

Experiment - 4.

Aim: Write a program

- To find the largest number in a given data array.
- To move a block of data from one section of memory to another section of memory.

Software Used: GNUSM 8085.

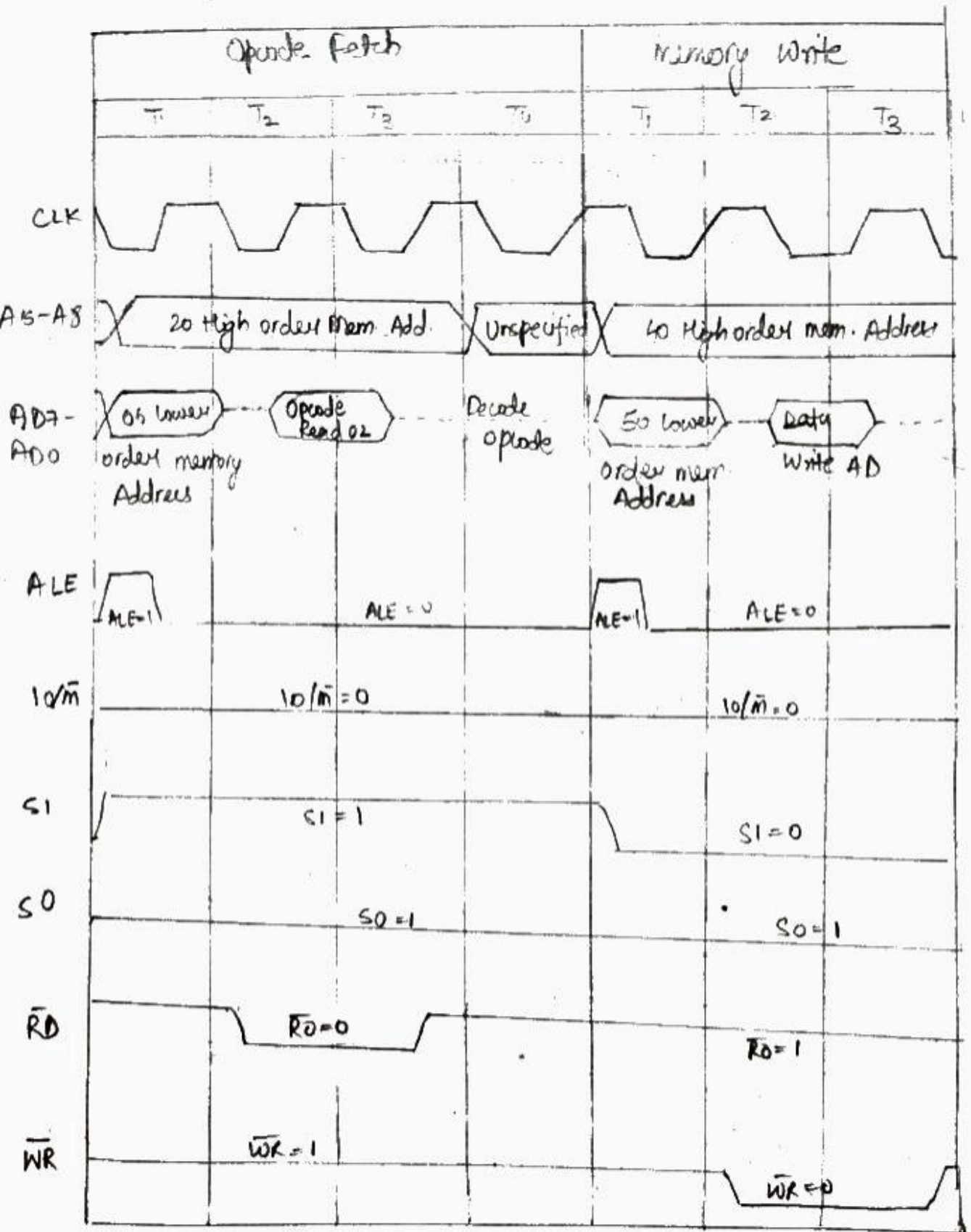
Algorithm:

A) To find the largest number in a given data array:-

1. Address of count in HL pair
2. Count in register C.
3. Address of 1st number in HL pair
4. 1st number in accumulator.
5. Decrement count
6. Address of next number
7. Compare next number with previous maximum.
8. Is next number > previous maximum?
9. No, larger number is in accumulator. Goto label ahead.
10. Yes, Get larger number in accumulator.
11. Decrement count & jump to step 6 if not zero.
12. Store the result in 2450H.
13. Stop.

B) To move block of data from one section of memory to another.

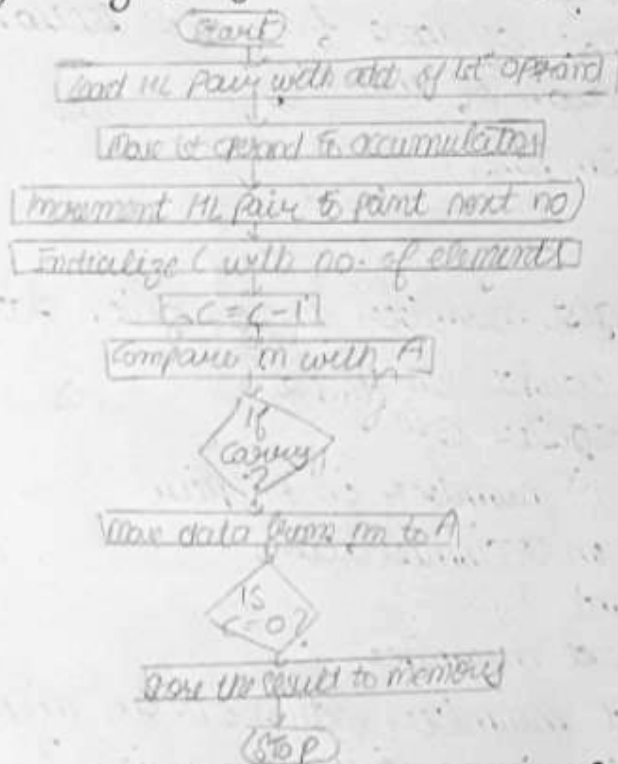
1. Initialize Counter
2. Get the data from source location
3. Store data in destination
4. Decrement the counter value.
5. If not zero, then continue processing
6. Halt.



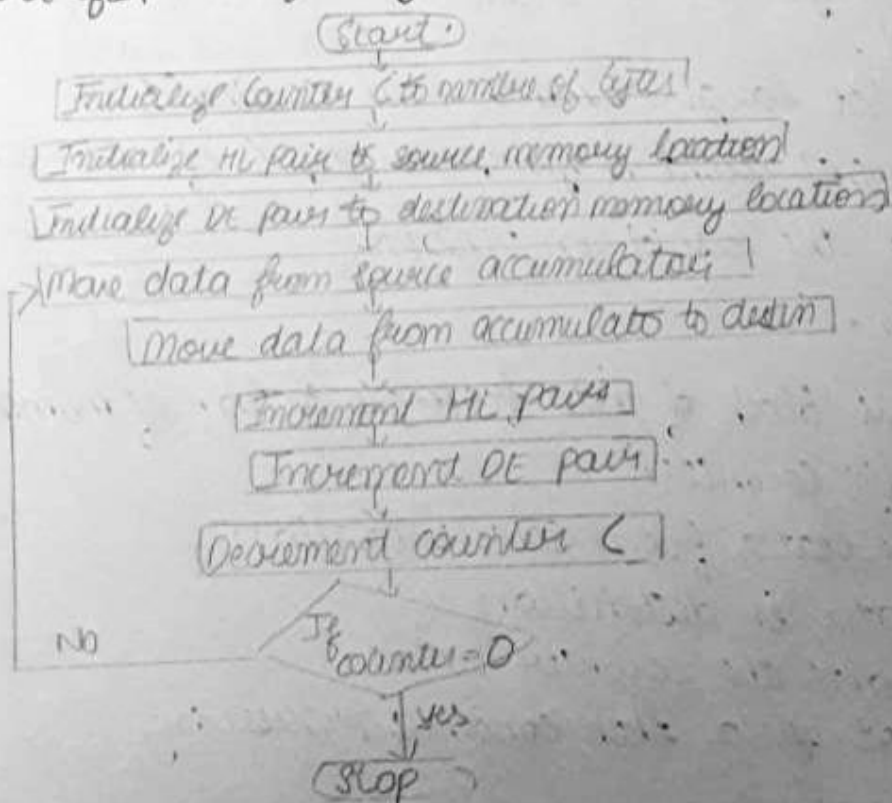
Timing Diagram for STAX D₇

Flowchart

A flowchart for finding largest no in a data array:-



Flowchart for transferring block of data from one to another



Program Codes

a)

Label	Memory Address	Operands	Operation	Comments	Address modes	Machine Cycle	T-States
	2000	LDI H	2050H	Load HL Pair with address	Immediate	opcode fetch + 2 memory read	10
	2003	MOV C, m		Move Count to register	Indirect	opcode fetch + memory read	7
	2004	DCR C		Decrement reg C	Register	opcode fetch	4
	2005	INX H		Increment HL Pair	Register	opcode fetch	6
	2006	MOV A, m		Move data from memory to A	Indirect	opcode fetch + memory read	7
	2007	INX H		Increment HL Pair		opcode fetch	6
loop2	2008	CMP m		Compare content of A with that in mem loc.	Indirect	opcode fetch + memory read	7
	2009	JNC loop1		Jump to loop1 if carry isn't generated	Immediate	opcode fetch + 2 memory read	7 (false) / 10 (true)
	200C	MOV A, m		Content of A to memory location	Indirect	opcode fetch + memory read	7
	200D	DCR C		Decrement reg C	Register	opcode fetch	4
loop1	200E	JNZ loop2		Jump to loop2 if not zero	Immediate	opcode fetch + 2 memory read	7 (false) / 10 (true)
	2011	STA	3050	Content of A to 3050 memory loc.	Direct	opcode fetch + memory read	7
	2014	HLT		Halt		opcode fetch + bus idle cycle	5

Output: Finding largest number in a data array.

I/P data →		04	20	1A	55	26
mem address →		2050	2051	2052	2053	2054

After Execution:

55	← output data
2050	← address

b).

Label	Memory Address	Mnemonics	Operands	Comments	Addressing mode	Machine cycle	Steps
	2000	LXI H	2000 H	Load the pair with address	Immediate	opcode fetch + memory read	10
	2003	MVI C	05H	Move count to C reg	Direct	opcode fetch + memory read	7
	2005	LXI D	2600	Load DE pair with address	Immediate	opcode fetch + memory read	10
loop	2008	MOV A,M		Move 1 st byte to accumulator	Indirect	opcode fetch + memory read	7
	2009	STAX D	1	Content of A to mem add stored in DE reg	Indirect	opcode fetch + memory write	7
	200A	INX H		Increment HL pair	Register	opcode fetch	6
	200B	INX D		Increment DE pair	Register	opcode fetch	6
	200C	DCR C		Decrement C reg	Register	opcode fetch	6
	200D	JNZ loop		Jump if not zero to loop	Immediate	opcode fetch + 2 mem read	7 (false) / 10 (true)
	2010	HLT		halt		opcode fetch + bus idle cycle	5

Output: Moving a block of data from one memory location to another :-

Input Data	01	02	03	04	05
Memory Address	2000	2001	2002	2003	2004

After Execution -

Out Data	01	02	03	04	05
Memory Address	2600	2601	2602	2603	2604

→ Calculation for time required for execution of program.

A) For finding largest number in a given data array

$$\text{Crystal freq} = 6\text{MHz}$$

$$\text{Clock freq} = 6/2 = 3\text{MHz}$$

$$\text{Clock Time period (T)} = \frac{1}{\text{clock freq.}}$$
$$= \frac{1}{3} \times 10^{-6} \text{s} = 0.33\mu\text{s}$$

$$1^{\text{st}} \text{ Pass} \rightarrow 10+7+4+6+7 = 34$$

$$2^{\text{nd}} \text{ Pass (4px)} \rightarrow 6+7+7+7+4+10 = 41$$

$$3^{\text{rd}} \text{ Pass (p17)} \rightarrow 6+7+7+7+4+10 = 41$$

$$4^{\text{th}} \text{ Pass (p55)} \rightarrow 6+7+10+9+7+7+5 = 46$$

$$\text{Total Tstates} = 34+41+41+46 = 162$$

$$\text{Time required} = 162 \times 0.33 \times 10^{-6} = \boxed{53.9\mu\text{s}}$$

$$b) \text{ First Pass} \rightarrow 10+10+7 = 27$$

$$\text{Further Passes} \rightarrow (4+7+6+6+4) \times 5 + 10 \times 4 + 7 + 5$$
$$= 202$$

(5 bytes i.e. 5 loop & Jump inst 4 times)

$$\text{Total} = 202 + 27 = 229$$

$$\text{Time Required} = 0.33 \times 229 \times 10^{-6} = \boxed{76.25\mu\text{s}}$$

Result:

a) Largest number in an array was found & program was executed successfully.

b) Program to move a block of data from one location to another was executed successfully.