WEST BENGAL STATE UNIVERSITY

REGISTRATION NO :- 107171111000 60 of 2017

ROLL - 32011 34 NO - 19162

SUBJECT - MICROPROCESSOR PRACTICAL

Index

Experiment Name : Assignment-1

Page No. 1
Date :

CLASS NOTE

☐ Program statement:- Write an ALP in 8085 up to add three number from stored memory location E200, E201 E202 and store the result in memory location E300.

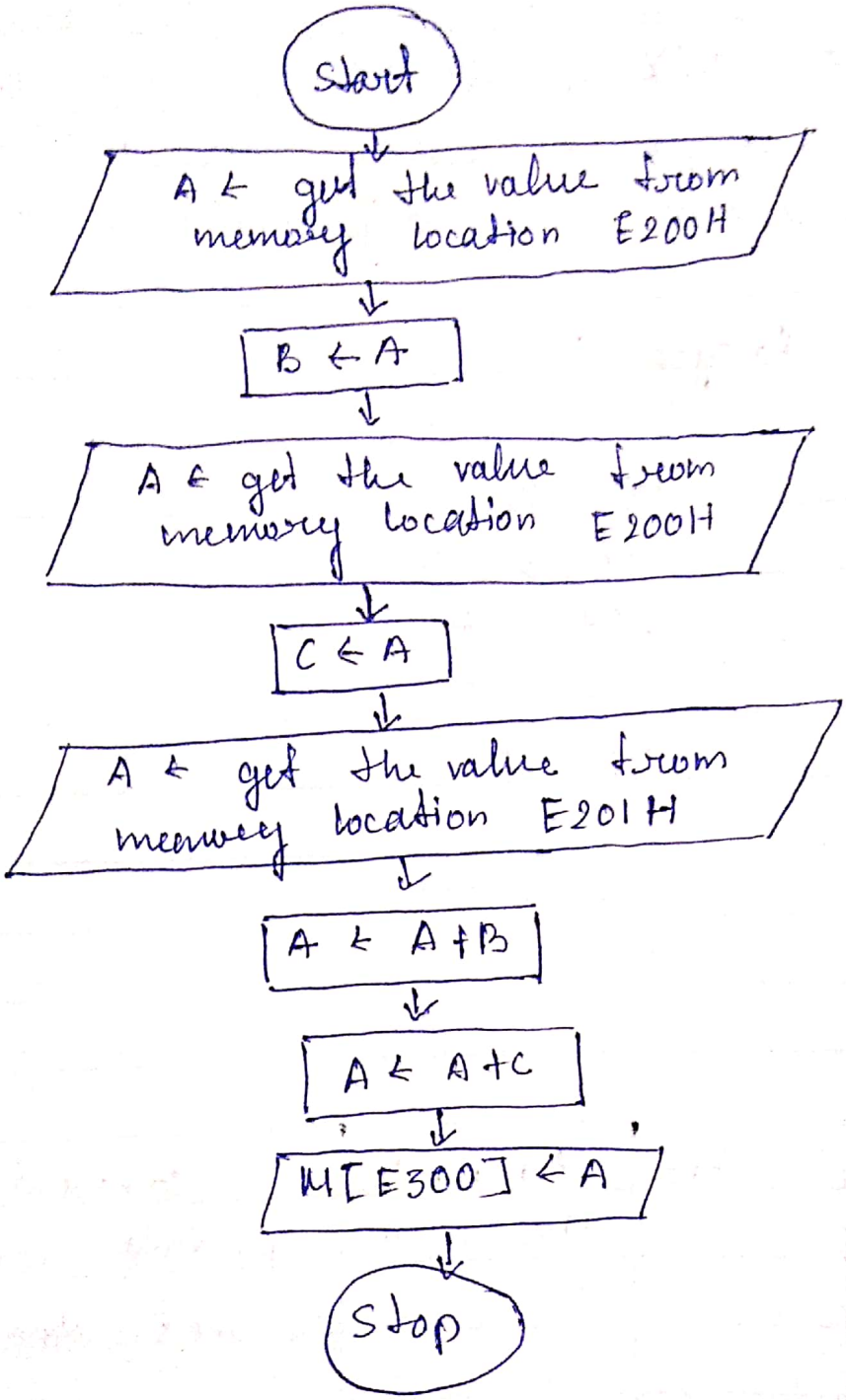
☐ Assembly Level Program :-

```
LDA  E200H
MOV  B, A
LDA  E201H
MOV  C, A
LDA  E202
ADD  B
ADD  C
STA  E300H
RST 0
```

☐ Table form :

Address	OP code	label	Mnemonics	comment
E000	3A		LDA E200H	Copy data from memory
E001	00			specified address
E002	E2			
E003	47		MOV B,A	Copying data from A to B
E004	3A		LDA E201H	Copy data from memory
E005	01			specified address
E006	E2			
E007	4F		MOV C,A	Copy data from A to C
E008	3A		LDA E202H	Copy data from memory
E009	02			specified address

Teacher's Signature & Date :



Experiment Name : ~~Assignment~~ - 2

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Date :

Table form :

Address	OP code	label	Mnemonics	comment
E009	3A			
E00A	E2			
E00B	80		ADD B	ADD B to A
E00C	81		ADD C	ADD C to A
E00D	32		STA E300H	copy the data from A
E00E	00			into specified memory
E00F	E3			location
E010	C7		RST 0	

□ Input & Output

		Input		Output	
Set -1	E200	11H		E300	66H
	E201	22H			
	E202	33H			

			Output	
Set-2	E200	22H	E300	88H
	E201	55H		
	E202	11H		

□ Discussion : 1) LDA is 3 byte instruction to load content of location into Accumulator.

2) STA is 3 byte instruction to store the content of accumulator to the memory specified location.

Teacher's Signature & Date : .....

Experiment Name : Assignment - 2

Page No. 3
Date :

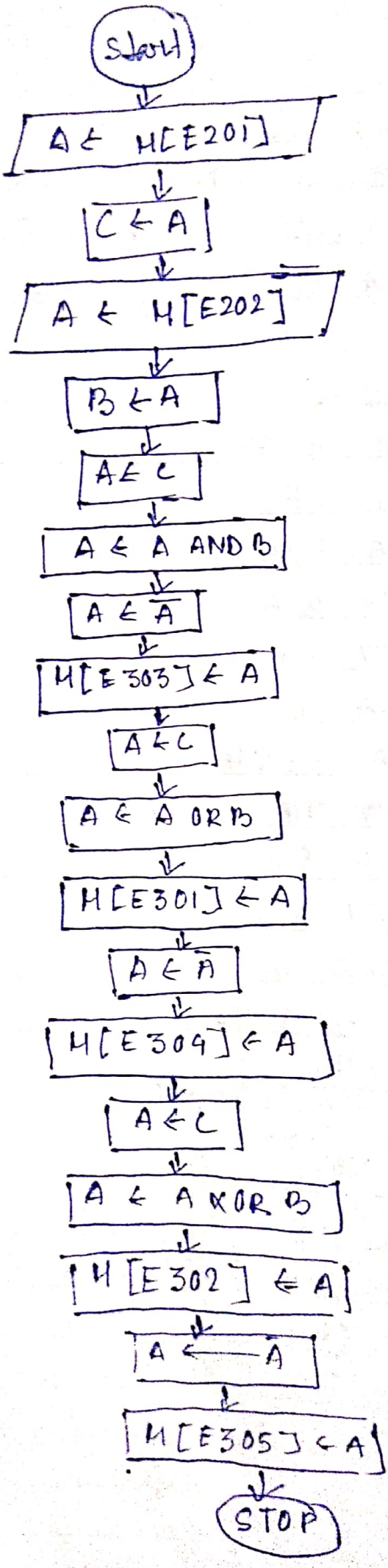
CLASS NOTE

☐ Program statement :- Perform AND, OR, XOR, NAND, NOR XNOR from two inputs stored in E201 and E202 and store the result in memory location from E300

☐ Assembly level Program :-

```
LDA E201 H
MOV C,A
LDA E202 H
MOV B,A
MOV A,C
ANA B
STA E300H
CMA
STA E305H
MOV A,C
ORA B
STA E301H
CMA
STA E304H
MOV A,C
XRA B
STA E302H
CMA
STA E3005H
RST 0
```

Date : .....



Experiment Name :

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Date :

CLASS NOTES

Table form :

Address	OPCode	label	Mnemonics	comment
E000	3A		LDA E201H	Copy data from specified
E001	01			memory location
E002	E2			
E003	47		MOV C, A	Copy data A to C
E004	3A		LDA E202H	Copy data from specified
E005	02			location
E006	E2			
E007	47		MOV B, A	Copy data A to B
E008	79		MOV A, C	Copy data B C to A
E009	A0		ANA B	AND operation
E00A	32		STA E300H	Copy data from
E00B	00			specified memory locati
E00C	E3			
E00D	2F		CMA	complement the Compare with accumulat
E00E	32		STA E303H	copy data from specified
E00F	03			location
E010	E3			
E011	79		MOV A, C	Copy data C to A
E012	B0		ORA B	OR operation
E013	32		STA E301H	copy data from specified
E014	01			location
E015	E3			
E016	2F		CMA	Compare with accumulator complement the
E017	32		STA E305	Copy dat from spaified
E018	05			location

Address	Opcode	label	Mnemonics	Comment
E019	E3			
E01A	C7		RST0	

~~Discussion~~ :-

INPUT & OUTPUT :-

Set-1

I/P		O/P	
E201	FF	E300	00
E202	00	E301	FF
		E302	FF
		E303	00
		E304	FF
		E305	00

Set-2

I/P		O/P	
E201	FF	E300	22H
E202	22H	E301	DDH
		E302	FFH
		E303	00H
		E304	DDH
		E305	22H

Discussion :- (i) The 3byte instruction LDA & STA are used in this program

(ii) ANA instruction used to do & AND operation between accumulator and B

(iii) CMA stands for complement the accumulator It performs 1's complement operation on the current contents of Accumulator.

Teacher's Signature & Date : .....

Experiment Name : Assignment - 5

Page No. 6
Date :

CLASS NOTE

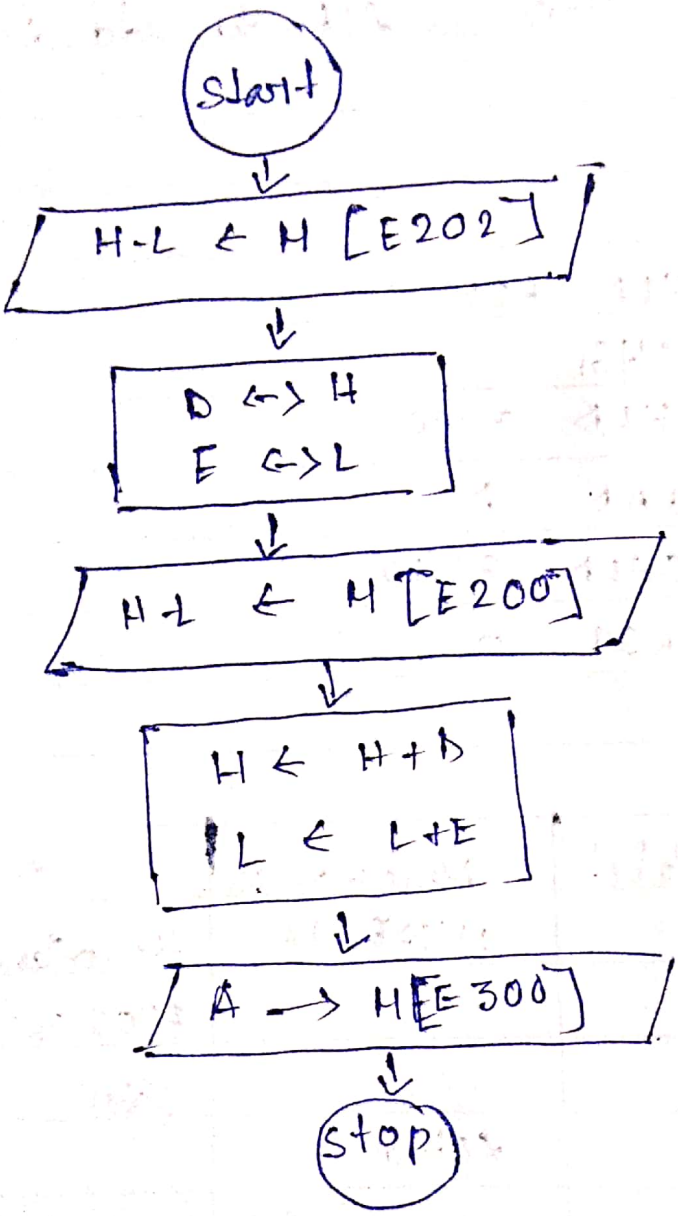
☐ Program statement : Write a ALP to add two 16 bit numbers.

☐ Assembly level :

```
LHLD  E202
XCHG
LHLD  E200
DAD   D
SHLD  E300
RST   0
```

☐ Table form :

Address	OP Code	label	Mnemonics	Comment
E200	2A		LHLDE202	the content of location
E001	02			E202 is copied into HL
E002	E2			pair
E003	EB		XCHG	
E004	2A		LHLD E200	the content of location
E005	00			E200 is copied int
E006	E2			HL pair
E007	19		DAD D	AND operation
E008	22		SHLD E300	Content of HL pair
E009	00			is stored in E300
E00A	E3			
E00B	C7		RST0	



Experiment Name :

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Date :

INPUT & OUTPUT :

Set 1 :

Input		Output	
E200	66H	E300	99H
E201	95H	E301	67H
E202	33H	E	
E203	22H		

Set 2.

E200	15H	E300	CCH
E201	1CH	E301	76H
E202	B7H		
E203	5AH		

Discussion :- ① LHLD is used to load HL pair using direct addressing from 16 bit memory location whose 16 bit address is denoted as a16.

② XCHG is used to exchange contents of HL register pair with DE register pair.

Teacher's Signature & Date : .....

Experiment Name: Assignment - 4

Page No. 8
Date:

CLASS NOTE

Program statement :- Pack two BCD numbers.

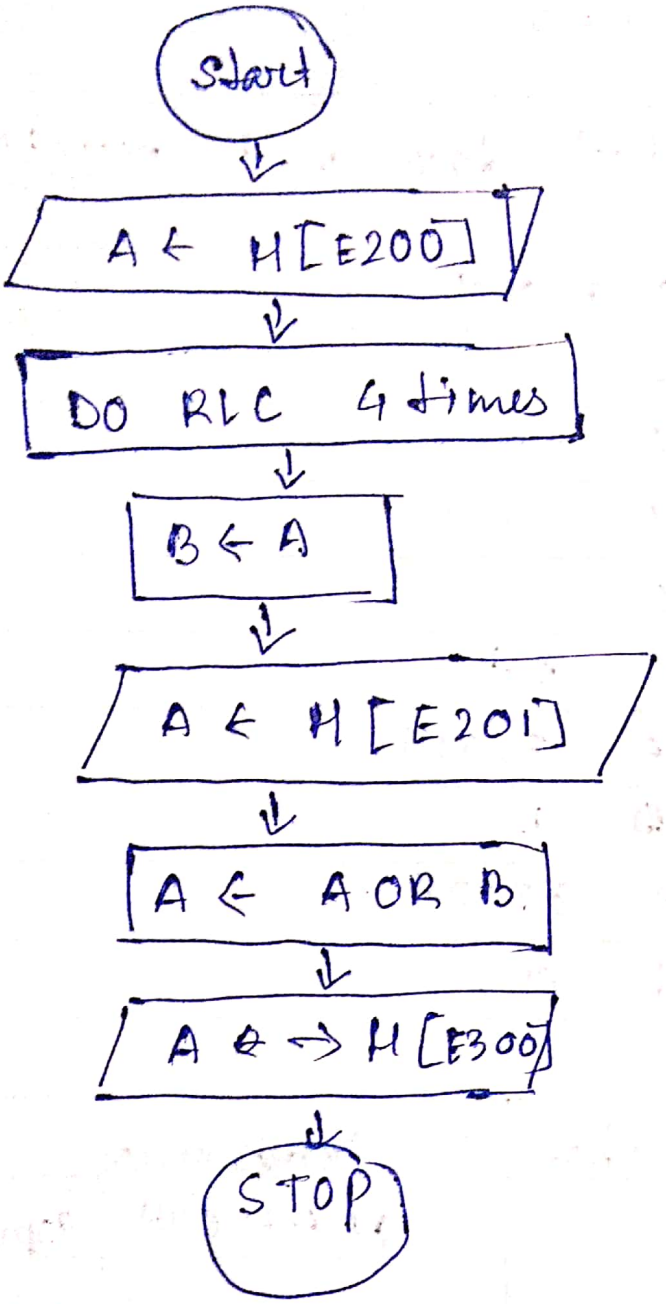
Assembly level :-

```
LDA  E200H
RLC
RLC
RLC
RLC
MOV  B,A
LDA  E201H
ORA  B
STA  E300H
RST  0
```

Table Form :-

Address	OPCode	label	Mnemonics	Comment
E000	3A		LDA E200H	Copy data from
E001	00			specified location
E002	E2			
E003	07		RLC	Rotate accumulator left
E004	07		RLC	"
E005	07		RLC	"
E006	07		RLC	"
E007	47		MOV B,A	Copy the data from A to B
E008	3A		LDA E201H	copy data from
E009	01			specified location
E00A	E2			
E00B	B0		ORA B	OR operation
E00C	32		STA E300H	copy the data to

Teacher's Signature & Date : .....



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Date :

CLASS NOTE

Address	OP Code	label	Mnemonics	Comment
E00D	00			memory specified
E00E	E3			location
E00f	C7		RST 0	

[1] Input & Output :-

Set 1 :-

Input	
E200	03
E201	02

Output	
E300	32

Set 2 :-

Input	
E200	04
E201	05

Output	
E300	45

[2] Discussion :- (i) LDA, STA are 3 byte instruction

(ii) RLC stands for "Rotate left Accumulator" It rotates the Accumulator contents to the left by 1 bit position. Thus, Cy flag gets a copy of the bit moved out from the MS position.

Teacher's Signature & Date : .....

Experiment Name: Assignment -5

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Date:

CLASS NOTE

1) Program statement :- Unpack two BCD number

2) Assembly level :-

```
LDA E200H
ANI 0FH
STA E201
LDA E200H
ANI F0H
RRC
RRL
RRC
RRC
STA E202H
RST 0
```

3) Table form :-

Address	OPCode	label	Mnemonics	comment
E000	3A		LDA E200H	Load BCD number in
E001	00			accumulator
E002	E2			
E003	E6		ANI 0F H	Mask Higher ~~lower~~ Byte to
E004	0F			~~Get~~
E005	32		STA E201H	copy the data to
E006	01			memory specified
E007	E2			location
E008	31		LDA E200H	load the content
E009	00			in accumulator
E00A	E2			

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Date:

CLASS NOTE

Address	OP Code	Label	Mnemonics	Comment
E00B	E6		ANI F0H	Mask lower Byte
E00C	F0			
E00D	0F		RRC	Rotate Right Accumulator
E00E	0F		RRC	"
E00F	0F		RRC	"
E010	0F		RRC	"
E011	32		STA E202 H	copy the content to
E012	02			the memory specified
E013	E2			location
E014	CF		RST 0	

☐ Input & Output :

Set 1

Input		Output	
E200	42	E201 H	4
		E202 H	2

Set 2

Input		Output	
E200	95	E201 H	9
		E202 H	5

☐ Discussion : ① LDA and STA are 3 Byte instruction.

② ANI OR 'And Immediate with Accumulator' is used to AND 8 bit Immediate data with the accumulator's content.

Experiment Name: Assignment - 6

Page No. 12
Date:

Problem statement :- Data transfer from one memory block to another

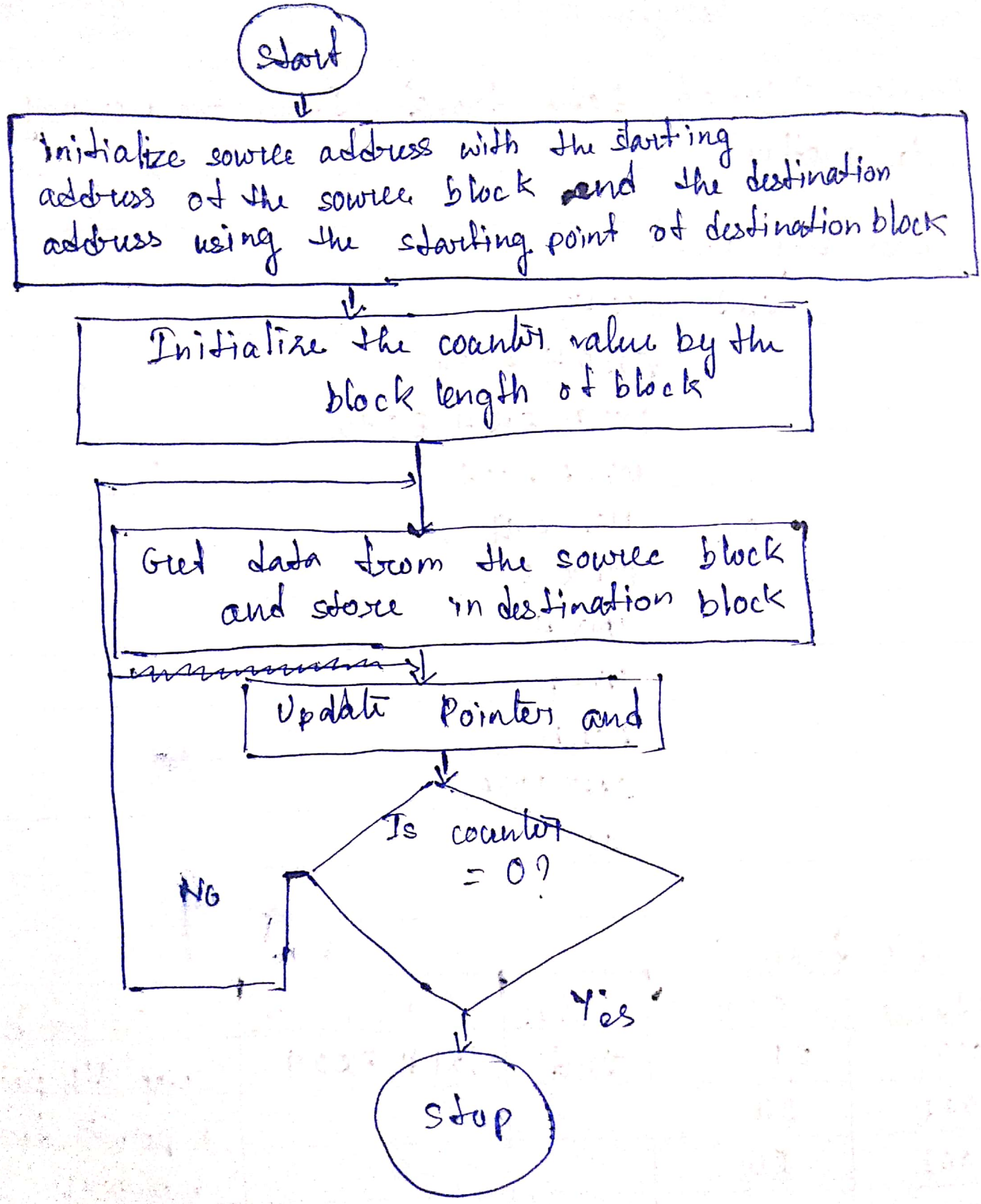
□ Assembly level :-

```
Start : LXI H,
        E050H E050H
        LXI D, E07H E070
        MVI B, 10H
Loop :  MOV A,M
        STAX D
        INX H
        INX D
        DCR B
        JNZ LOOP
        HLT
```

□ Table form :-

Address	OPCode	Label	Mnemonics	Comments
E000	21	Start	LXI H, E050H	Setup HL pair as
E001	50			a pointer for source
E002	E0			memory
E003	11		LXI D, E070H	Setup DE pair as
E004	70			pointer for destination
E005	E0			memory
E006	06		MVI B, 10H	Setup B to count
E007	10			16 bytes
E008	7E	LOOP	MOV A,M	Get data from source

Teacher's Signature & Date : .....



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Date :

CLASS NOTE

Address	OPCode	Label	Mnemonics	Comment
E009	12		STAX D	store data as destination
E00A	23		INX H	Point HL to next sourc loc
E00B	13		INX D	Point DE to next destinat
E00C	05		DCR B	Decrement count
E00D	C2		JNZ LOOP	if c != 0 go
E00E	08			back to transfer next
E00F	80			by te.
E010	76		HLT	

Input & Output

INPUT

Address	Value
E050H	00
E051	11
E052	22
E053	33
E054	44
E055	55
E056	66
E057	77
E058	88
E059	99
E05A	AA
E05B	BB
E05C	CC
E05D	DD

OUTPUT

Address	Value
E070	00
E071	11
E072	22
E073	33
E074	44
E075	55
E076	66
E077	77
E078	88
E079	99
E07A	AA
E07B	BB
E07C	CC
E07D	DD

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Experiment Name :

Page No. 14
Date :

CLASS NOTE

INPUT		OUTPUT	
Address	value	Address	value
8E05E	EE	E07E	EE
E05F	FF	E07F	FF

Discussion :- (i) LXI is used to load data from memory location using the memory address which stored in the register pair

(ii) INX is used to increment the register pair's value

Experiment Name : Assignment-1

Page No. 15
Date :

CLASS NOTE

Program statement : Write an ALP to find the factorial of an number.

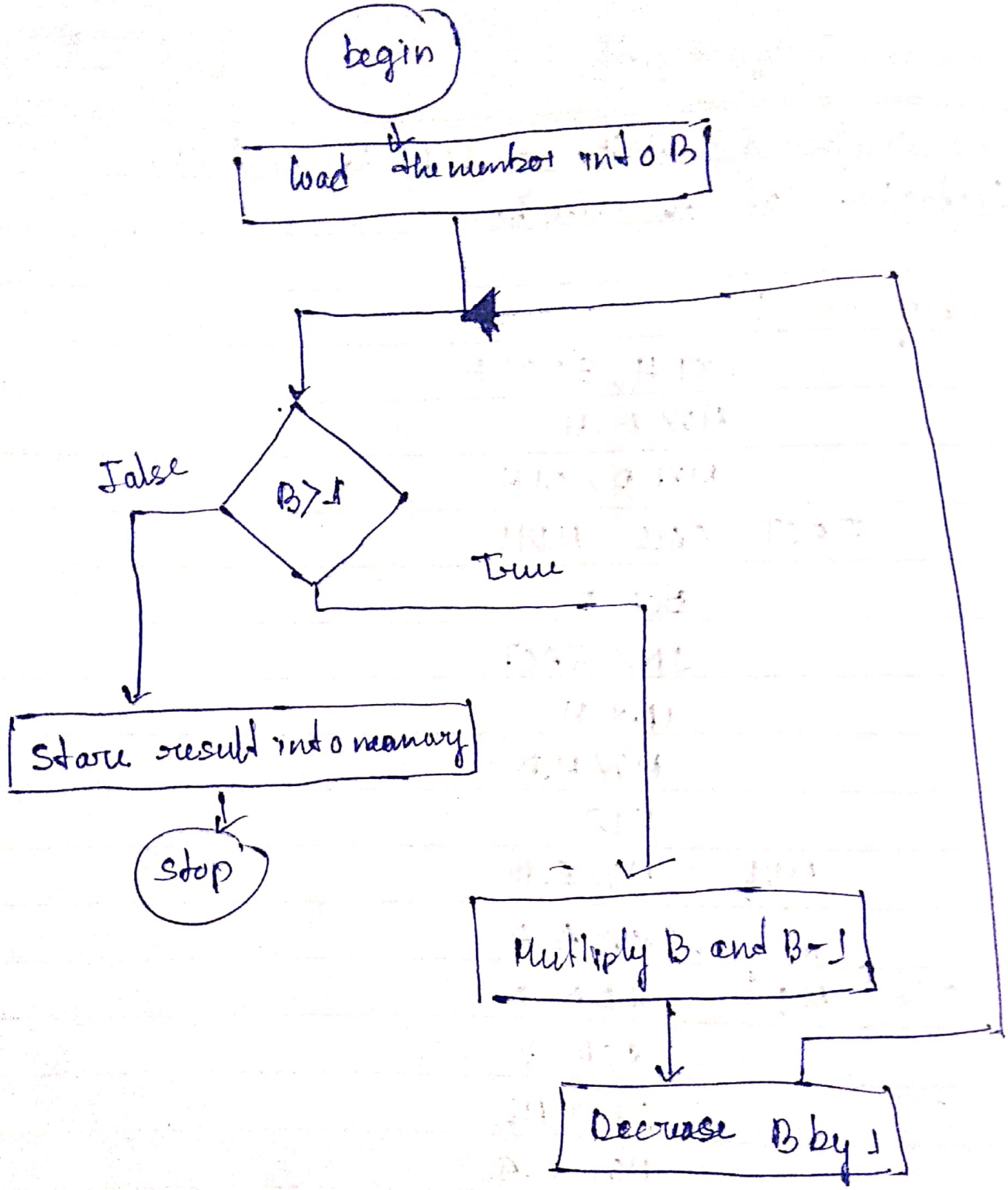
Assembly level :-

```
        LXI H, E200H
        MOV B, M
        MVI D, 01H
FACT:   CALL MULL
        DCR B
        JNZ FACT
        INX H
        MOV M, D
        HLT
MUL     MOV E, B
        XRA A
ML      ADD D
        DCR E
        JNZ ML
        MOV D, A
        RET
```

Table Form

Address	OPCode	labels	Mnemonics	Comments
E000	21		LXI E200	load the number
E001	00			
E002	E2			
E003	46		MOV B, M	Take number from to B
E004	016		MVI D, 01H	Set D to 01H

Teacher's Signature & Date : .....



Experiment Name :

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Date :

CLASS NOTE

Address	OPCode	Label	Mnemonics	Comments
E005	01			
E006	CD	FACT	CALL MULL	Call multiplication
E007	10			
E008	F0			
E009	05		DCR B	Decrease B by 1
E00A	C2		JNZ FACT	If Z=0 jmp to fact
E00B	06			
E00C	F0			
E00D	23		INX H	Point to next location
E00E	F2		MOV A, D	Store result in memory
E00F	F8		HLT	Terminate the program
E010	58	MUL	MOV E, B	Load B to E
E011	AF		XRA A	
E012	82	ML	ADD D	Add D to A
E013	1D		DCR E	Decrement E
E014	C2			
E015	12		JNZ ML	If Z=0 jmp to ML
E016	F0			
E017	57		MOV DA	Transfer contents of A to D
F018	C9		RET	Return Result

INPUT & OUTPUT

Set 1 - input → E200 [05] Output → E201 [F8]

Experiment Name :

Page No. 17
Date :

CLASS NOTE

Discussion:- In 8085, there is no direct instruction to perform multiplication. We need to perform repetitive addition to get the result of the multiplication. In each step we are decreasing the value of B and multiply with previous value of B. We are repeating these steps until B reaches 1 and B-1 to 0. Thus the factorial is generated.

Experiment Name : Assignment - 8

Page No. 16
Date :

CLASS NOTE

□ Problem statement :- write an ALP to generate Fibonacci series.

□ Assembly level :-

```
START:  LXI H E200
        XRA
        MOV B,A
        MOV M,A
        INR A
        INX H
        MOV M,A
        MVI C, 08H
LOOP:   ADD B
        MOV B,M
        INX H
        MOV M,A
        DCR C
        JNZ LOOP
        HLT
```

□ Table form

Address	OPCode	label	Mnemonics	Comment
E000	21	START	LXI H E200	Pointer to the out Button
E001	00			
E002	E2			
E003	AF		XRA	and reg clear accumulator A
E004	47		MOV B,A	
E005	77		MOV M,A	copy content to the target loc

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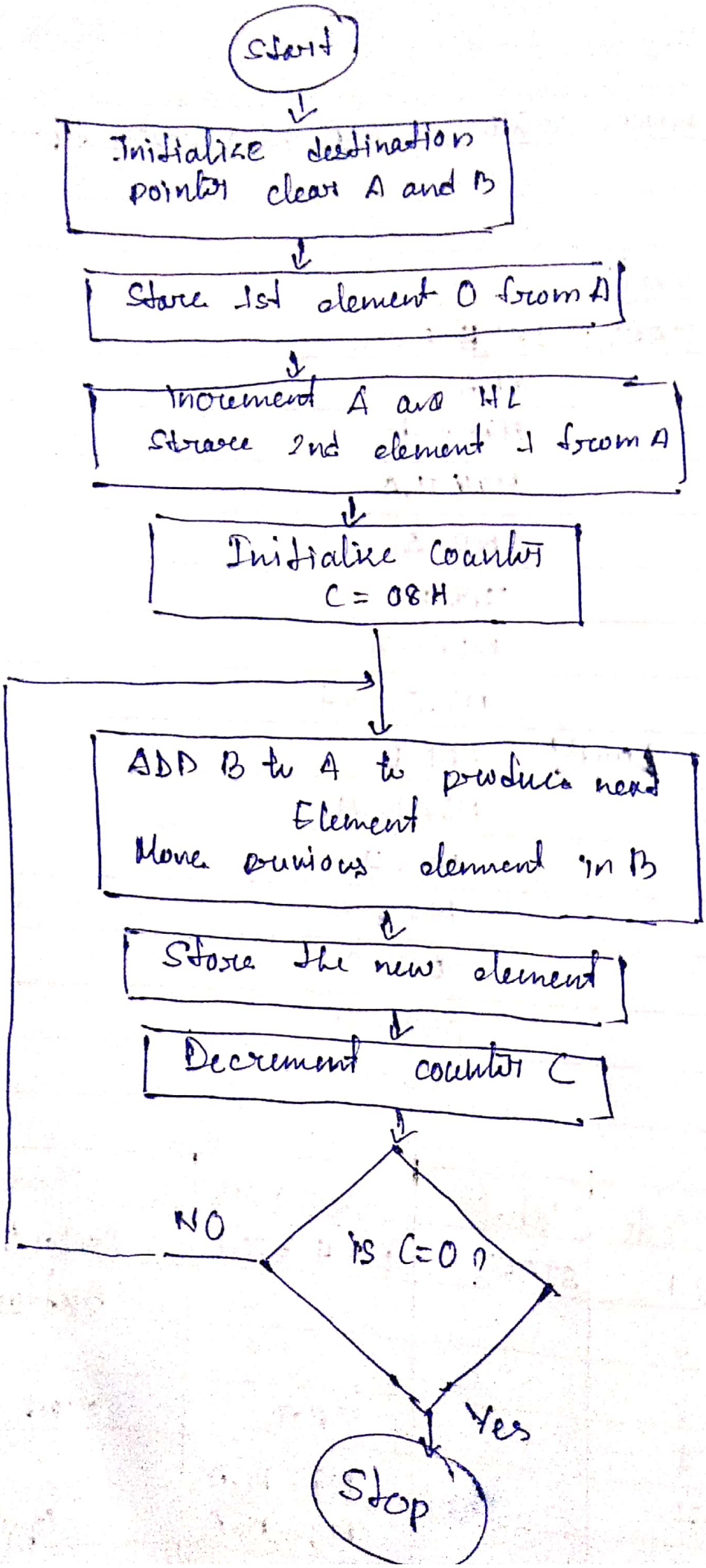

Experiment Name :

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Date :

CLASS NOTE

Address	OP Code	label	Mnemonics	Comments
E006	3C		MOV INR A	Increment A
E007	23		INX H	Goto the next dest address
E008	77		MOV M,A	Moving the content
E009	0E		MVI C,08H	initialise counter
E00A	08			
E00B	80	LOOP	ADD B	Getting the next term
E00C	46		MOV B,M	Initialising terms eg. T1=T2
E00D	23		INX H	Goto the next dest add
E00E	77		MOV M,A	writing to the dest buffer
E00F	0D		DCR C	Decrement count until 0
E010	C2		JNZ LOOP	
E011	0B			
E012	80			
E013	76		HLT	Terminate the program

Output :

Address	Data
....	
E200	00
E201	01
E202	01
E203	02
E204	03
E205	05
E206	08
E207	0D

Teacher's Signature & Date : .....

Experiment Name :

Address	Data
E208	15
E209	22
...	...

Discussion :- This program will generate the Fibonacci number. The Fibonacci number follows the relation $F(i) = F(i-1) + F(i-2)$ for all $i > 2$ with $F(1) = 0, F(2) = 1$

Experiment Name : Assignment-9

Page No. 21
Date :

Problem statement : Write an ALP to check a 16 bit number is palindrome or not.

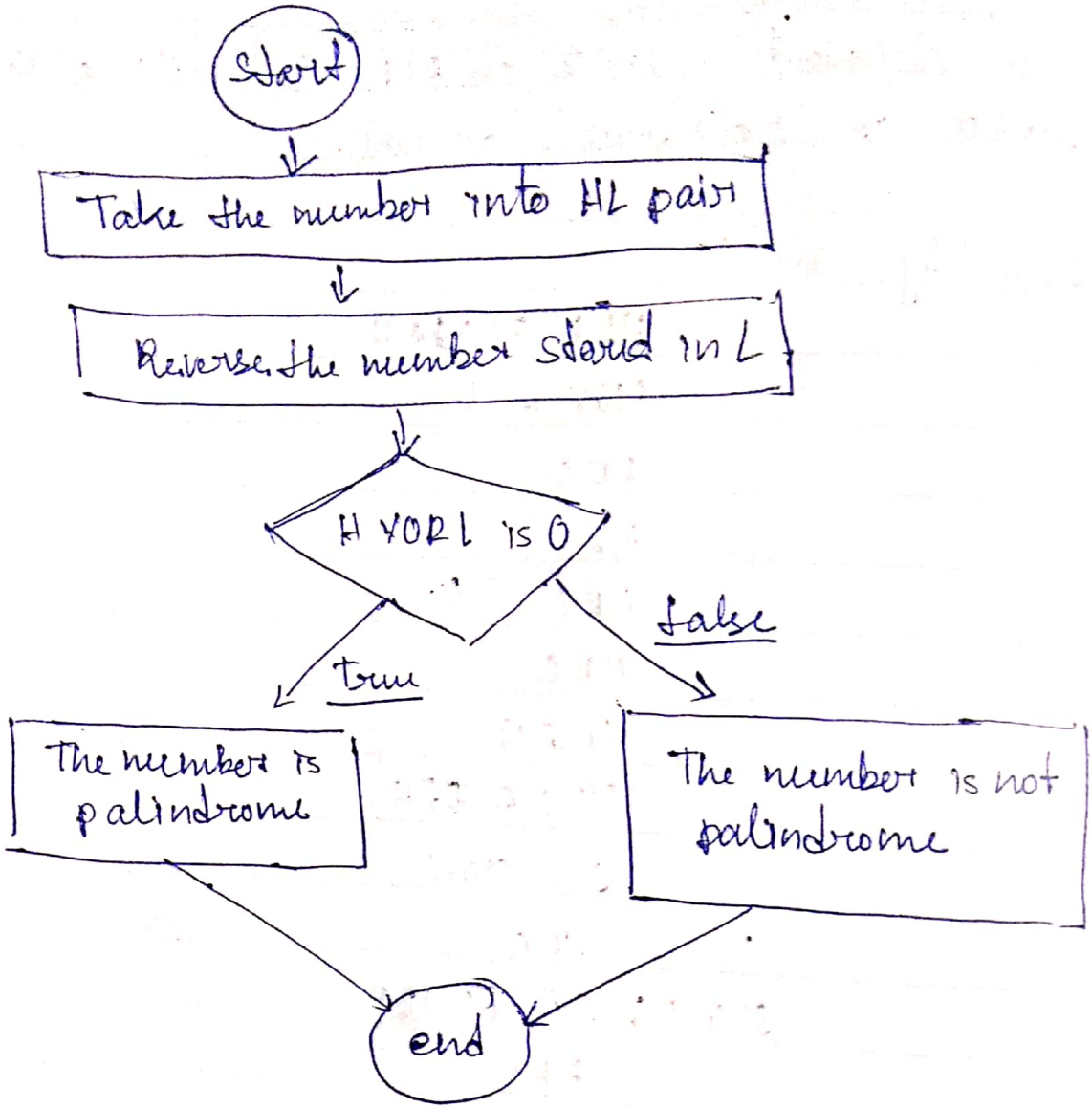
Assembly level :-

```
LHLD E200H
MOV A,L
RRC
RRC
RRC
RRC
XRAH
MVI A,FFH
JZ STORE
XRA
STORE: STA E20BH
HLT
```

Table form

Address	OPcode	Label	Mnemonics	comments
E000	2A		LHLDE201 H	Take the 16 bit number
E001	01			from memory to HL
E002	E2			pair.
E003	7D		MOV A,L	Take L to A
E004	0F		RRC	
E005	0F		RRC	
E006	0F		RRC	
E007	0F		RRC	
E008	AC		XRA H	XOR Acc and H

Teacher's Signature & Date : .....



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Address	OPcode	label	Mnemonics	Comments
E009	3E		MVI A, FFH	load FF H into A
E00A	FF			
E00B	CA		JZ STORE	
E00C	0F			
E00D	0F			
E00E	AF		XRA	Otherwise load A=0
E00F	32	Store	STA E206H	Store Results
E010	06			
E011	E2			
E012	76		HLT	Terminate the program

I Input & Output :

Set 1

Input

E200	25
E202	52

Output

E205	FF

Set 2

Input

E201	CD
E202	AB

Output

E205	00

I Discussion :- A number is a pb palindrome if the number and its reversed sequence is the number itself FOR for example, 5225 is a palindrome, but ABCD is not a palindrome. In this problem, we are taking the number and store it into the HL pair. Then we are reverse operation on L content. If the H and updated L value are the same, then the number is palindrom.

Experiment Name: Assignment - 10

Page No. 23
Date:

CLASS NOTE

1) Problem statement :- Write an ALP to count number of 1's in 8-bit number stored at location E201H

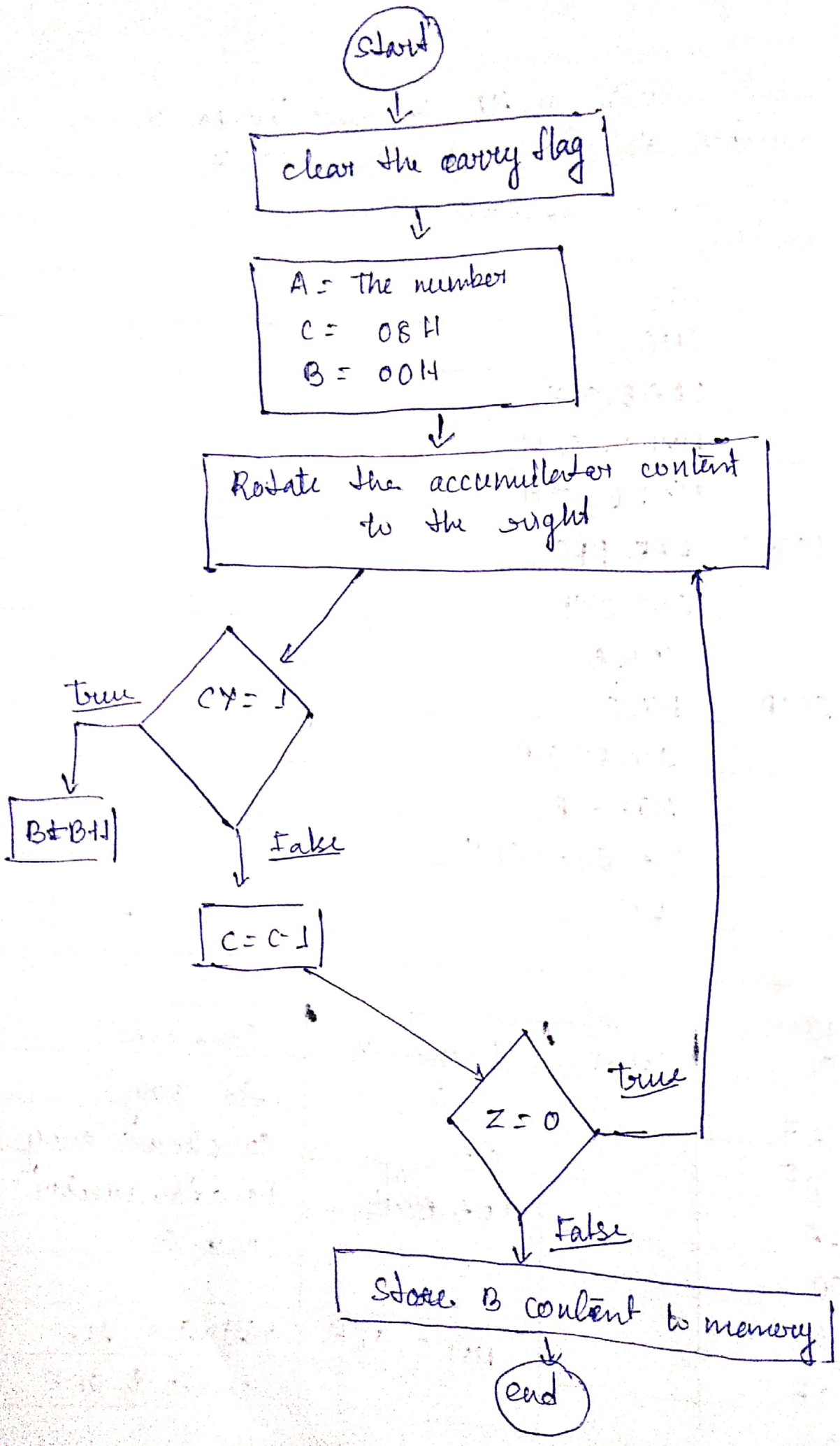
2) Assembly level :-

```
        STC
        CMC
        LDA E201H
        MVI C, 08H
        MVI B, 00H
LOOP:   RRC
        JNC SKIP
        INR B
SKIP    DCR C
        JNZ LOOP
        MOV A, B
        STA E202H
        HLT
```

3) Table Form

Address	OP code	Label	Mnemonics	Comments
E200	37		STC	Set carry
E201	3F		CMC	Complement Carry
E202	3A		LDA E201H	Load the number into A
E203	01			
E204	E2			
E205	0E		MVI C, 08H	Initialize the counter to 08H
E206	08			

Teacher's Signature & Date : .....



Experiment Name :

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Date :

CLASS NOTE

Address	OPCode	label	Mnemonics	Comments
E204	06		MVI B, 00H	clear B reg
E206	00			
E209	0F	LOOP	RRC	Rotate right
E20A	D2		JNC SKIP	if CY=0 skip the next step
E20B	0E			
E20C	10			
E20D	04		INR B	if CY=1 increase B
E20E	0D	SKIP	DCR C	Decrease C by 1
E20F	C2		JNZ LOOP	if Z=0 jump to Loop
E210	09			
E211	E0			
E212	78		MOV A,B	Load the count to A
E213	32		STA E202H	Store the result
E214	76		HLT	

I. Input & Output

	Input		Output	
Set 1	E201	DA	E202	05
Set	E201	22 H	E202	02

II. Discussion :- In this program we are using the rotate operation to count the number of 1's. As the are 8 different bits in 8 bit number then we are rotating the number eight times we can use RRC or RLC. Here we have used the RRC instruction. This instruction sends the LSb to MSb

Teacher's Signature & Date : .....

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Date :

CLASS NOTE

also to our array flag. So after each iteration as we can check the array status to get the count of 1's

Teacher's Signature & Date : .....