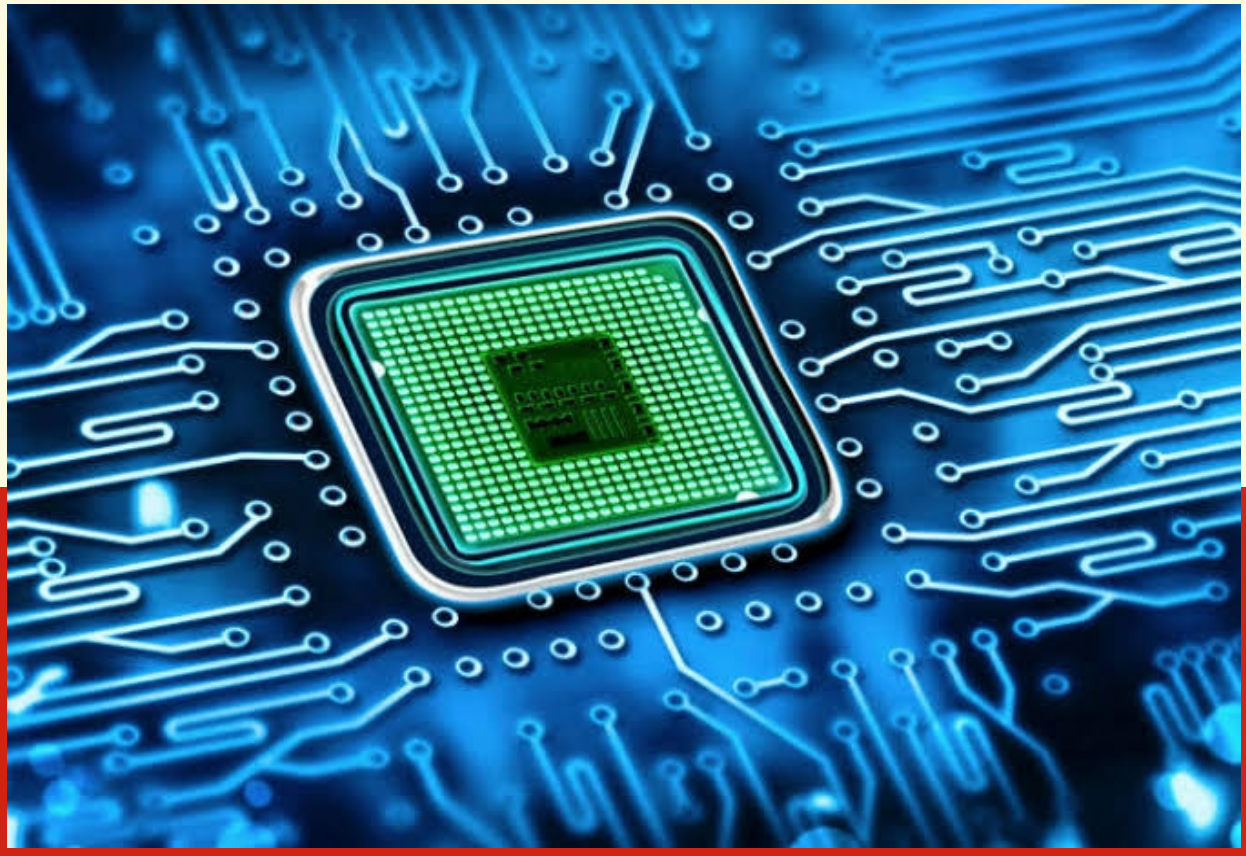
LAB MANNUAL

OF

MICROPROCESSOR AND MICROCONTROLLER



BHUBANANANDA ORISSA SCHOOL OF ENGINEERING

CUTTACK

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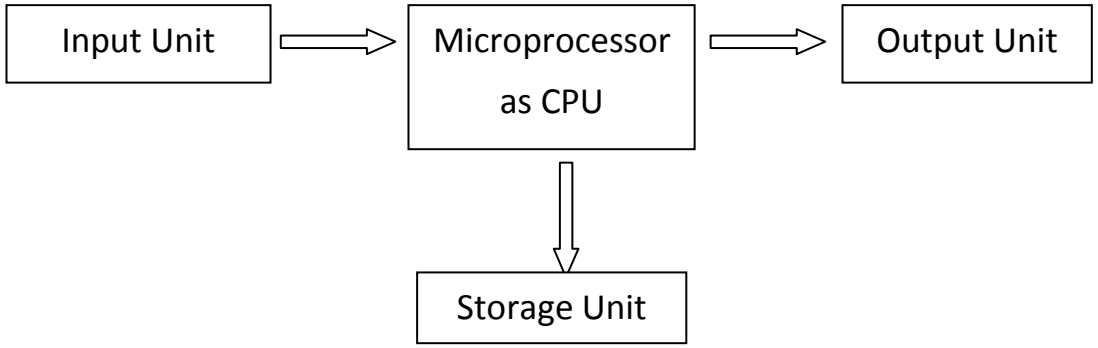
EXPERIMENT -1

AIM OF THE EXPERIMENT:-

Introduction to microprocessor.

Microprocessor:-

Microprocessor is a programmable electronic cable or silicon IC. Microprocessor is a small processor which incorporates the functions of computer central processing unit on a single IC chip.



Microprocessor basically contains:

(I) Multipurpose

(II) Digital Service

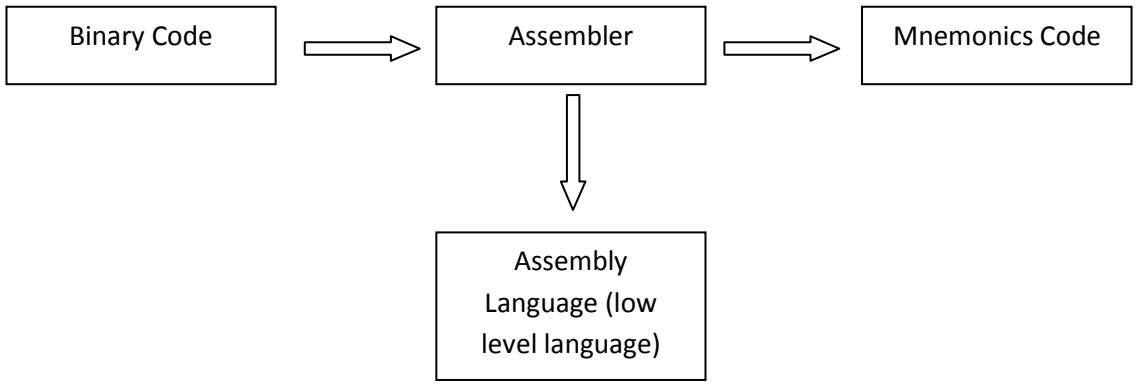
(III) Silicon IC

(IV) Reprogrammable

Microprocessor programming concept is waiting in two ways :

(a) Binary Code (0,1)

(b) Mnemonics Code (AXI, AXE, MVI, etc.)



Advantages of Microprocessor:-

(I) Speed: The rate of speed is becoming more to use of microprocessor.

(II) Data moment: Data can be easily transfer from one place to another to use of microprocessor.

(III) Complex Mathematics : More complex mathematical function will be done by microprocessor.

(IV) Small in Size : Its shape of size is small.

Disadvantages of Microprocessor:-

(I) Expensive

(II) It gets overheated

(III) Using only machine code.

Generation of Microprocessor:-

(I) Small Scale Integration

- It was introduced in the year of 1961.
- It also uses 10-20 transistor.
- Example : SSI Inverter

(II) Medium Scale Integration

- It was introduced in the year of 1966.
- It also uses 21-100 transistor.
- Example : MSI Multiplexer

(III) Large Scale Integration

- It was introduced in the year of 1971.
- It also uses 1000 transistor.
- Example : LSI 4004-4bit

(IV) Very Large Scale Integration

- It was introduced in the year of 1990.
- It also uses 10,000 transistor.
- Example : VLSI 8086,80286

(V) Ultra Large Scale Integration

- It was introduced in the year of 2000.
- It also uses 100,000 transistor.
- Example : ULSI Pentium-IV

(VI) Graphics Scale Integration

- It was introduced in the year of 2002.
- It also uses 10 lakh transistor.
- Example : Transmanufacturing

Application of Microprocessor:-

(I) Calculator

(II) Game

(III) Mobile Phone

(IV) Washing Machine

(V) Micro Oven

(VI) Refrigerator

(VII) Laptop/PC

(VIII) Traffic Light Control

(IX) Digital Watch

(X) Television

Evolution of Microprocessor:-

Sl. No.	Processor	Year	Address bus width	Data bus width
01	4004	1971	10 bit	4 bit
02	8008	1972	14 bit	8 bit
03	8080	1973	16 bit	8 bit
04	8085	1975	16 bit	8 bit
05	8086	1978	20 bit	16 bit
06	8088	1979	20 bit	16 bit
07	80286	1982	24 bit	16 bit
08	80386	1985	32 bit	32 bit
09	80486	1989	32 bit	32 bit
10	Pentium	1993	32 bit	64 bit
11	Pentium Pro	1995	36 bit	64 bit
12	Pentium -II	1997	36 bit	64 bit
13	Pentium - III	1999	36 bit	64 bit
14	Pentium -IV	2000	36 bit	64 bit

(I) The 1st microprocessor is 4004. It was introduced in the year of 1971. It's address bus width is 10 bit and data bus width is 4 bit.

(II) The 2nd microprocessor is 8008. It was introduced in the year of 1972. It's address bus width is 14 bit and data bus width is 8 bit.

(III) The 3rd microprocessor is 8080. It was introduced in the year of 1973. It's address bus width is 16 bit and data bus width is 8 bit.

(IV) The 4th microprocessor is 8085. It was introduced in the year of 1975. It's address bus width is 16 bit and data bus width is 8 bit.

(V) The 5th microprocessor is 8086. It was introduced in the year of 1978. It's address bus width is 20 bit and data bus width is 16 bit.

(VI) The 6th microprocessor is 8088. It was introduced in the year of 1979. It's address bus width is 20 bit and data bus width is 16 bit.

(VII) The 7th microprocessor is 80286. It was introduced in the year of 1982. It's address bus width is 24 bit and data bus width is 16 bit.

(VIII) The 8th microprocessor is 80386. It was introduced in the year of 1985. It's address bus width is 32 bit and data bus width is 32 bit.

(IX) The 9th microprocessor is 80486. It was introduced in the year of 1989. It's address bus width is 32 bit and data bus width is 32 bit.

(X) The 10th microprocessor is Pentium. It was introduced in the year of 1993. It's address bus width is 32 bit and data bus width is 64 bit.

(XI) The 11th microprocessor is Pentium Pro. It was introduced in the year of 1995. It's address bus width is 32 bit and data bus width is 64 bit.

(XII) The 12th microprocessor is Pentium-II. It was introduced in the year of 1997. It's address bus width is 32 bit and data bus width is 64 bit.

(XIII) The 13th microprocessor is Pentium-III. It was introduced in the year of 1999. It's address bus width is 32 bit and data bus width is 64 bit.

(XIV) The 14th microprocessor is Pentium-IV. It was introduced in the year of 2000. It's address bus width is 32 bit and data bus width is 64 bit.

CONCLUSION :

From the above experiment we conclude that the experiment has successfully done the basic on the introduction to microprocessor.

EXPERIMENT -2

AIM OF THE EXPERIMENT:-

8085 instruction set.

DATA TRANSFER INSTRUCTION : -

Opcode	Operand	Description
MOV(Copy from source to destination)	Rd, Rs	➢ This instruction copies the content of the source register to destination register. ➢ The contain of source register are not alter if the one of operand is a memory location its supply by content of the register.
	M, Rs	
	Rd, M	
MVI(Move immediate 8-bit data)	Rd, Data	➢ The 8-bit data to store the designation register or in memory. ➢ Example-MVI B,57H.
	M, Data	
STA(Store Accumulator Direct)	B/D register pair	➢ The content of the accumulator are copied to the memory location specified by the operand.
STAX (Store Accumulator Indirect	Rp	➢ The content of accumulator are copy to the memory location specified by the memory location.
SHLD (Store H-L pair direct)	16 bit address	➢ The contents of register are store in to the memory specified by the memory location. ➢ The contents of H-L pair register are not altered.
LDA(Load Accumulator)	16 bit address	➢ The contents of the designated register pair are copied to the content of the accumulator. ➢ Ex- LDA 024H
LDAX (Load Accumulator Indirect)	B/D register pair	➢ The contents of the designated register pair are copied to the content of the accumulator. ➢ Ex- LDAX B
LXI(Load Register Pair Immediate)	Register pair 16 bit data	➢ The content of 16 bit data is copied to the register pair.
LHLD (Load H-L pair direct)	16 bit address	➢ The instruction copy the contents of memory location pointed by 16 bit address into the H-L pair. ➢ This an indirect addressing mode. ➢ Ex- LHLD 6050H
SHLD(Store H-L pair direct)	16 bit address	➢ The content of register i.e. 16 bit data store in the H-L pair register. ➢ Ex- SHLD 6050H

ARITHIMETIC INSTRUCTION : -

Opcode	Operand	Description
ADD (Add register or memory to the accumulator)	ADD R	➢ The content of register or memory are added to the content of the accumulator and the result stored in the accumulator. ➢ Ex- ADD R [A] ← A+R
	ADD M	
ADI (Add Immediate data to the accumulator)	ADI 8 bit data	➢ All flags are modify to reflect the operation. ➢ Ex- ADI 19H. 19H + A → A
ADC (Add register to the accumulator with carry)	ADC R	➢ The content of register or memory and carry flag are to the content of accumulator and result stored in the accumulator.
	ADC M	
ACI (Add Carry Immediate)	ACI 8 bit data	➢ The 8 bit data and carry flags are added to the content of the accumulator and result stored in the accumulator. ➢ Ex- ACI 30H ➢ [A]← A+ 30H + Cy
DAD(Add Rp to the H-L pair)	DAD Rp	➢ The instruction add the Rp that is B-C, DE, WZ with the concept of H-L pair and result stored in the H-L pair. ➢ Ex- DAD DE [H-L]← DE + HL
SUB (Subtract register or memory from A)	SUB R	➢ The content of register or memory are subtracted from the concept of the accumulator and the result stored in the accumulator. ➢ Ex- SUB R[A] ← A - R
	SUB M	
SBB (Subtract register or memory and borrow are subtracted from the accumulator)	SBB R	➢ The concept of register or memory and borrow are subtracted from the content of concept of accumulator and result stored in the accumulator. ➢ Ex- SBB R [A]← A - R - Br
	SBB M	
SUI (Subtract Immediate data from the A)	SUI 8 bit data	➢ The 8 bit data are subtracted from the concept of accumulator and result stored in the accumulator. ➢ Ex- SUI 20H [A]← A-20H
INR (increment the content of Register/ memory by 1.	INR R	➢ The content of register memory are incremented by 1 and the result store in the same place.
	INR M	

		➢ Ex- INR DE, Let DE=15.6 H DE ← 15.6H
DCR (Decrement the content of R or M by 1	DCR R	➢ The content of register memory are decremented by 1 and the result store in the same place. ➢ If the operand is M then the result store in the H-L pair register. ➢ Ex- DCR R, Let R=17 H R ← 16H
	DCR M	
DCX (Decrement the Rp by 1)	DCX Rp	➢ The content of Rp are decremented by 1 and result stored in the same place. ➢ Ex- DCX C Let C=22H B-C ← 21H

EXPERIMENT -3

AIM OF THE EXPERIMENT:-

To add 8bit numbers using mnemonics code.

REQUIREMENT:-

(I) 8085 trainer kit

(II) Power supply

(III) Keyboard

PROGRAM:-

Press Enter

Press E

Press A

Press Enter (3 times)

Press N

Press Enter

Press W

0001 ORG 6000 ↵

0002 MVI A , 22 ↵

0003 MVI B, 33 ↵

0004 ADD B

0005 RST 1

Press control + C

Press A

Press Y

Press Esc (2times)

Press G

Press Enter (2 times)

6000 ↵

Press Enter

Press S

Press Enter

Enter any value in 2 times (K, L, etc.)

Press Enter (2 times)

OUTPUT:-

A=22H

B=33H

A=55H

CONCLUSION:-

From the above experiment, we concluded that the experiment has successfully done.

EXPERIMENT - 4

AIM OF THE EXPERIMENT:-

To add 8bit numbers using machine code.

REQUIREMENT:-

(I) Microprocessor kit(8085)

(II) Power supply

(III) Keyboard

PROGRAM:-

Address	Machine Code	Instruction
7001	3E, 11	MVI A, 11H
7002	06, 12	MVI B, 12H
7004	50	MOV D,B
7005	80	ADD B
7006	CF	RST 1

PROCESS:

Enter

S

Enter

Enter

7000

Enter

3E

ENTER (3times)

6

ENTER

ENTER any value

ENTER

50

ENTER

80

ENTER

CF

ENTER

Esc

G

ENTER

ENTER

7000

ENTER

S

ENTER

Space Key(2 times)

ENTER (2 times)

OUTPUT:-

A=23H

CONCLUSION:-

From the above experiment, we concluded that the experiment has successfully done by me.

EXPERIMENT - 5

AIM OF THE EXPERIMENT:-

To subtract 8bit numbers using machine code.

REQUIREMENT:-

(I) 8085 trainer kit

(II) Power supply

(III) Keyboard

PROGRAM:-

Address	Machine Code	Instruction
7000	3E, 91	MVI A, 91H
7002	06, 21	MVI B, 21H
7004	50	MOV D,B
7005	90	SUB B
7006	CF	RST 1

PROCESS:-

Press Enter

Press S

Press Enter (2 times)

7000

3E

91

06

21

50

90

CF

Press Esc

Press G

Press Enter (2 times)

Press 7000

Press Enter

Press Space key (2times)

Press Enter (2 times)

OUTPUT:-

A=91H

B=21H

A=70H

CONCLUSION:-

From the above experiment, we concluded that the experiment has successfully done by me.

EXPERIMENT - 6

AIM OF THE EXPERIMENT:-

Addition of two number using address 20C0, 20C1 and result stored in 20C2.

REQUIREMENT:-

(I) Microprocessor kit

(II) Power supply

(III) Keyboard

PROGRAM:-

Address	Opcode	Instruction
6400	3A, C0, 20	LDA 20C0H
6403	47	MOV B,A
6404	3A, C1, 20	LDA 20C1H
6407	80	ADD B
6408	32, C2, C0	STA 20C2H
640B	CF	RST 1

PROCESS:-

Press Enter

Press S

Press Enter (2 times)

Press 6400

Press Enter

Press 3A

Press C0

Press 20

Press 47

Press 3A

Press C1

Press 20

Press 80

Press 32

Press C2

Press 20

Press CF

Press Esc

Press S

Press Enter (2 times)

Press 20C0

Press 35

Press 26

Press Esc

Press G

Press Enter (2 times)

Press 6400

Press S

Press Enter (2 times)

Press 20C2

Press Enter

OUTPUT:-

5B

CONCLUSION:-

From the above experiment, we concluded that the experiment has successfully done by me.

EXPERIMENT - 7

AIM OF THE EXPERIMENT:-

Subtraction of two number using address 20C1, 20C2 and result stored in 20C3.

REQUIREMENT:-

(I) Microprocessor kit

(II) Power supply

(III) Keyboard

PROGRAM:-

Address	Opcode	Instruction
6400	3A, C1, 20	LDA 20C1H
6403	47	MOV B,A
6404	3A, C2, 20	LDA 20C2H
6407	90	SUB B
6408	32, C3, C0	STA 20C3H
640B	CF	RST 1

PROCESS:-

Press Enter

Press S

Press Enter (2 times)

Press 6400

Press Enter

Press 3A

Press C1

Press 20

Press 47

Press 3A

Press C2

Press 20

Press 90

Press 32

Press C3

Press 20

Press CF

Press Esc

Press S

Press Enter (2 times)

Press 20C1

Press 35

Press 26

Press Esc

Press G

Press Enter (2 times)

Press 6400

Press S

Press Enter (2 times)

Press 20C3

Press Enter

OUTPUT:-

10

CONCLUSION:-

From the above experiment, we concluded that the experiment has successfully done by me.

EXPERIMENT - 8

AIM OF THE EXPERIMENT:-

To find out the 1's Complement of an 8 bit number using address 2501 and result stored in 2502H.

REQUIREMENT:-

(I) Microprocessor kit

(II) Power supply

(III) Keyboard

PROGRAM:-

Address	Machine Code	Mnemonics	Operand	Comments
2000	3A, 01, 25	LDA	2501 H	Get data in Accumulator
2003	2F	CMA		Take it's complement
2004	32, 02, 25	STA	2502 H	Store result in 2502H.
2007	CF	HLT		STOP

PROCESS:-

Press Enter

Press S

Press Enter (2 times)

Press 2000

Press Enter

Press 3A

Press 01

Press 25

Press 2F

Press 32

Press 02

Press 25

Press CF

Press Esc

Press S

Press Enter (2 times)

Press 2501

Press Enter

Press 94

Press Esc

Press G

Press Enter (2 times)

Press 2000

Press Enter

Press S

Press Enter (2 times)

Press 2502

Press Enter

OUTPUT:-

6C

CONCLUSION:-

From the above experiment, we concluded that the experiment has successfully done by me.

EXPERIMENT - 9

AIM OF THE EXPERIMENT:-

To find out 2's Complement of an 8 bit number using address 2501 and result stored in 2502H.

REQUIREMENT:-

(I) Microprocessor kit

(II) Power supply

(III) Keyboard

PROGRAM:-

Address	Machine Code	Mnemonics	Operand	Cpmments
2000	3A, 01, 25	LDA	2501 H	Get data in Accumulator
2003	2F	CMA		Take it's complement
2004	3C	INR	A	Take 2's complement
2005	32, 02, 25	STA	2502 H	Store result in 2502H.
2008	CF	HLT		STOP

PROCESS:-

Press Enter

Press S

Press Enter (2 times)

Press 2000

Press Enter

Press 3A

Press 01

Press 25

Press 2F

Press 3C

Press 32

Press 02

Press 25

Press CF

Press Esc

Press S

Press Enter (2 times)

Press 2501

Press Enter

Press 96

Press Esc

Press G

Press Enter (2 times)

Press 2000

Press Enter

Press S

Press Enter (2 times)

Press 2502

Press Enter

OUTPUT:-

6A

CONCLUSION:-

From the above experiment, we concluded that the experiment has successfully done by me.