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Branch - CBA Batch - 51
M&A Practical 4

Aim : Learning Techniques on Block Transfer of Data.

Exercise :

1. Write a program to transfer a block of data from 3000H to 4000H. The size of block is 16 bytes.

```
MVI B,10H
MVI C,64H
LXI H,3000H
```

DATA:

```
MOV M,C
INR C
INX H
DCR B
JNZ DATA
```

```
LXI H,3000H
LXI D,4000H
MVI B,10H
```

MAIN:

```
MOV A,M
STAX D
```

```
INX H
INX D
```

```
DCR B
JNZ MAIN
```

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HLT

8085 Simulator

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Editor Assembler Registers Memory Devices

Assembler

Address	Label	Mnemonics	Hexco...	Bytes	M-Cyc...	T-Stat...
0009		INX H	23	1	1	6
000A		DCR B	05	1	1	4
000B		JNZ DATA	C2	3	3	10
000C			07			
000D			00			
000E		LXI H,3000	21	3	3	10
000F			00			
0010			30			
0011		LXI D,4000	11	3	3	10
0012			00			
0013			40			
0014		MVI B,10	06	2	2	7
0015			10			
0016	MAIN	MOV A,M	7E	1	2	7
0017		STAX D	12	1	2	7
0018		INX H	23	1	1	6
0019		INX D	13	1	1	6
001A		DCR B	05	1	1	4
001B		JNZ MAIN	C2	3	3	10

Simulate

Start From → 0000

Run all At a Time Step By Step

Memory Editor

Memory Range: 0000 FFFF

Memory Address	Value
001C	16
001E	76
3000	64
3001	65
3002	66
3003	67
3004	68
3005	69
3006	6A
3007	6B
3008	6C
3009	6D
300A	6E
300B	6F
300C	70
300D	71
300E	72
300F	73
4000	64
4001	65
4002	66
4003	67
4004	68
4005	69
4006	6A
4007	6B
4008	6C
4009	6D
400A	6E
400B	6F
400C	70
400D	71
400E	72
400F	73

☐ Show entire memory content
☒ Show only loaded memory location
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↑ 0.0 b
↓ 0.0 b

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Subject: M&A Practical 4

Code: MVI B, 10H // Load 10H in reg. B (Counter)
MVI C, 64H // Load 64H in reg. C (data)
LXI H, 3000H // Load 3000H in H, L pair (start addr.)

DATA: // Loading data in mem. from 3000H
MOV M, C // Copy contents of C in memory 3000H
INR C // Increment data
INX H // Increment address
DCR B // Decrement counter
JNZ DATA // Repeat loop till counter is zero

LXI H, 3000H // Again load address in H, L pair
LXI D, 4000H // Load address to copy in D, E pair
MVI B, 10H // Set counter

MAIN: //
MOV A, M // Load data from memory to A
STAX D // Copy from A to mem. pointed by D, E
INX H // Increment first address
INX D // Increment second address
DCR B // Decrement counter
JNZ MAIN // Repeat loop till counter is zero


HLT // End execution

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<div>PAGE NO. DATE</div>						
Address	Label	Mnemonics	Hex	Bytes	M-cycles	T-states
0000		MVI B, 10	06	2	2	7
0001			10			
0002		MVI C, 64	0E	2	2	7
0003			64			
0004		LXI H, 3000	21	3	3	10
0005			00			
0006			30			
0007	DATA	MOV M, C	71	1	2	7
0008		INR C	0C	1	1	4
0009		INX H	23	1	1	6
000A		DCR B	05	1	1	4
000B		JNZ DATA	C2	3	3	10
000C			02			
000D			00			
000E		LXI H, 3000	21	3	3	10
000F			00			
0010			30			
0011		LXI D, 4000	11	3	3	10
0012			00			
0013			40			
0014		MVI B, 10	06	2	2	7
0015			10			
0016	MAIN	MOV A, M	7E	1	2	7
0017		STAX D	12	1	2	7
0018		INX H	23	1	1	6
0019		INX D	13	1	1	6
001A		DCR B	05	1	1	4
001B		JNZ MAIN	C2	3	3	10
001C			16			
001D			00			
001E		HLT	76	1	2	5

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2. Write a program to reverse a string stored in memory starting from FF00H. The length of the string is given in memory location 3FFF H. Store the reversed string at location 3050H.

```
// LOAD DATA FOR TASK
```

```
LXI H,3FFF
```

```
MVI A,05
```

```
MOV M,A
```

```
LXI H,FF00
```

```
MVI C,05
```

```
MVI B,64
```

```
DENTRY:      MOV M,B
```

```
INR B
```

```
INX H
```

```
DCR C
```

```
JNZ DENTRY
```

```
// -----
```

```
// REVERSE
```

```
LXI H,3FFF
```

```
MOV C,M
```

```
LXI H,FF00
```

```
LXI D,3050
```

```
MOV A,C
```

```
ADD E
```

```
MOV E,A
```

```
MOV A,D
```

```
ACI 00
```

```
MOV D,A
```

```
STORE:      MOV A,M
```

```
STAX D
```

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INX H
DCX D
DCR C
JNZ STORE
HLT

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Assembler

Address	Label	Mnemonics	Hexco...	Bytes	M-Cyc...	T-Stat...
0000		LXI H,3FFF	21	3	3	10
0001			FF			
0002			3F			
0003		MVI A,05	3E	2	2	7
0004			05			
0005		MOV M,A	77	1	2	7
0006		LXI H,FF00	21	3	3	10
0007			00			
0008			FF			
0009		MVI C,05	0E	2	2	7
000A			05			
000B		MVI B,64	06	2	2	7
000C			64			
000D		MOV M,B	70	1	2	7
000E	DENT...	INR B	04	1	1	4
000F		INX H	23	1	1	6
0010		DCR C	0D	1	1	4
0011		JNZ DENTRY	C2	3	3	10
0012			0D			

Memory Editor

Memory Range: 1000 ---- FFFF

Memory Address	Value
0014	21
0015	FF
0016	3F
0017	4E
0018	21
001A	FF
001B	11
001C	50
001D	30
001E	79
001F	83
0020	5F
0021	7A
0022	CE
0024	57
0025	7E
0026	12
0027	23
0028	1B
0029	0D
002A	C2
002B	25
002D	76
3051	68
3052	67
3053	66
3054	65
3055	64
3FFF	05
FF00	64
FF01	65
FF02	66
FF03	67
FF04	68

☐ Show entire memory content
☒ Show only loaded memory location
☐ Store directly to specified memory location

Simulate

Start From → 0000

Run all At a Time Step By Step

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7:30:07 PM

↑ 2.6 k
↓ 4.1 k

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Code: // Load Data Burst

```
LXI H, 3FFFH // addr. to store length of data
MVI A, 05H // setting some length in A
MOV M, A // copy length from A to M(FFFH)
LXI H, F000H // load start addr. in H, L pair
MVI C, 05H // get counter / length
MVI B, 64H // load data in B reg.
```

ENTRY:

```
MOV M, B // copy from reg. B to M(FFFH) initially
INR B // increment data
INX H // increment addr.
DCR C // decrement counter
JNZ ENTRY // repeat till counter is zero
```

// Reverse and store

```
LXI H, 3FFFH // load length addr. in H, L pair
MOV C, M // load length from M to C
LXI H, F000H // load start addr. in H, L pair
LXI D, 3050H // load second addr. in D, E pair
MOV A, C // load length from C to A
ADD E // add lower byte of D, E pair
MOV E, A // update lower byte of D, E
MOV A, D // load upper byte of D, E in A
RCI 00H // increment if carry
MOV D, A // update upper byte of D, E
```

STORE:

```
MOV A, M // load from H, L pointer to A
STAX D // store in D, E pair
INX H // increment addr. - 1
DCX D // decrement addr. - 2
DCR C // decrement counter
JNZ STORE // repeat till counter is zero
```


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Address	Label	Mnemonics	Hex	Bytes	M-cycles	T-Jules
0000		LXI H, 3FFF	21	3	3	10
0001		LXI H, 3FFF	FF			
0002			3F			
0003		MVI A, 05	3E	2	2	7
0004		MVI A, 05	05			
0005		MOV M, A	77	1	2	7
0006		LXI H, FF00	21	3	3	10
0007			00			
0008			FF			
0009		MVI C, 05	0F	2	2	7
000A			05			
000B		MVI B, 64	06	2	2	7
000C			64			
000D	ENTRY	MOV M, B	70	1	2	7
000E		INR B	04	1	1	4
000F		INX H	23	1	1	6
0010		DCR C	0D	1	1	4
0011		IN2: ENTRY	C2	3	3	10
0012			0D			
0013			00			
0014		LXI H, 3FFF	21	3	3	10
0015			FF			
0016			3F			
0017		MOV C, M	4F	1	2	7
0018		LXI H, FF00	21	3	3	10
0019			00			
001A			FF			
001B		LXI D, 3050	11	3	3	10
001C			50			
001D			30			
001E		MOV A, C	79	1	1	7
001F		ADD E	83	1	1	4

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Address	Label	Mnemonics	Hex	Bytes	M-cycles	T-states
0020		MOV E, A	5F	1	1	4
0021		MOV A, D	7A	1	1	5
0022		ACI 00	CE	2	2	7
0023			00			
0024		MOV D, A	57	1	1	5
0025	STORE	MOV A, M	7E	1	2	7
0026		STAX D	12	1	2	7
0027		INX A	23	1	1	6
0028		DCR D	1B	1	1	6
0029		DCR C	0D	1	1	5
002A		JNZ STORE	C2	3	3	10
002B			25			
002C			00			
002D		HIT	76	1	2	5
002E						
002F						

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3. Write a program to transfer a block of data from B010H to B020H. The end of block is indicated by 00H.

```
        LXI H,B010
        MVI B,32
        MVI C,05

DENTRY:    MOV M,B
            INR B
            INX H
            DCR C
            JNZ DENTRY
            MVI A,00
            MOV M,A

// -----
            LXI H,B010
            LXI D,B020

CHECK:     MOV A,M
            STAX D
            INX H
            INX D
            CPI 00
            JNZ CHECK
            HLT
```

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8085 Simulator

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Assembler

Address	Label	Mnemonics	Hexco...	Bytes	M-Cyc...	T-Stat...
0000		LXI H,B010	21	3	3	10
0001			10			
0002			80			
0003		MVI B,32	06	2	2	7
0004			32			
0005		MVI C,05	0E	2	2	7
0006			05			
0007	DENT...	MOV M,B	70	1	2	7
0008		INR B	04	1	1	4
0009		INX H	23	1	1	6
000A		DCR C	0D	1	1	4
000B		JNZ DENTRY	C2	3	3	10
000C			07			
000D			00			
000E		MVI A,00	3E	2	2	7
000F			00			
0010		MOV M,A	77	1	2	7
0011		LXI H,B010	21	3	3	10
0012			10			

Simulate

Start From → 0000

Run all At a Time Step By Step

Memory Editor

Memory Range: 0000 ---- FFFF

Memory Address	Value
0000	21
0001	10
0002	80
0003	06
0004	32
0005	0E
0006	05
0007	70
0008	04
0009	23
000A	0D
000B	C2
000C	07
000D	00
000E	3E
0010	77
0011	21
0012	10
0013	80
0014	11
0015	20
0016	80
0017	7E
0018	12
0019	23
001A	13
001B	1E
001D	C2
001E	17
0020	76
B010	32
B011	33
B012	34
B013	35
B014	36
B020	32
B021	33
B022	34
B023	35
B024	36

☐ Show entire memory content
☒ Show only loaded memory location
☐ Store directly to specified memory location

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↑ 22.1 k
↓ 37.1 k

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Code						
LXI H, 8010H // load start address in H,L pair						
MVI B, 32H // load data in reg. B						
MVI C, 05H // load length of data in C						
DENTRY :						
MOV M, B // Copy from B to H,L pointer						
INR B // increment data						
INX H // increment address						
DCR C // decrement counter						
JNZ DENTRY // repeat till counter is zero						
MVI A, 00H // load & clear accumulator						
MOV M, A // store 00H in last address						
LXI H, 8010H // load address-1 in H,L pair						
LXI D, 8020H // load address-2 in D,E pair						
CHECK :						
MOV A, M // load data from H,L pointer to A						
STAX D // Copy from A to DE pointer						
INX H // increment address-1						
INX D // increment address-2						
CPI 00 // compare A's content with 00						
JNZ CHECK // repeat till A equals 00						
HLT // end execution						
Address	Label	Mnemonics	Hex	Bytes	N-cycles	T-states
0000		LXI H, 8010	21	3	3	10
0001			40			
0002			80			
0003		MVI B, 32	06	2	2	7

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				PAGE NO.		DATE	
Address	Label	Mnemonic	Hex	Bytes	M-cycles	T-state	
0004			32				
0005		MVI C, 05	0E	2	2	7	
0006			05				
0007	ENTRY	MOV M, B	70	1	2	7	
0008		INR B	04	1	1	4	
0009		INX H	23	2	1	6	
000A		DCR C	0D	1	1	4	
000B		JNZ ENTRY	C2	3	3	10	
000C			07				
000D			00				
000E		MVI A, 00	3E	2	2	7	
000F			00				
0010		MOV M, A	77	1	2	7	
0011		LXI H, 8010	21	3	3	10	
0012			10				
0013			B0				
0014		LXI D, 8020	11	3	3	10	
0015			20				
0016			B0				
0017	CHECK	MOV A, M	7E	1	2	7	
0018		STAX D	12	1	2	7	
0019		INX H	23	2	1	6	
001A		INX D	13	1	1	6	
001B		CPI 00	FE	2	2	7	
001C			00				
001D		JNZ CHECK	C2	3	3	10	
001E			17				
001F			00				
0020		HLT	76	1	2	5	

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Exercise : (Answer the following questions)

- 1) The register always pointing to the location of next instruction to be fetched is __
- 2) If starting address of 8KB RAM is 3000H, than ending address is ____
- 3) Define Bus and give its type.
- 4) A memory chip in a microcomputer system has eight address lines and eight data lines. How many bytes can be stored in it?
- 5) If the starting address of the chip is 9000H, What will be the ending address?
- 6) How many address lines are necessary to access 16 Kbytes EPROM & 8 Kbytes RAM?

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Exercise answers:

1] PC (Program Counter)

2] Starting addr. = 3000 H

Size of 8 KCB RAM = 2^{13} bytes

In 8085, 64 KB max mem. = 2^{16} bytes

For, 8 KCB, $16 - 13 = 3$, $\frac{16}{2^3} = \frac{16}{8} = 2$

$\frac{16}{2^3} = \frac{16}{8} = 2$ blocks or units

1st block of 16 : 3000 to 3FFF

2nd block of 16 : 4000 to 4FFF

→ ending address = 4FFF H

3] Bus is a set of electrical lines used to transfer data signals among different parts of a computer or its parts.

Types of bus : (1) Address Bus

(2) Data Bus

(3) Control Bus

4] $2^8 = \underline{256 \text{ bytes}}$

5] Depends on size of chip, but max it can go till FFFF H

6] EPROM : 16 KB = 2^{14} ⇒ 14 address lines

RAM : 8 KCB = 2^{13} ⇒ 13 address lines