 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 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 | 54 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 0 |

| Type | Value |
|---|---|
| Stack Pointer(SP) | 0000 |
| Memory Pointer (HL) | 0000 |
| Program Status Word(PSW) | 0154 |
| Program Counter(PC) | 2020 |
| Clock Cycle Counter | 213 |
| Instruction Counter | 35 |

| 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 |

8085 Simulator

File Edit Tools Settings Simulation Subroutine View Load Sample Program Help

Editor | Assembler

Assembler

| * | Address | Label | Mnemonics | Hexcode | Bytes | M-Cycles | T-States |
|---|---|---|---|---|---|---|---|
| √ | 2000 | | MVI A,09 | 3E | 2 | 2 | 7 |
| | 2001 | | | 09 | | | |
| √ | 2002 | | MVI B,07 | 06 | 2 | 2 | 7 |
| | 2003 | | | 07 | | | |
| √ | 2004 | | CMP B | B8 | 1 | 1 | 4 |
| √ | 2005 | | JZ DOWN | CA | 3 | 3 | 10 |
| | 2006 | | | 1D | | | |
| | 2007 | | | 20 | | | |
| √ | 2008 | | JNC SHIFT | D2 | 3 | 3 | 10 |
| | 2009 | | | 0E | | | |
| | 200A | | | 20 | | | |
| √ | 200B | | MOV C,A | 4F | 1 | 1 | 4 |
| √ | 200C | | MOV A,B | 78 | 1 | 1 | 4 |
| √ | 200D | | MOV B,C | 41 | 1 | 1 | 4 |
| √ | 200E | SHIFT | SUB B | 90 | 1 | 1 | 4 |
| √ | 200F | | CMP B | B8 | 1 | 1 | 4 |
| √ | 2010 | | JZ MOVE | CA | 3 | 3 | 10 |
| | 2011 | | | 1C | | | |
| | 2012 | | | 20 | | | |

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 |
|---|---|
| 200C | 78 |
| 200D | 41 |
| 200E | 90 |
| 200F | B8 |
| 2010 | CA |
| 2011 | 1C |
| 2012 | 20 |
| 2013 | D2 |
| 2014 | 0E |
| 2015 | 20 |
| 2016 | 4F |
| 2017 | 78 |
| 2018 | 41 |
| 2019 | C3 |
| 201A | 0F |
| 201B | 20 |
| 201C | 78 |
| 201D | 32 |
| 201F | F2 |
| 2020 | 76 |
| F200 | 01 |

- ○ Show entire memory content
- ◉ Show only loaded memory location
- ○ Store directly to specified memory location