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**Assignment-3(MIT)**

1-> Store the data byte 32H into memory location 4000H.

Code:-

MVI A, 32H

STA 4000H

HLT

Output:-

The screenshot displays the GNUSim8085 - 8085 Microprocessor Simulator interface. The main window is titled "GNUSim8085 - 8085 Microprocessor Simulator". The menu bar includes File, Reset, Assembler, Debug, and Help. The toolbar contains icons for file operations, execution, and debugging.

**Registers:**

Register	Value
A	32
BC	00 00
DE	00 00
HL	00 00
PSW	00 00
PC	42 06
SP	FF FF
Int-Reg	00

**Flag:**

Flag	Value
S	0
Z	0
AC	0
P	0
C	0

**Decimal - Hex Conversion:**

Decimal: 0      Hex: 0  
[To Hex]      [To Dec]

**I/O Ports:**

0      -      +      00  
[Update Port Value]

**Memory:**

0      -      +      00  
[Update Memory]

**Assembly Code:**

```
1 MVI A, 32H
2 STA 4000H
3 HLT
4
```

**Memory View:**

Address (Hex)	Address	Data
4000	16384	50
4001	16385	0
4002	16386	0
4003	16387	0
4004	16388	0
4005	16389	0
4006	16390	0
4007	16391	0
4008	16392	0
4009	16393	0
400A	16394	0

**Assembler Message:**

Line No	Assembler Message
0	Program assembled successfully

Simulator: Idle

2-> Exchange the contents of memory locations 2000H and 4000H.

Code:-

LDA 2000H

MOV B,A

LDA 4000H

STA 2000H

MOV A,B

STA 4000H

HLT

Output:-

GNUSim8085 - 8085 Microprocessor Simulator

File Reset Assembler Debug Help

Registers

Register	Value
A	00
BC	00 00
DE	00 00
HL	00 00
PSW	00 00
PC	42 0F
SP	FF FF
Int-Reg	00

Flag

Flag	Value
S	0
Z	0
AC	0
P	0
C	0

Load me at

1 LDA 2000H  
2 MOV B,A  
3 LDA 4000H  
4 STA 2000H  
5 MOV A,B  
6 STA 4000H  
7 HLT  
8

Decimal - Hex Conversion

Decimal: 0 Hex: 0

To Hex To Dec

I/O Ports

0 - + 00

Update Port Value

Memory

0 - + 00

Update Memory

Start: 2000h

Address (Hex)	Address	Data
2000	8192	50
2001	8193	0
2002	8194	0
2003	8195	0
2004	8196	0
2005	8197	0
2006	8198	0
2007	8199	0
2008	8200	0
2009	8201	0
200A	8202	0

Line No Assembler Message

0 Program assembled successfully

Simulator: Idle

3-> Add two 8-bit numbers: Add the contents of memory locations 4000H and 4001H and place the result in memory location 4002H.

Code:-

```
MVI A,12H
STA 4000H
MVI A,32H
STA 4001H
LXI H, 4000H
MOV A, M
INX H
ADD M
INX H
MOV M,A
HLT
```

Output:-

The screenshot displays the GNUSim8085 - 8085 Microprocessor Simulator interface. The main window is titled "GNUSim8085 - 8085 Microprocessor Simulator". The interface includes a menu bar (File, Reset, Assembler, Debug, Help) and a toolbar with various icons. The central area shows the assembly code being executed, with line numbers 1 through 12. The code is as follows:

```
1 MVI A, 12H
2 STA 4000H
3 MVI A, 32H
4 STA 4001H
5 LXI H, 4000H
6 MOV A, M
7 INX H
8 ADD M
9 INX H
10 MOV M, A
11 HLT
12
```

On the left side, there are several panels:

- Registers:** A table showing the current values of the 8085 registers. The PC register is 42, and the SP register is FF.
- Flag:** A table showing the status of the flags. The S flag is 0, and the P flag is 1.
- Decimal - Hex Conversion:** A panel with input fields for decimal and hex values and buttons for conversion.
- I/O Ports:** A panel with input fields for port values and a button to update the port value.
- Memory:** A panel with input fields for memory address and a button to update the memory.

On the right side, there is a **Memory** panel showing a memory dump. The "Start" address is 4000h. The dump shows the following data:

Address (Hex)	Address	Data
4000	16384	18
4001	16385	50
4002	16386	68
4003	16387	0
4004	16388	0
4005	16389	0
4006	16390	0
4007	16391	0
4008	16392	0
4009	16393	0
400A	16394	0

At the bottom right, there is a **Line No Assembler Message** panel showing the message "Program assembled successfully".

Simulator: Idle

4-> Subtract two 8-bit numbers: Subtract the contents of memory location 4001H from the memory location 2000H and place the result in memory location 4002H.

Code:-

```
MVI A,32H
STA 4000H
MVI A,12H
STA 4001H
LXI H,4000H
MOV A,M
INX H
SUB M
INX H
MOV M,A
HLT
```

Output:-

The screenshot displays the GNUSim8085 - 8085 Microprocessor Simulator interface. The main window is titled "GNUSim8085 - 8085 Microprocessor Simulator". The interface includes a menu bar (File, Reset, Assembler, Debug, Help) and a toolbar with various icons. The central area shows the assembly code being executed, with line numbers 1 through 12. The code is as follows:

```
1 MVI A, 32H
2 STA 4000H
3 MVI A, 12H
4 STA 4001H
5 LXI H, 4000H
6 MOV A, M
7 INX H
8 SUB M
9 INX H
10 MOV M, A
11 HLT
12
```

On the left side, there are panels for "Registers" and "Flag". The "Registers" panel shows the current values of the 8085 registers: A (20), BC (00 00), DE (00 00), HL (40 02), PSW (00 00), PC (42 13), SP (FF FF), and Int-Reg (00). The "Flag" panel shows the status of the flags: S (0), Z (0), AC (0), P (0), and C (0). Below the registers, there is a "Decimal - Hex Conversion" section with input fields for decimal and hex values, and buttons for "To Hex" and "To Dec". There is also an "I/O Ports" section with input fields for port values and an "Update Port Value" button. A "Memory" section at the bottom left has input fields for memory address and data, and an "Update Memory" button.

On the right side, there is a "Memory" panel showing the memory contents. The "Start" address is set to 4000h. The memory table shows the following data:

Address (Hex)	Address	Data
4000	16384	50
4001	16385	18
4002	16386	32
4003	16387	0
4004	16388	0
4005	16389	0
4006	16390	0
4007	16391	0
4008	16392	0
4009	16393	0
400A	16394	0

Below the memory table, there is a "Line No" and "Assembler Message" section. The message shows "0 Program assembled successfully".

The status bar at the bottom indicates "Simulator: Idle".

5-> Add the 16-bit number in memory locations 4000H and 4001H to the 16-bit number in memory locations 4002H and 4003H. The most significant eight bits of the two numbers to be added are in memory locations 4001H and 4003H. Store the result in memory locations 4004H and 4005H with the most significant byte in memory location 4005H.

Code:-

```
MVI A,12H
STA 4000H
MVI A,32H
STA 4001H
LHLD 4000H
XCHG
LHLD 4002H
MOV A, E
ADD L
MOV L, A
MOV A, D
ADC H
MOV H, A
SHLD 4004H
HLT
```

Output:-

The screenshot displays the GNUSim8085 - 8085 Microprocessor Simulator interface. The main window shows the assembly code being executed, with line numbers 1 through 17. The code is as follows:

```
1 MVI A, 12H
2 STA 4000H
3 MVI A, 32H
4 STA 4001H
5
6 LHLD 4000H
7 XCHG
8 LHLD 4002H
9 MOV A, E
10 ADD L
11 MOV L, A
12 MOV A, D
13 ADC H
14 MOV H, A
15 SHLD 4004H
16 HLT
17
```

The left panel shows the registers and flags. The registers are A (32), BC (00 00), DE (32 12), HL (32 32), PSW (00 00), PC (42 1B), SP (FF FF), and Int-Reg (00). The flags are S (0), Z (0), AC (0), P (0), and C (0).

The right panel shows the memory dump. The start address is 4000h. The memory dump is as follows:

Address (Hex)	Address	Data
4000	16384	18
4001	16385	50
4002	16386	32
4003	16387	0
4004	16388	50
4005	16389	50
4006	16390	0
4007	16391	0
4008	16392	0
4009	16393	0
400A	16394	0

The bottom panel shows the assembler message: "Program assembled successfully".

6-> Add contents of two memory locations: Add the contents of memory locations 4000H and 4001H and place the result in the memory locations 4002H and 4003H.

Code:-

```
LXI H,4000H
MOV A,M
INX H
ADD M
INX H
MOV M, A
MVI A, 00H
ADC A
INX H
MOV M,A
HLT
```

Output:-

The screenshot displays the GNUSim8085 - 8085 Microprocessor Simulator interface. The main window is divided into several sections:

- Registers:** Shows the state of various registers. The Accumulator (A) contains 00. The Program Counter (PC) contains 42. The Stack Pointer (SP) contains FF. The Instruction Register (Int-Reg) contains 00.
- Flags:** Shows the status of various flags. The Sign flag (S) is 0. The Zero flag (Z) is 1. The Carry flag (C) is 0.
- Assembly Code:** A list of instructions is shown, starting with `LXI H, 4000H` and ending with `HLT`. The code is loaded at address 4000H.
- Memory:** A table showing memory contents. The address 4000H contains the value 18. The address 4001H contains the value 50. The address 4002H contains the value 68. The address 4003H contains the value 0. The address 4004H contains the value 50. The address 4005H contains the value 50. The address 4006H contains the value 0. The address 4007H contains the value 0. The address 4008H contains the value 0. The address 4009H contains the value 0. The address 400AH contains the value 0.
- I/O Ports:** A section for interacting with I/O ports, showing a value of 0 and buttons for updating the port value.
- Memory:** A section for interacting with memory, showing a value of 0 and a button for updating the memory.
- Assembler Message:** A message box at the bottom right states "Program assembled successfully".

7-> Write a program for one's complement of 8 bit number.

Code:-

LDA 4000H

CMA

STA 4001H

HLT

Output:-

GNUSim8085 - 8085 Microprocessor Simulator

File Reset Assembler Debug Help

Registers

Register	Value
A	ED
BC	00 00
DE	32 12
HL	40 03
PSW	00 00
PC	42 08
SP	FF FF
Int-Reg	00

Flag

Flag	Value
S	0
Z	1
AC	0
P	1
C	0

Load me at

```
1 LDA 4000H
2 CMA
3 STA 4001H
4 HLT
5
```

Decimal - Hex Conversion

Decimal	Hex
0	0

I/O Ports

Port	Value
0	00

Memory

Address (Hex)	Address	Data
4000	16384	18
4001	16385	237
4002	16386	68
4003	16387	0
4004	16388	50
4005	16389	50
4006	16390	0
4007	16391	0
4008	16392	0
4009	16393	0
400A	16394	0

Line No Assembler Message

Line No	Assembler Message
0	Program assembled successfully

Simulator: Idle

8-> Write a program for two's complement of 8 bit number.

Code:-

LDA 4000H

CMA

ADI 01H

STA 4001H

HLT

Output:-

The screenshot displays the GNUSim8085 - 8085 Microprocessor Simulator interface. The main window is titled "GNUSim8085 - 8085 Microprocessor Simulator". The menu bar includes File, Reset, Assembler, Debug, and Help. The toolbar contains icons for file operations, execution, and debugging.

**Registers:**

Register	Value
A	EE
BC	00 00
DE	32 12
HL	40 03
PSW	00 00
PC	42 0A
SP	FF FF
Int-Reg	00

**Flag:**

Flag	Value
S	1
Z	0
AC	0
P	1
C	0

**Load me at:** [Empty text box]

**Assembly Program:**

```
1 LDA 4000H
2 CMA
3 ADI 01H
4 STA 4001H
5 HLT
```

**Memory View:**

Address (Hex)	Address	Data
4000	16384	18
4001	16385	238
4002	16386	68
4003	16387	0
4004	16388	50
4005	16389	50
4006	16390	0
4007	16391	0
4008	16392	0
4009	16393	0
400A	16394	0

**Line No Assembler Message:**

Line No	Assembler Message
0	Program assembled successfully

**Simulator: Idle**



9-> Subtract the 16-bit number in memory locations 4002H and 4003H from the 16-bit number in memory locations 4000H and 4001H. The most significant eight bits of the two numbers are in memory locations 4001H and 4003H. Store the result in memory locations 4004H and 4005H with the most significant byte in memory location 4005H.

Code:-

```
LHLD 4000H ;GET FIRST 16 BIT NUMBER
XCHG ;SAVE FIRST 16 BIT NUMBER IN DE
LHLD 4002H ;GET SECOND 16 BIT NUMBER IN HL
MOV A,E ;GET LOWER BYTE OF FIRST NUMBER
SUB L ;SUBTRACTE LOWER BYTE OF SECOND NUMBER
MOV L,A ;STORE RESUKT IN L REGISTER
MOV A,D ;GET HIGHER BYTE OF FIRST NUMBER
SBB H ;SUBTRACTE HIGHER BYTE OF SECOND NUMBER
MOV H,A ;STORE RESULT IN HL
SHLD 4004H ;STORE 16 BIT RESULT IN MEMORY LOCATION 4004H
HLT
```

Output:-

The screenshot displays the GNUSim8085 - 8085 Microprocessor Simulator interface. The main window is divided into several sections:

- Registers:** Shows the state of the 8085 registers. The HL register pair contains 16388 (4004H) and 237 (4005H), which is the result of the subtraction. The DE register pair contains 16384 (4000H) and 238 (4001H). The BC register pair contains 16386 (4002H) and 68 (4003H). The PSW register contains 0000. The PC register contains 4211. The SP register contains FF FF. The Int-Reg register contains 00.
- Flag:** Shows the status of the flags. The Sign flag (S) is 1, the Zero flag (Z) is 0, the Auxiliary Carry flag (AC) is 0, the Parity flag (P) is 1, and the Carry flag (C) is 0.
- Assembly Code:** The code is loaded at address 4000H. It consists of 12 lines: LHLD 4000H, XCHG, LHLD 4002H, MOV A,E, SUB L, MOV L,A, MOV A,D, SBB H, MOV H,A, SHLD 4004H, and HLT.
- Memory:** The memory contents are displayed in a table. The address range 4000 to 400A is shown. The data values are: 4000: 16384 (18), 4001: 16385 (238), 4002: 16386 (68), 4003: 16387 (0), 4004: 16388 (206), 4005: 16389 (237), 4006: 16390 (0), 4007: 16391 (0), 4008: 16392 (0), 4009: 16393 (0), and 400A: 16394 (0).
- I/O Ports:** The I/O ports are shown with values 0, -, and 00. The Update Port Value button is visible.
- Memory:** The memory is shown with values 0, -, and 00. The Update Memory button is visible.
- Assembler Message:** The message "Program assembled successfully" is displayed.

The simulator status at the bottom indicates "Simulator: Idle".

10-> Write a program using the ADI instruction to add the two hexadecimal numbers 3AH and 48H and store the result in memory location 2100H.

Code:-

MVI A,3AH

ADI 48H

STA 2100H

HLT

Output:-

The screenshot displays the GNUSim8085 - 8085 Microprocessor Simulator interface. The main window is titled "GNUSim8085 - 8085 Microprocessor Simulator". The menu bar includes File, Reset, Assembler, Debug, and Help. The toolbar contains various icons for file operations, simulation control, and debugging.

**Registers:**

Register	Value
A	82
BC	00 00
DE	EE 12
HL	ED CE
PSW	00 00
PC	42 08
SP	FF FF
Int-Reg	00

**Flag:**

Flag	Value
S	1
Z	0
AC	1
P	1
C	0

**Decimal - Hex Conversion:**

Decimal: 0, Hex: 0. Buttons: To Hex, To Dec.

**I/O Ports:**

Port 0: 0, Port 1: 00. Button: Update Port Value.

**Memory:**

Memory 0: 0. Button: Update Memory.

**Assembly Code:**

```
1 MVI A, 3AH
2 ADI 48H
3 STA 2100H
4 HLT
```

**Memory Dump:**

Address (Hex)	Address	Data
2100	8448	130
2101	8449	0
2102	8450	0
2103	8451	0
2104	8452	0
2105	8453	0
2106	8454	0
2107	8455	0
2108	8456	0
2109	8457	0
210A	8458	0

**Assembler Message:**

Line No	Assembler Message
0	Program assembled successfully

Simulator: Idle

11-> Write an assembly language program that AND, OR and XOR together the contents of register B, C and E and place the result into memory location 3000H, 3001H and 3002H.

Code:-

```
MVI B,12H
MVI C,51H
MVI D,26H
MOV A,B
ANA C
ANA D
STA 3000H
MOV A,B
ORA C
ORA D
STA 3001H
MOV A,B
XRA C
XRA D
STA 3002H
HLT
```

Output:-

The screenshot displays the GNUSim8085 - 8085 Microprocessor Simulator interface. The main window is divided into several sections:

- Registers:** A table showing the current values of the 8085 registers. The A register contains 65, B contains 12, C contains 51, D contains 26, E contains 12, F contains 12, H contains ED, L contains CE, P contains 00, S contains 00, D contains 42, B contains 19, I contains FF, R contains FF, and Int-Reg contains 00.
- Flags:** A table showing the status of the 8085 flags. The S flag is 0, Z flag is 0, AC flag is 0, P flag is 1, and C flag is 0.
- Decimal - Hex Conversion:** A section for converting between decimal and hexadecimal values. The decimal input is 0, and the hex output is 0.
- I/O Ports:** A section for monitoring and controlling I/O ports. The port value is 0.
- Memory:** A section for monitoring and controlling memory. The memory address is 0.
- Assembly Code:** A list of 16 lines of assembly code, including MVI, MOV, ANA, STA, ORA, XRA, and HLT instructions.
- Memory Contents:** A table showing the contents of memory locations. The address range is from 3000 to 300A, and the data values are 0, 119, 101, 0, 0, 0, 0, 0, 0, 0, 0, 0.
- Assembler Message:** A section for displaying assembler messages. The message is "Program assembled successfully".

The simulator status at the bottom indicates "Simulator: Idle".

## 12-> Program to Find 1's Complement of 16-bit Number.

Code:-

```
MVI A,1DH
```

```
mov L,A
```

```
MVI A,14H
```

```
mov H,A
```

```
SHLD 2000H
```

```
LHLD 2000H ;load into HL Pair
```

```
MOV A, L ;Load L into accumulator
```

```
CMA ;Complement
```

```
MOV L, A ;store in L
```

```
MOV A, H ;Load H into accumulator
```

```
CMA ;Complement
```

```
MOV H, A ;store in H
```

```
SHLD 2002H ;Store the 1's complemented result
```

```
HLT
```

Output:-

The screenshot displays the GNUSim8085 - 8085 Microprocessor Simulator interface. The main window shows the assembly code for finding the 1's complement of a 16-bit number. The code is as follows:

```
1 MVI A,1DH
2 mov L,A
3 MVI A,14H
4 mov H,A
5 SHLD 2000H
6 LHLD 2000H ;load into HL Pair
7 MOV A, L ;Load L into accumulator
8 CMA ;Complement
9 MOV L, A ;store in L
10 MOV A, H ;Load H into accumulator
11 CMA ;Complement
12 MOV H, A ;store in H
13 SHLD 2002H ;Store the 1's complemented result
14 HLT
15
```

The left panel shows the registers and flags. The registers are A, BC, DE, HL, PSW, PC, SP, and Int-Reg. The flags are S, Z, AC, P, and C. The decimal-hex conversion section shows 0 in both fields. The I/O Ports section shows 0 in both fields. The Memory section shows 0 in both fields.

The right panel shows the memory dump. The start address is 2000h. The memory dump is as follows:

Address (Hex)	Address	Data
2000	8192	29
2001	8193	20
2002	8194	226
2003	8195	235
2004	8196	0
2005	8197	0
2006	8198	0
2007	8199	0
2008	8200	0
2009	8201	0
200A	8202	0

The bottom panel shows the assembler message: "Program assembled successfully".

### 13-> Program to Find 2's Complement of 16-bit Number.

Code:-

```
MVI A,2AH
mov L,A
MVI A,5BH
mov H,A
SHLD 2000H
LHLD 2000H ;load into HL Pair
MOV A, L    ;Load L into accumulator
CMA        ;Complement
MOV L, A    ;store in L
MOV A, H    ;Load H into accumulator
CMA        ;Complement
MOV H, A    ;store in H
INX H      ;Increment register Pair by 1
SHLD 2002H ;Store the 2's complemented result
HLT
```

Output:-

The screenshot displays the GNUSim8085 - 8085 Microprocessor Simulator interface. The main window shows the assembly code being executed, with line numbers 1 through 15. The code is as follows:

```
1 MVI A,2AH
2 mov L,A
3 MVI A,5BH
4 mov H,A
5 SHLD 2000H
6 LHLD 2000H ;load into HL Pair
7 MOV A, L    ;Load L into accumulator
8 CMA        ;Complement
9 MOV L, A    ;store in L
10 MOV A, H    ;Load H into accumulator
11 CMA        ;Complement
12 MOV H, A    ;store in H
13 INX H      ;Increment register Pair by 1
14 SHLD 2002H ;Store the 2's complemented result
15 HLT
```

The left panel shows the Registers window with the following values:

Register	Value
A	00
BC	00 00
DE	00 00
HL	A4 D6
PSW	00 00
PC	42 17
SP	FF FF
Int-Reg	00

The right panel shows the Memory window with the following values:

Address (Hex)	Address	Data
2000	8192	42
2001	8193	91
2002	8194	214
2003	8195	164
2004	8196	0
2005	8197	0
2006	8198	0
2007	8199	0
2008	8200	0
2009	8201	0
200A	8202	0

The bottom panel shows the Assembler Message window with the following message:

```
0 Program assembled successfully
```