Topic :

Assignment → 01

PIONEER
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Problem → 1

- Load the contents of the memory locations 2200_H and 2201_H into registers. Add these registers and store the result in memory locations 2202_H and 2203_H.

⇒

Address	Command (Assembly Language)	Operation	Opcode
2000	LDA 2200_H	A ← [2200]	3A 00 22
2003	MOV H,A	H ← A	67
2004	LDA 2201_H	A ← [2201]	3A 01 22
2007	ADD H	A ← A+H	84
2008	MOV L,A	L ← A	6F
2009	MVI A 00_H	A ← 00	3E 00
2011	ADC A	A ← A+A+Carry	8F
2012	MOV H,A	H ← A	67
2013	SHLD 2202_H	H → [2202] L → [2203]	22 02 22
2016	HLT	Stop	76

Algorithm :-

```
LDA   2200H     // Load data In Accumulator
MOV   H,A       // Move A to H
LDA   2201H     // Load data in Accumulator
ADD   H         // Add accumulator with H
MOV   L,A       // Move A to L
MVI   A,00H     // Move immediately 00H to A
ADC   A         // Add Accumulator with A and Carry
MOV   H,A       // Move A to H
SHLD  2202H     // store HL register pair
HLT             // Stop
```

Problem = 2

⇒ Find the sum of N numbers stored in consecutive location starting from 2500_H. The value of N is stored in 2200_H. Store the result in location 2300_H and 2301_H.

⇒ Algorithm ⇒

```
        LDA   2200H     // Load Accumulator
        MOV   C,A       // Move A to C
        MVI   E, 00H    // Move immediate 00 to E
        MVI   D, 00H    // Move immediate 00 to D
        LXI   H, 2500H  // Load HL register pair
L2 :    MOV   A,M       // Move M to A
        ADD   E         // Add A with E
        JNC   L1        // Jump if no carry
        INR   D         // Increment D
L1 :    MOV   E,A       // Move A to E
        INX   H         // Increment HL pair
        DCR   C         // Decrement C
        JNZ   L2        // Jump if not Zero
        MOV   A,E       // Move E to A
        STA   2300H     // Store Accumulator in 2300H
        MOV   A,D       // Move D to A
        STA   2301H     // Store Accumulator 2301H
        HLT             // Stop
```

Example : ⇒ For N = 5.

9A + FB + 5E + BC + 4E = 02FD

Address	Command	Operation	Hex Code
2000	LDA 2200_H	A ← [2200]	3A 00 22
2003	MOV C,A	C ← A	4F
2004	MVI E, 00_H	E ← 00_H	1E 00
2006	MVI D, 00_H	D ← 00_H	16 00
2008	LXI H, 2500_H	H ← [2500]	21 00 25
200B	MOV A,M	A ← M	7E
200C	ADD E	A ← A+E	83
200D	JNC 2011_H	Jump to 2011_H	D2 11 20
2010	INR D	D ← D+1	14
2011	MOV E,A	E ← A	5F
2012	INX H	H ← H+1	23
2013	DCR C	C ← C-1	0D
2014	JNZ $200B_H$	Jump to $200B_H$	C2 0B 20
2017	MOV A,E	A ← E	7B
2018	STA 2300_H	[2300] ← A	32 00 23
201B	MOV A,D	A ← D	7A
201C	STA 2301_H	[2301] ← A	32 01 23
201F	HLT	Stop	76

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Problem ⇒ 03

Question ⇒ Find the sum of the least significant 4 bits and most significant 4 bits of a byte stored in memory location 2500_H. Store the result in 2550_H.

⇒ **Algorithm :-**

```
LXI  H, 2500H    // Load Register pair HL
MVI  A, 0FH      // Move immediate 0F to A
ANA  M           // And M with Accumulator
MOV  C,A         // Move A to C
MVI  A, F0H      // Move immediate F0 to A
ANA  M           // And M with Accumulator
RRC              // Rotate Accumulator Right
RRC              // Rotate Accumulator Right
RRC              // Rotate Accumulator Right
RRC              // Rotate Accumulator Right
ADD  C           // Add Accumulator with C
STA  2550H       // Store at 2550H
HLT              // Stop.
```

Address	Command	Operation	Hex Code
2000	LXI H, 2500_H	H ← [2500]	21 00 25
2003	MVI A, $0F_H$	A ← $0F_H$	3E 0F
2005	ANA M	A ← A & M	A6
2006	MOV C,A	C ← A	4F
2007	MVI A, $F0_H$	A ← $F0_H$	3E F0
2009	ANA M	A ← A & M	A6

Address	Command	Operation	Hex code
200A	RRC	Rotate Right Accumulator	0F
200B	RRC	Rotate Right Accumulator	0F
200C	RRC	Rotate Right Accumulator	0F
200D	RRC	Rotate Right Accumulator	0F
200E	ADD C	$A \leftarrow A+C$	81
200F	STA 2550_H	$[2550] \leftarrow A$	32 50 25
2012	HLT	Stop	76

Example ⇒ Let the number in 9C.

So, after executing,

the addition result

is = 9 + C

= 15

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Problem - 04

⇒ Write a program to count the 1's and 0's of a byte stored in 2500_H. Store the result in 2610_H and 2511_H respectively.

⇒ Algorithm ⇒

```
        LXI  H, 2500H    // Load HL register pair.
        MVI  C, 08H      // Move immediate 08H to C
        MOV  A, M        // Move M to A
        MVI  B, 00H      // Move immediate 00 to B
Loop1 : RLC              // Rotate Accumulator left
        JC   Loop2       // Jump if carry.
        INR  B           // Increament B.
Loop2 : DCR  C           // Decrement C
        JNZ  Loop1       // Jump if not Zero
        MOV  A, B        // Move B to A
        STA  2511H       // Store at 2511H
        MVI  A, 08H      // Move immediate 08 to A
        SUB  B           // Subtract B from A
        STA  2610H       // Store 2610H
        HLT              // Stop.
```

Example ⇒ Let take a number 6A.

Binary representation ⇒ 01101010.

Number of 1's ⇒ 4

Number of 0's ⇒ 4

The answer should be 4 and 4. in 2610_H and 2511_H.

Address	Command	Operation	Hex Code
2000	LXI H, 2500_H	H ← [2500]	21 00 25
2003	MVI C, 08_H	C ← 08_H	0E 08
2005	MOV A, M	A ← M	7E
2006	MVI B, 00_H	B ← 00_H	06 00
2008	RLC	Rotate Left Accumulator	07
2009	JC $200D_H$	Jump to $200D_H$	DA 0D 20
200C	INR B	B ← B+1	04
200D	DCR C	C ← C−1	0D
200E	JNZ 2008_H	Jump to 2008_H	C2 08 20
2011	MOV A, B	A ← B	78
2012	STA 2511_H	[2511] ← A	32 11 25
2015	MVI A, 08_H	A ← 08_H	3E 08
2017	SUB B	A ← A − B	90
2018	STA 2610_H	[2610] ← A	32 10 26
201B	HLT	Stop	76

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Problem-05

⇒ Write a program to sum two 16-bit binary numbers. (76FE + AB59) = 12257

⇒ Algorithm ⇒

```
        MVI  C, 00H    // Move immediate 00 to C
        LHLD 2500H     // Load HL register pair
        XCHG           // exchange HL with DE
        LHLD 2502H     // Load HL register pair
        DAD  D         // Double addition from HL and DE
        JNC  200E      // Jump if not carry
        INR  C         // Increament C
Level : SHLD 2550H     // Store HL pair 2550H
        MOV  A,C       // Move C to A
        STA  2552H     // Store at 2552H
        HLT            // Stop
```

Address	Command	Operation	Hex Code
2000	MVI C, 00_H	C ← 00_H	0E 00
2002	LHLD 2500_H	L ← [2500] H ← [2501]	2A 00 25
2005	XCHG	HL ⇄ DE	EB
2006	LHLD 2502_H	L ← [2502] H ← [2503]	2A 02 25
2009	DAD D	HL ← HL + DE	19
200A	JNC 200E	go to $200E_H$	D2 0E 20
200D	INR C	C ← C + 1	0C
200E	SHLD 2550_H	[2550] ← L, [2551] ← H	22 50 25
2011	MOV A,C	A ← C	79
2012	STA 2552_H	[2552] ← A	32 52 25
2015	HLT	Stop	76