# Experiment No - 4

**Aim**: (A) Write an assembly language program to multiply two 8-bit numbers stored in memory by bit rotation method using 8085 simulator. Store result in the memory

(B) Write an assembly language program to find the minimum of two 8-bit numbers stored in the memory location 2050H and 2051H using 8085 simulator. Store the result in 2052H

**Date:** 06/03/2023

**Competency and Practical Skills:** Logic building, Programming and Analyzing

## Relevant CO: CO3

**Objectives:** (a) To recall data transfer and arithmetic instructions of 8085 microprocessor

(b) To use data transfer and arithmetic instructions in programs.

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**Equipment/Instruments:** 8085 microprocessor kit / 8085 Simulator

## Program:

1. **Program to multiply two 8-bit numbers stored in memory by bit rotation method using 8085 simulator. Store result in the memory**

**Input :** (1000H) : 02H

(1001H) : 03H

**Output :** (1003H) : 06H

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Address** | **Label** | **Mnemonics** | **Hex Code** | **Comments** |
| 0000 |  | LXI H,1000 | 21 | ; Load data in HL register pair from memory  address 1000H |
| 0001 |  |  | 00 |  |
| 0002 |  |  | 10 |  |
| 0003 |  | MOV B,M | 46 | ; Transfer data of memory to register B |
| 0004 |  | INX H | 23 | ; Increment HL pair by one |
| 0005 |  | MOV C,M | 4E | ; Transfer data of memory to register C |
| 0006 | L1: | ADD B | 80 | ; Add data of register B in accumulator |
| 0007 |  | DCR C | 0D | ; decrement counter register by one |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 0008 |  | JNZ L1 | C2 | ; jump to label L1 if not zero |
| 0009 |  |  | 06 |  |
| 000A |  |  | 00 |  |
| 000B |  | JZ L2 | CA | ; Jump to label L2 if not zero |
| 000C |  |  | DE |  |
| 000D |  |  | 00 |  |
| 000E | L2: | STA 1003 | 32 | ; Store data into memory address 1003H |
| 000F |  |  | 03 |  |
| 0010 |  |  | 10 |  |
| 0011 |  | HLT | 76 | ; End of the program |

## Program to find the minimum of two 8-bit numbers stored in the memory location 2050H and 2051H using 8085 simulator. Store the result in 2052H

**Input :** (2050H) : 05H

( 2051H) : 09H

**Output :** (2052H) : 05H

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Address** | **Label** | **Mnemonics** | **Hex Code** | **Comments** |
| 0000 |  | LDA 2050H | 3A | ; load the value of the first number into  accumulator A |
| 0001 |  |  | 50 |  |
| 0002 |  |  | 20 |  |
| 0003 |  | MOV B, A | 47 | ; copy the value of A into register B |
| 0004 |  | LDA 2051H | 3A | ; load the value of the second number into  accumulator A |
| 0005 |  |  | 51 |  |
| 0006 |  |  | 20 |  |
| 0007 |  | CMP B | B8 | ; compare the value of A with B |
| 0008 |  | JC LABEL | DA | ; jump to LABEL if the carry flag is set (i.e., B is  smaller) |
| 0009 |  |  | 0C |  |
| 000A |  |  | 00 |  |
| 000B |  | MOV A, B | 78 | ; copy the value of B into accumulator A  (minimum value) |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 000C | LABEL: | STA 2052H | 32 | ; store the minimum value in memory location  2052H |
| 000D |  |  | 52 |  |
| 000E |  |  | 20 |  |
| 000F |  | HLT | 76 | ; End of the program |

## Observations:

By performing this above experiments I have observe that to compare hex value in 8085 simulator we need to use CMP instruction which is compare value that is store in register and accumulator. After that which value is smaller that is store in memory location in 2052 from accumulator.

## Conclusion:

By performing this above experiments I have seen that In 8085 Multiplication is not directly possible so, addition is done through iterative way to make the product easily . Flag Bits like carry and sign bit are very important to perform certain ALU operations easily .

## Quiz:

* 1. What is the meaning of bit manipulation?
  2. What is the use of rotate instruction?
  3. What is the use of compare instruction?

## Suggested Reference:

8085 – Microprocessor architecture, programming and interfacing by Ramesh S. Goankar, 5th edition, prentice hall publication.

## References used by the students:

Use of ChatGPT to understanding code in better way: https://chat.openai.com/chat

**Rubric wise marks obtained:**

|  |  |  |  |  |  |  |  |  |  |  |  |
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| **Rubrics** | **Knowledge (2)** | | **Problem**  **Recognition (2)** | | **Logic Building (2)** | | **Completeness**  **and accuracy (2)** | | **Ethics (2)** | | **Total** |
| **Good**  **(2)** | **Average**  **(1)** | **Good**  **(2)** | **Average**  **(1)** | **Good**  **(2)** | **Average**  **(1)** | **Good**  **(2)** | **Average**  **(1)** | **Good**  **(2)** | **Average**  **(1)** |
| **Marks** |  |  |  |  |  |  |  |  |  |  |  |

# Experiment No - 5

**Aim**: (A) Write an assembly language program using 8085 simulator to find square-root of a given number. Display result on output port number 01H

(B) Write an assembly language program to find a factorial of a given number using 8085 simulator. Display result on output port number 0AH

**Date:** 13/03/2023

**Competency and Practical Skills:** Logic building, Programming and Analyzing

## Relevant CO: CO3

**Objectives:** (a) To recall arithmetic and I/O instructions of 8085 microprocessor

(b) To use arithmetic and I/O instructions in program.

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**Equipment/Instruments:** 8085 microprocessor kit / 8085 Simulator

## Program:

1. **Program to find square root of given 8-bit number using 8085 simulator. Display result on output port number 01H**

**Input :** (3050): 09H

**Output :** (01) : 03H

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Address** | **Label** | **Mnemonics** | **Hex Code** | **Comments** |
| 0000 |  | MVI C,00 | 0E | ; Transfer 00 to register C |
| 0001 |  |  | 00 |  |
| 0002 |  | LXI H,3050 | 21 | ; Loads the register pair HL with the contents of  memory location 3050 |
| 0003 |  |  | 50 |  |
| 0004 |  |  | 30 |  |
| 0005 |  | MOV A,M | 7E | ; Transfer data of memory to accumulator |
| 0006 |  | MVI B,01 | 06 | ; Transfer 01 to register B |
| 0007 |  |  | 01 |  |
| 0008 | LOOP: | SUB B | 90 | ; Subtract register B |
| 0009 |  | INR B | 04 | ; Increment register B value by one |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 000A |  | INR B | 04 | ; Increment register B value by one |
| 000B |  | INR C | 0C | ; Increment counter register C by one |
| 000C |  | CPI 00 | FE | ; Complement |
| 000D |  |  | 00 |  |
| 000E |  | JNZ LOOP | C2 | ; Jump if not getting zero |
| 000F |  |  | 08 |  |
| 0010 |  |  | 00 |  |
| 0011 |  | MOV A,C | 79 | ; Transfer counter data in accumulator |
| 0012 |  | OUT 01 | D3 | ; Show output in output port number 01 |
| 0013 |  |  | 01 |  |
| 0014 |  | HLT | 76 | ; End |

## Program to find a factorial of a given number using 8085 simulator. Display result on output port number 0AH

**Input :** (8000) : 05H

**Output :** (8001) : 78H

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Address** | **Label** | **Mnemonics** | **Hex Code** | **Comments** |
| 0000 |  | LXI H,8000 | 21 | ; Load data in HL register pair from memory  location 8000 |
| 0001 |  |  | 00 |  |
| 0002 |  |  | 80 |  |
| 0003 |  | MOV B,M | 46 | ; Transfer data of memory address to register B |
| 0004 |  | MVI D,01 | 16 | ; Transfer 01 to register D |
| 0005 |  |  | 01 |  |
| 0006 | FACT: | CALL MUL | CD | ; Call label MUL |
| 0007 |  |  | 10 |  |
| 0008 |  |  | 00 |  |
| 0009 |  | DCR B | 05 | ; Decrement register value by one |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 000A |  | JNZ FACT | C2 | ; Jump to label FACT if not zero |
| 000B |  |  | 06 |  |
| 000C |  |  | 00 |  |
| 000D |  | INX H | 23 | ; Increment HL pair |
| 000E |  | MOV M,D | 72 | ; Transfer data of register D to memory address |
| 000F |  | HLT | 76 | ; Holt |
| 0010 | MUL: | MOV E,B | 58 | ; Transfer data of register B to E |
| 0011 |  | XRA A | AF | ; Ex-OR contents of R with the Accumulator |
| 0012 | ML: | ADD D | 82 | ; Add data of register D into accumulator |
| 0013 |  | DCR E | 1D | ; Decrement register by one |
| 0014 |  | JNZ ML | C2 | ; Jump to lable ML if not zero |
| 0015 |  |  | 12 |  |
| 0016 |  |  | 00 |  |
| 0017 |  | MOV D,A | 57 | ; Transfer data of accumulator of register to  accumulator |
| 0018 |  | RET | C9 | ; Return from subroutine |

## Observations:

By performing above experiments I observe that to find square root of a number I need to use one counter register which store our square root value. This is only one specific method by which we can find any square root of give hex number in 8085 simulator.

## Conclusion:

By performing above experiment I find conclusion that there is nor direct method to do multiplication or square root of number we need to use specific method to find factorial and square root of given number.

## Quiz:

* 1. What is the meaning of port address?
  2. What is difference between memory mapped IO and I/O mapped I/O?
  3. How can you create loop statement in assembly language program?

## Suggested Reference:

8085 – Microprocessor architecture, programming and interfacing by Ramesh S. Goankar, 5th edition, prentice hall publication.

## References used by the students:

YouTube Video for Understanding purpose: **https://youtu.be/GEBD9T0zPoY**

## Rubric wise marks obtained:

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Rubrics** | **Knowledge (2)** | | **Problem**  **Recognition (2)** | | **Logic Building (2)** | | **Completeness**  **and accuracy (2)** | | **Ethics (2)** | | **Total** |
| **Good**  **(2)** | **Average**  **(1)** | **Good**  **(2)** | **Average**  **(1)** | **Good**  **(2)** | **Average**  **(1)** | **Good**  **(2)** | **Average**  **(1)** | **Good**  **(2)** | **Average**  **(1)** |
| **Marks** |  |  |  |  |  |  |  |  |  |  |  |