

DRONACHARYA

Group of Institutions

MICROPROCESSOR AND MICROCONTROLLER LAB

LABORATORY MANUAL

B.Tech. Semester –V

Subject Code: KEC-552

Session: 2023-24, Odd Semester

DRONACHARYA GROUP OF INSTITUTIONS

DEPARTMENT OF ECE

**#27 KNOWLEDGE PARK 3
GREATER NOIDA**

AFFILIATED TO Dr. ABDUL KALAM TECHNICAL UNIVERSITY,

LUCKNOW

List of Experiments mapped with COs

S. No.	Name of the Experiment	Course Outcome
1	Write a program using 8085 Microprocessor for Decimal, Hexadecimal addition and subtraction of two Numbers.	CO 1
2	Write a program using 8085 Microprocessor for addition and subtraction of two BCD numbers.	CO 1
3	To perform multiplication and division of two 8 bit numbers using 8085.	CO 2
4	To find the largest and smallest number in an array of data using 8085 instruction set.	CO 2
5	To write a program to arrange an array of data in ascending and descending order.	CO 3
6	To convert given Hexadecimal number into its equivalent ASCII number and vice versa using 8085 instruction set.	CO 5
7	To write a program to initiate 8251 and to check the transmission and reception of character.	CO 4
8	To interface 8253 programmable interval timer to 8085 and verify the operation of 8253 in six different modes.	CO 2
9	To interface DAC with 8085 to demonstrate the generation of square, saw tooth and triangular wave.	CO 3
10	Serial communication between two 8085 through RS-232 C port.	CO 5

EXPERIMENT-1

OBJECTIVE:

Write a program using 8085 Microprocessor for Decimal, Hexadecimal addition and subtraction of two Numbers.

APPARATUS REQUIRED: -

Sr. no.	Name of equipments/components/software	Specification/range/rating/versi on	Quantity
1	8085 Microprocessor programming kit, instruction coding sheet.	SCIENTECH-8085	1
2.	Power supply	A.C (230V Mains)	

DESCRIPTION/ALGORITHM:-

Hexadecimal Addition: The program takes the content of 2009, adds it to 200B & stores the result back at 200C.

- Steps:**
1. Initialize HL Reg. pair with address where the first number is lying.
 2. Store the number in accumulator.
 3. Get the second number.
 4. Add the two numbers and store the result in 200B.
 5. Go back to Monitor

Let: (2009 H) = 80 H
(200B H) = 15 H

Result = 80 H + 15 H = 95 H

(2009 H) → A
A → B

(200B H) → A

A + B → A

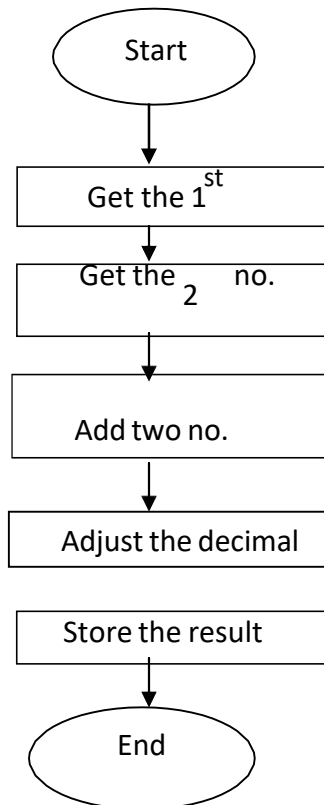
A → (200C H)

LXIH, 2009	;	Point 1 st no.
MOV A, M	;	Load the acc.
INX H	;	Adv Pointer
ADD M	;	ADD 2 nd NO.
INX H	;	Adv Pointer
MOV M, A	;	Store Result
RST 5		

Decimal Addition:

- Steps:**
1. Initialize HL Reg. pair with address where the first number is lying.
 2. Store the number in accumulator.
 3. Get the second number.
 4. Add the two numbers and store the result in 200B.
 5. Go back to Monitor

FLOWCHART:-



LXIH, 2009	;	Point 1 st no.
MOV A, M	;	Load the acc.
INX H	;	Adv Pointer
ADD M	;	ADD 2 nd NO.
DAA	;	Adjust the decimal
INX H	;	Adv Pointer
MOV M, A	;	Store Result
RST 5		

RESULTS: - Thus the numbers at 2009H and at memory are added.

CONCLUSION: - Thus the program to add two 8-bit numbers was executed.

EXPERIMENT-2

OBJECTIVE:- Write a program using 8085 Microprocessor for addition and subtraction of two BCD numbers.

APPARATUS REQUIRED: -

Sr. no.	Name of equipments/components/software	Specification/range/rating/version	Quantity
1	8085 Microprocessor programming kit, instruction coding sheet.	SCIENTECH-8085	1
2.	Power supply	A.C (230V Mains)	

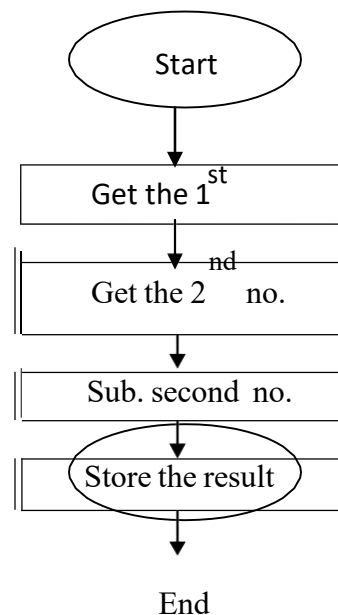
DESCRIPTION/ALGORITHM:-

Hexadecimal Subtraction : The program takes the content of 2009, subtracts it to 200B & stores the result back at 200C.

Steps:-

1. Initialize HL Reg. pair with address where the first number is lying.
2. Store the number in accumulator.
3. Get the second number.
4. Subtract second no from acc and store the result in 200B.
5. Go back to Monitor

FLOWCHART:-



PROGRAM:-

LXI H, 2009	;	Point 1 st no.
MOV A, M	;	Load the acc.
INX H	;	Adv Pointer

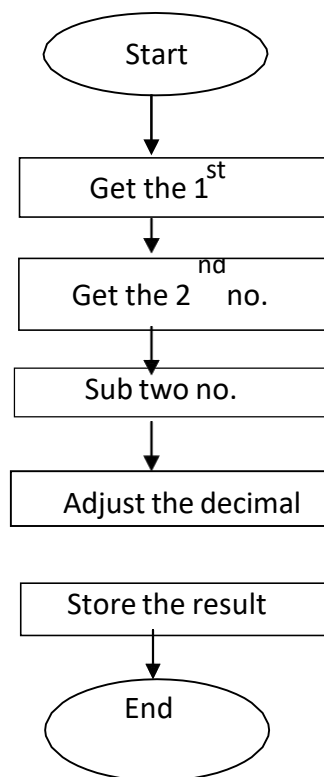
SUB M	;	Subtract IIND NO.
INX H	;	Adv Pointer
MOV M, A	;	Store Result
RST 5		

Decimal Subtraction :

Steps:-

1. Initialize HL Reg. pair with address where the first number is lying.
2. Store the number in accumulator.
3. Get the second number.
4. Subtract second no from acc and store the result in 200B.
5. Adjust the decimal
6. Go back to Monitor

FLOWCHART:-



PROGRAM:-

LXI H, 2009	;	Point 1 st no.
MOV A, M	;	Load the acc.
INX H	;	Adv Pointer
SUB M	;	Subtract IIND NO.

```
DAA      ; Adjust the decimal
INX H    ; Adv  Pointer
MOV M, A ; Store Result RST
5
```

RESULTS:- Numbers at 2009H and in HL pairs (Memory) are subtracted.

CONCLUSION:- Thus the subtraction operation is taken out using assembly language.

EXPERIMENT-03

OBJECTIVE:- To perform multiplication and division of two 8 bit numbers using 8085.

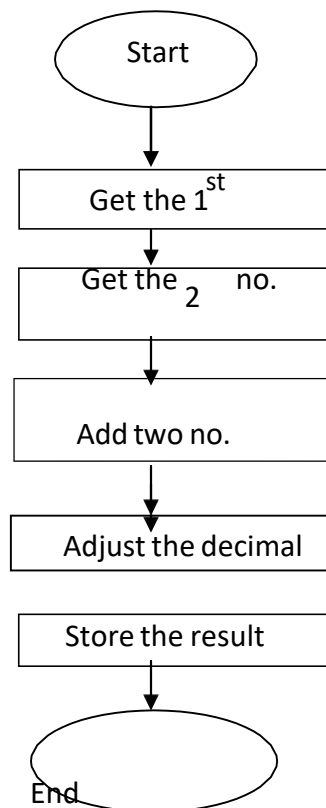
APPARATUS REQUIRED: -

Sr. no.	Name of equipments/components/software	Specification/range/rating/version	Quantity
1	8085 Microprocessor programming kit, instruction coding sheet.	SCIEN TECH-8085	1
2.	Power supply	A.C (230V Mains)	

DESCRIPTION/ALGORITHM:-

- Steps:**
1. Initialize HL Reg. pair with address where the first number is lying.
 2. Store the number in accumulator.
 3. Get the second number.
 4. Add the two numbers and store the result in 200B.
 5. Go back to Monitor

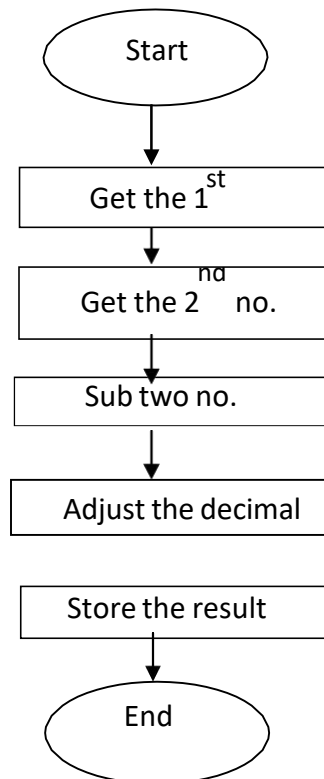
FLOWCHART:-



Steps:-

7. Initialize HL Reg. pair with address where the first number is lying.
8. Store the number in accumulator.
9. Get the second number.
10. Subtract second no from acc and store the result in 200B.
11. Adjust the decimal
12. Go back to Monitor

FLOWCHART:-



PROGRAM:-

```
LXI H, 2009 ; Point 1st no.  
MOV A, M ; Load the acc.  
INX H ; Adv Pointer  
SUB M ; Subtract IIND NO.  
DAA ; Adjust the decimal  
INX H ; Adv Pointer  
MOV M, A ; Store Result RST
```

RESULTS:-

The BCD numbers at 2009H and memory are added or subtracted.

CONCLUSION:-

Thus the subtraction operation is taken out using assembly language.

EXPERIMENT – 4

OBJECTIVE: - To find the largest and smallest number in an array of data using 8085 instruction set

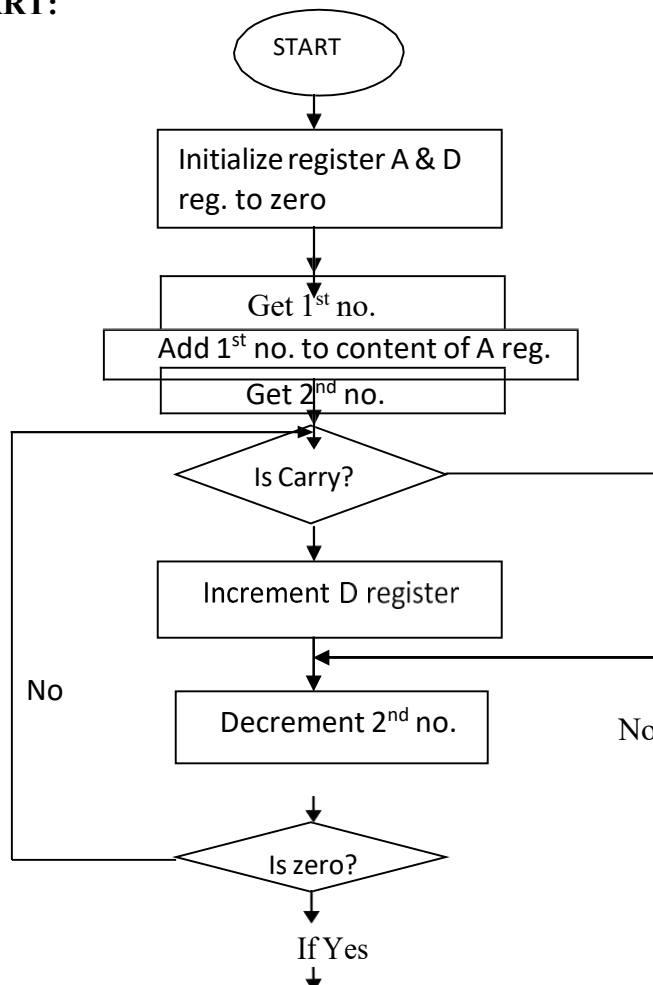
APPARATUS REQUIRED: -

Sr. no.	Name of equipments/ components/ software	Specification/range/rating/ version	Quantity
1	8085 Microprocessor programming kit, instruction coding sheet.	SCIENTECH-8085	1
2.	Power supply	A.C (230V Mains)	

DESCRIPTION/ALGORITHM:-

- 1) Start the program by loading HL register pair with address of memory location.
- 2) Move the data to a register (B register).
- 3) Get the second data and load into Accumulator.
- 4) Add the two register contents.
- 5) Check for carry.
- 6) Increment the value of carry.
- 7) Check whether repeated addition is over and store the value of product and carry in memory location.

FLOWCHART:



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PROGRAM:

```
MVI D, 00      ; Initialize register D to 00
MVI A, 00      ; Initialize Accumulator content to 00
LXI H, 4150    ; HL Points 4150
MOV B, M       ; Get the first number in B - register
INX H          ; HL Points 4151
MOV C, M       ; Get the second number in C- reg.
LOOP : ADD B   ; Add content of A - reg to register B.
JNC NEXT       ; Jump on no carry to NEXT.
INR D          ; Increment content of register D
NEXT : DCR C   ; Decrement content of register C.
JNZ LOOP       ; Jump on no zero to address
STA 4152       ; Store the result in Memory
MOV A, D       ; Get the carry in Accumulator
STA 4153       ; Store the MSB of result in Memory
HLT           ; Terminate the program.
```

RESULTS:

-

Input: FF (4150)
FF (4151)

Output: 01 (4152)
FE (4153)

CONCLUSION:-

Thus the multiplication process is taken out using assembly language for 8085 microprocessor

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EXPERIMENT – 5

OBJECTIVE: - To write a program to arrange an array of data in ascending and descending order.

APPARATUS REQUIRED: -

Sr. no.	Name of equipments/components/software	Specification/range/rating/version	Quantity
1	8085 Microprocessor programming kit, instruction coding sheet.	SCIENTECH-8085	1
2.	Power supply	A.C (230V Mains)	

DESCRIPTION/ALGORITHM:-

- 1) Start the program by loading HL register pair with address of memory location.
- 2) Move the data to a register (E register).
- 3) Get the second data and load into Accumulator.
- 4) Add the two register contents.
- 5) Check for carry.
- 6) Increment the value of carry.
- 7) Check whether repeated addition is over and store the value of product and carry in memory location.
- 8) Terminate the program.

EXAMPLE :

Steps	Product	Multiplier	Comments
	B ₇ B ₆ B ₅ B ₄ B ₃ B ₂ B ₁ B ₀	CY B ₃ B ₂ B ₁ B ₀	
Step 1	0 0 0 0 0 0 0 0	0 0 1 0 1	Initial Stage Shift left by 1
	0 0 0 0 0 0 0 0	0 1 0 1 0	Don't add since CY=0
Step 2	0 0 0 0 0 0 0 0	1 0 1 0 0	Shift
	0 0 0 0 1 1 0 0	1 0 1 0 0	Add multiplicand;CY=1
Step 3	0 0 0 1 1 0 0 0	0 1 0 0 0	Shift left by 1
	0 0 0 1 1 0 0 0	0 1 0 0 0	Don't add since CY=0
Step 4	0 0 1 1 0 0 0 0	1 0 0 0 0	Add multiplicand;CY=1

PROGRAM:

```

LXI H, 2200 H    ; Initialize the memory pointer
MOV E, M        ; Get multiplicand
MVID, 00 H      ; Extend to 16 bits
    
```

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```
INX H          ; Increment memory pointer
MOV A , M     ; Get Multiplier
LXI H , 0000 H ; Product = 0
MOV B, 08 H   ; Initialize counter with count 8
LOOP: DAD H   ; Product = product X 2

RAL
JNC XYZ      ; Is carry from multiplier 1?
DAD D       ; Yes, product = product + multiplicand
XYZ: DCR B   ; Is counter = 0
JNZ LOOP    ; No, repeat
SHLD 2300 H ; Store the result
HLT
```

RESULTS:-

Multiplication has been carried out between the data of 2200H and 2201 H.

CONCLUSION:-

Thus the multiplication process for 8 bit binary numbers is taken out in 8085 microprocessor

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EXPERIMENT – 6

OBJECTIVE:- To convert given Hexadecimal number into its equivalent ASCII number and vice versa using 8085 instruction set.

APPARATUS REQUIRED: -

Sr. no.	Name of equipments/components/software	Specification/range/rating/version	Quantity
1	8085 Microprocessor programming kit, instruction coding sheet.	SCIENTECH-8085	1
2.	Power supply	A.C (230V Mains)	

DESCRIPTION/ALGORITHM:-

- 1) Start the program by loading HL register pair with address of memory location.
- 2) Move the data to a register (B register).
- 3) Get the second data and load into Accumulator.
- 4) Compare the two numbers to check for carry.
- 5) Subtract the two numbers.
- 6) Increment the value of carry.
- 7) Check whether repeated subtraction is over and store the value of product and Carry in memory location.
- 8) Terminate the program.

PROGRAM:

```
LXI H, 4150
MOV B , M      ; Get the dividend in B – reg.
MVI C, 00      ; Clear C – reg for quotient
INX H          ;
MOV A , M      ; Get the divisor in A – reg.
NEXT: CMP B    ; Compare A - reg with register B.
JC LOOP        ; Jump on carry to LOOP
SUB B          ; Subtract A – reg from B- reg.
INR C          ; Increment content of register C.
JMP NEXT      ; Jump to NEXT
LOOP: STA 4152 ; Store the remainder in Memory
MOV A, C      ;
STA 4153      ; Store the quotient in memory
HLT           ; Terminate the program.
```

RESULTS:

Input: FF (4150)

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FF (4251)

Output: 01 (4152)-----Remainder

FE (4153)----- Quotient

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EXPERIMENT- 7

OBJECTIVE:- To write a program to initiate 8251 and to check the transmission and reception of character.

APPARATUS REQUIRED: -

Sr. no.	Name of equipments/components/software	Specification/range/rating/version	Quantity
1	8085 Microprocessor programming kit, instruction coding sheet.	SCIENTECH-8085	1
2.	Power supply	A.C (230V Mains)	

PROGRAM:

```
        MVIE, 00 H      ;      Quotient = 0
        LHLD 2200 H    ;      Get Dividend
        LDA 2300 H     ;      Get Divisor
        MOV B, A       ;      Store Divisor
        MVIC, 08 H    ;      Count = 08
NEXT : DAD H          ;      Dividend = Dividend X 2
        MOV A, E
        RLC
        MOV E, A      ;      Quotient = X 2
        MOV A, H
        SUB B         ;      Is MSB of dividend > divisor
        JC SKIP      ;      No go to next step
        MOV H, A     ;      Yes subtract divisor
        INR E        ;      Quotient = Quotient + 1
SKIP : DCR C         ;      Count = count - 1
        JNZ NEXT    ;      Is count = 0 repeat
        MOV A, E
        STA 2401 H   ;      Store Quotient
        MOV A, H
        STA 2401 H   ;      Store Remainder
        HLT         ;      End of program
```

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RESULTS:-

Number at 220H is divided from the number at 2300H

CONCLUSION:-

Thus the division process is taken out in 8085 microprocessor

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EXPERIMENT- 8

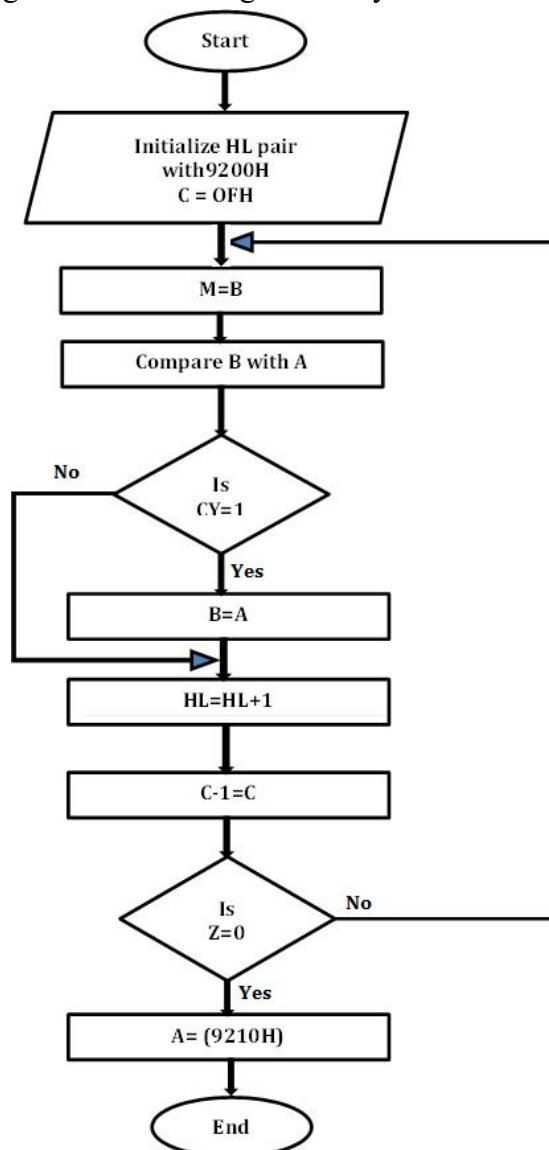
OBJECTIVE:- . To interface 8253 programmable interval timer to 8085 and verify the operation of 825 in six different modes.

APPARATUS REQUIRED: -

Sr. no.	Name of equipments/components/software	Specification/range/rating/version	Quantity
1	8085 Microprocessor programming kit, instruction coding sheet.	SCIENSTECH-8085	1
2.	Power supply	A.C (230V Mains)	

DESCRIPTION/ALGORITHM:-

Write a program to find the largest number in a given array of 16 elements. The array is stored in



memory from 9200H onwards. Store the result at the end of the array.FLOWCHART:-

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PROCEDURE:-

To find largest of given no. of a given string we compare all given no. one by one. Suppose given no. is 2, 4, 3, 1, 0 1st we compare 2 & 4 (2 is in register A & 4 is in Register B).

$A < B$ so put B into (A) & Compare with next number i.e. 3 Here $A > B$ so directly compare 4 with 1 then 0.

RESULT AND INFERENCE:-

The largest number from the array of 16 numbers from memory location 9200H is found out and stored at 9210H

PRECAUTION:- Take memory locations according model of kit.

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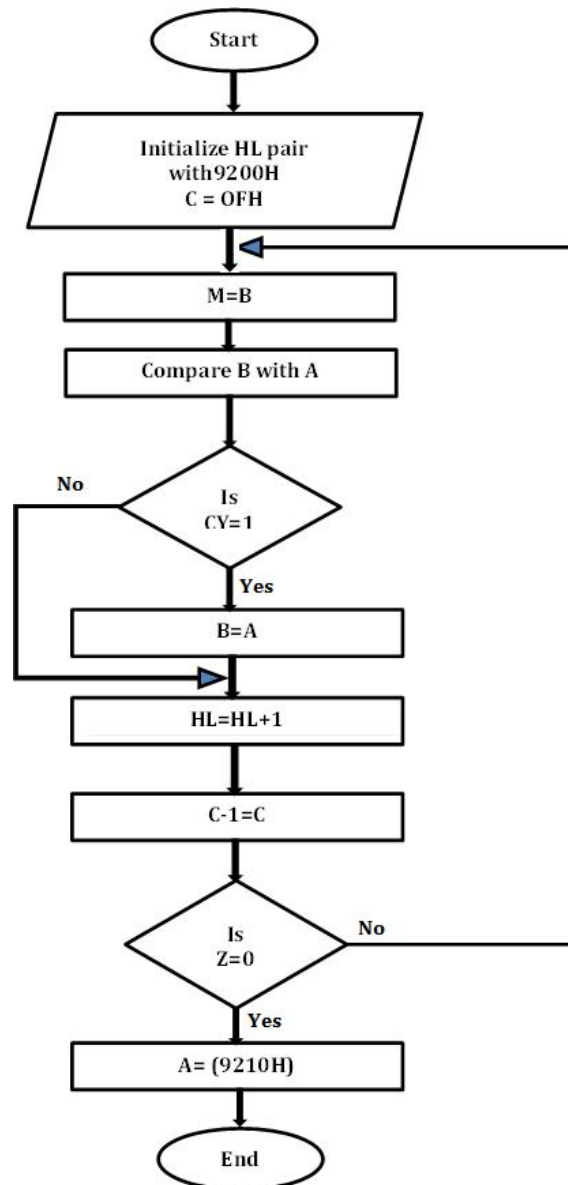
EXPERIMENT- 9

AIM:- To interface DAC with 8085 to demonstrate the generation of square, saw tooth and triangular wave.

REQUIREMENT:- 8085 microprocessor programming kit, instruction coding sheet.

THEORY:- Same as largest no. we compare two number one by one but comparison process is reverse.

PROCEDURE:-



RESULTS:

Smallest number has been found out from a 16 bit array starting from 9200H and is stored at 9210H.

CONCLUSION:

Thus the smallest number has been found out from the array in assembly language for 8085 microprocessor

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EXPERIMENT-10

OBJECTIVE:- Serial communication between two 8085 through RS-232 C port.

APPARATUS REQUIRED: -

Sr. no.	Name of equipments/components/software	Specification/range/rating/version	Quantity
1	8085 Microprocessor programming kit, instruction coding sheet.	SCIENTECH-8085	1
2.	Power supply	A.C (230V Mains)	

DESCRIPTION/ALGORITHM:-

Steps:

1. Intitialize timer IC
2. Move the mode command word to A
3. Output it to port address C2
4. Moce the command instruction word to A reg.
5. Output it to port address C2
6. Move the data to be transferred to A
7. Output it to port address C0
8. Reset the system
9. Get data from input port C0
10. Store the value in memory
11. Reset the system

PROGRAM:

```
MVI A,36H

Out CEH
MVI A,0AH
Out C8H
LXI H,4200H
MVI A,4EH

Out C2H
MVI A, 37H
Out C2H
MVI A, 42H
Out C0H
RST 1
ORG 4200H
In C0H
STA 4500H
RST 1
```

RESULT

Output at 4500=1

CONCLUSION

Thus the 8251 was initiated and the transmission and reception character was done successfully.

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This lab manual has been updated by

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Please spare some time to provide your valuable feedback