MICROPROCESSORS AND MICROCONTROLLERS

LAB MANUAL

A.Y: 2018-19

III B.TECH II Semester-ECE (R16)

Prepared by

D Mahesh

Assistant professor

ECE Dept.

MARRI LAXMAN REDDY

INSTITUTE OF TECHNOLOGY & MANAGEMENT

(Affiliated to JNTU, Hyderabad, Approved by AICTE, New Delhi)

Accredited by NBA, Accredited by NAAC with 'A' Grade & Recognized Under section 2(f) & 12(B) of the UGC act, 1956

Dundigal (Vill .& Mandal), Medchal District, Hyderabad - 500043, Telangana.

VISION AND MISSION OF THE INSTITUTE

INSTITUTE VISION:

To establish as an ideal academic institutions in the service of the nation, the world and the humanity by graduating talented engineers to be ethically strong, globally competent by conducting high quality research, developing breakthrough technologies, and disseminating and preserving technical knowledge.

INSTITUTE MISSION:

To fulfill the promised vision through the following strategic characteristics and aspirations:

1. **An atmosphere** that facilitates personal commitment to the educational success of students in an environment that **values diversity and community.**

2. Prudent and accountable **resource management**;

3. Undergraduate programs that integrate **global awareness, communication skills and team building** across the curriculum;

4. **Leadership and service** to meet society's needs;

5. Education and research **partnerships** with colleges, universities, and industries to graduate education and training that prepares students for **interdisciplinary engineering** research and advanced problem solving;

6. Highly **successful alumni** who contribute to the profession in the global society.

VISION AND MISSION OF THE DEPARTMENT

DEPARTMENT VISION:

Imparting quality technical education through research, innovation and team work for a lasting technology development in the area of Electronics and Communication Engineering.

MISSION:

To develop a strong centre of excellence for education and research with excellent infrastructure and well qualified faculties to instill in them a passion for knowledge.

To achieve the Mission the department will

1. Establish a unique learning environment to enable the students to face the challenges of the Electronics and Communication Engineering field.

2. Promote the establishment of centre of excellence in niche technology areas to nurture the spirit of innovation and creativity among faculty and students.

3. Provide ethical and value based education by promoting activities addressing the societal needs.

4. Enable students to develop skills to solve complex technological problems of current times and also provide a framework for promoting collaborative and multidisciplinary activities.

PROGRAMME EDUCATIONAL OBJECTIVES

1. **PEO 1:** have successful **careers in Industry.**
2. **PEO 2:** show excellence in **higher studies/ Research.**
3. **PEO 3:** Show good competency towards **Entrepreneurship.**

COURSE OUTCOMES

MPMC:

CO1: The student will learn the internal organization of popular 8086/8051 microprocessors/microcontrollers.

CO2: The student will learn hardware and software interaction and integration.

CO3: The students will learn the design of microprocessors microcontrollers-based systems.

MPMC LAB:

CO1: write and execute simple assembly language programs involving arithmetic operations.

CO2: write and execute simple assembly language programs for sorting an array in Ascending order and descending order.

CO3: write and execute program for searching a Number in a given array.

CO4: write and execute programs for string display, length of the string and reverse of the string.

PROGRAM OUTCOMES

a	An ability to apply knowledge of Science, Mathematics, Engineering & Computing fundamentals for the solutions of Complex Engineering problems
b	An ability to identify, formulates, research literature and analyze complex engineering problems using first principles of mathematics and engineering sciences.
c	An ability to design solutions to complex process or program to meet desired needs.
d	Ability to use research-based knowledge and research methods including design of experiments to provide valid conclusions.
e	An ability to use appropriate techniques, skills and tools necessary for computing practice.
f	Ability to apply reasoning informed by the contextual knowledge to assess social issues, consequences & responsibilities relevant to the professional engineering practice.
g	Ability to understand the impact of engineering solutions in a global, economic, environmental, and societal context with sustainability.
h	An understanding of professional, ethical, Social issues and responsibilities.
i	An ability to function as an individual, and as a member or leader in diverse teams and in multidisciplinary settings.
j	An ability to communicate effectively on complex engineering activities within the engineering community.
k	Ability to demonstrate and understanding of the engineering and management principles as a member and leader in a team.
l	Ability to engage in independent and lifelong learning in the context of technological change.

History of Microprocessor:

A **microprocessor** is a computer processor which incorporates the functions of a computer's central processing unit (CPU) on a single integrated circuit (IC), or at most a few integrated circuits. The microprocessor is a multipurpose, clock driven, register based, programmable electronic device which accepts digital or binary data as input, processes it according to instructions stored in its memory, and provides results as output. Microprocessors contain both combinational logic and sequential digital logic. Microprocessors operate on numbers and symbols represented in the binary numeral system.

The integration of a whole CPU onto a single chip or on a few chips greatly reduced the cost of processing power. Integrated circuit processors are produced in large numbers by highly automated processes resulting in a low per unit cost. Single-chip processors increase reliability as there are many fewer electrical connections to fail. As microprocessor designs get faster, the cost of manufacturing a chip (with smaller components built on a semiconductor chip the same size) generally stays the same.

Before microprocessors, small computers had been built using racks of circuit boards with many medium- and small-scale integrated circuits. Microprocessors combined this into one or a few large-scale ICs. Continued increases in microprocessor capacity have since rendered other forms of computers almost completely obsolete (see history of computing hardware), with one or more microprocessors used in everything from the smallest embedded systems and handheld devices to the largest mainframes and supercomputers.

- 8-bit Microprocessor:
    - ✓ 8008, 8080,8085
- 16-bit Microprocessor:
    - ✓ 8086,8088,80186, 80188,80286
- 32-bit Microprocessor:
    - ✓ 80386DX, 80386SX, 80376, 80386SL,80386EX
    - ✓ 80486DX,80486SX,80486DX2,80486SL, 80486DX4
- 64-bit Microprocessor:
    - ✓ Pentium Pro,Pentium II, Celeron (Pentium II-based), Pentium III,Pentium II and III Xeon, Celeron M, Intel Core, Dual-Core Xeon LV
    - ✓ Intel Core 2,Intel Pentium Dual-Core, Celeron,Intel Pentium,Core i3,Core i5, Core i7
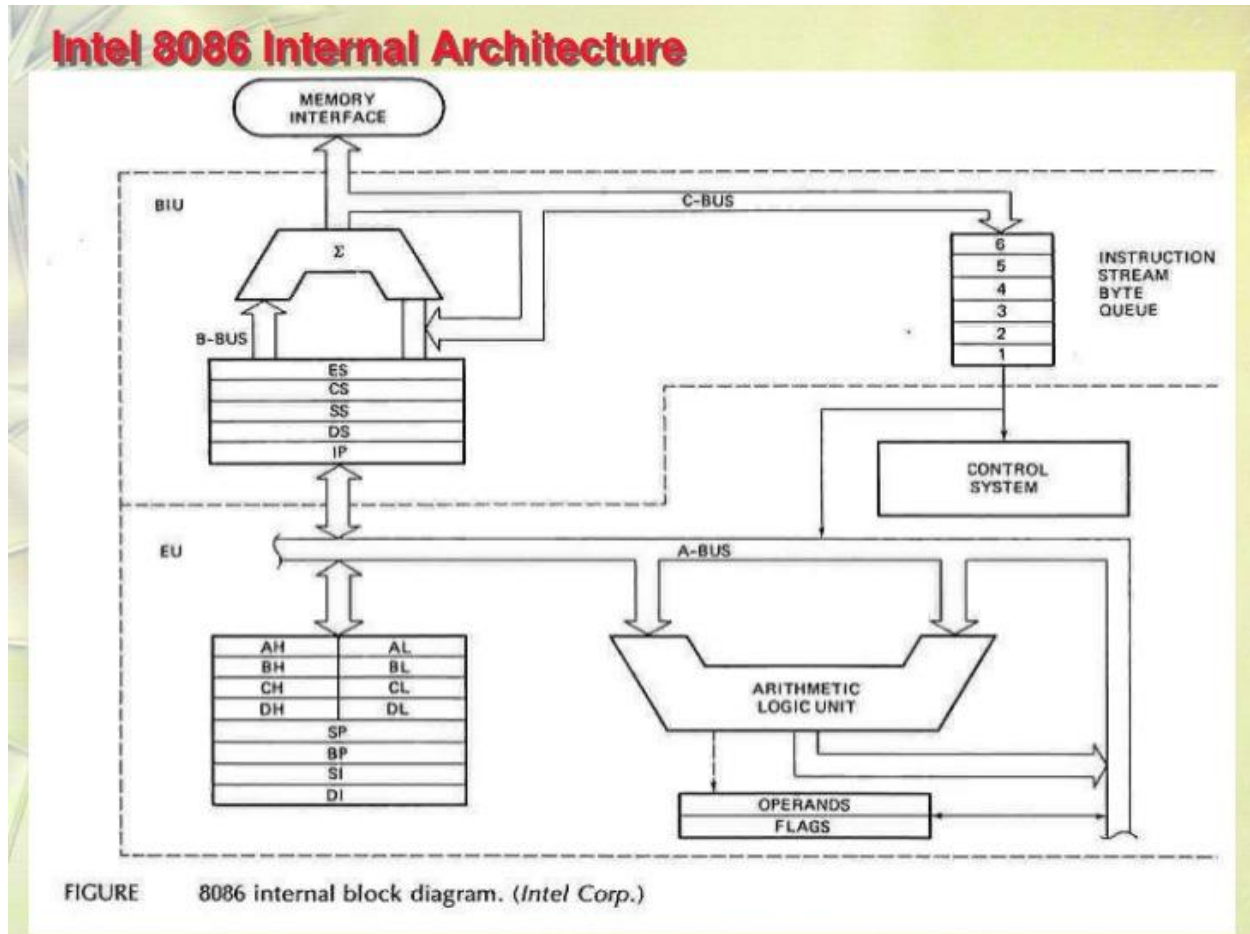
History of Microcontroller:

A **microcontroller** (or **MCU**,short for *microcontroller unit*) is a small computer (SoC) on a single integrated circuit containing a processor core, memory, and programmable input/output peripherals. Program memory in the form of Ferroelectric RAM, NOR flash or OTP ROMis also often included on chip, as well as a typically small amount of RAM. Microcontrollers are designed for embedded applications, in contrast to the microprocessors used in personal computers or other general purpose applications consisting of various discrete chips.

Microcontrollers are used in automatically controlled products and devices, such as automobile engine control systems, implantable medical devices, remote controls, office machines, appliances, power tools, toys and other embedded systems. By reducing the size and cost compared to a design that uses a separate microprocessor, memory, and input/output devices, microcontrollers make it economical to digitally control even more devices and processes. Mixed signal microcontrollers are common, integrating analog components needed to control non-digital electronic systems.

Some microcontrollers may use four-bit words and operate at frequencies as low as 4 kHz, for low power consumption (single-digit milliwatts or microwatts). They will generally have the ability to retain functionality while waiting for an event such as a button press or other interrupt; power consumption while sleeping (CPU clock and most peripherals off) may be just nanowatts, making many of them well suited for long lasting battery applications. Other microcontrollers may serve performance-critical roles, where they may need to act more like a digital signal processor (DSP), with higher clock speeds and power consumption.

- 8-bit Microcontroller:
  - Freescale S08
  - 68HC05 (CPU05)
  - 68HC08 (CPU08)
  - 68HC11 (CPU11)
- 16-bit Microcontroller:
  - Freescale S12
  - 68HC12 (CPU12)
  - 68HC16 (CPU16)
  - Freescale DSP56800 (DSPcontroller)
- 32-bit Microcontroller:
  - Freescale Kinetis (ARM architecture)
  - M·CORE
  - MPC500
  - MPC 860 (PowerQUICC)
  - MPC 8240/8250 (PowerQUICC II)
  - MPC 8540/8555/8560 (PowerQUICC III)

INTERNAL ARCHITECTURE OF 8086:
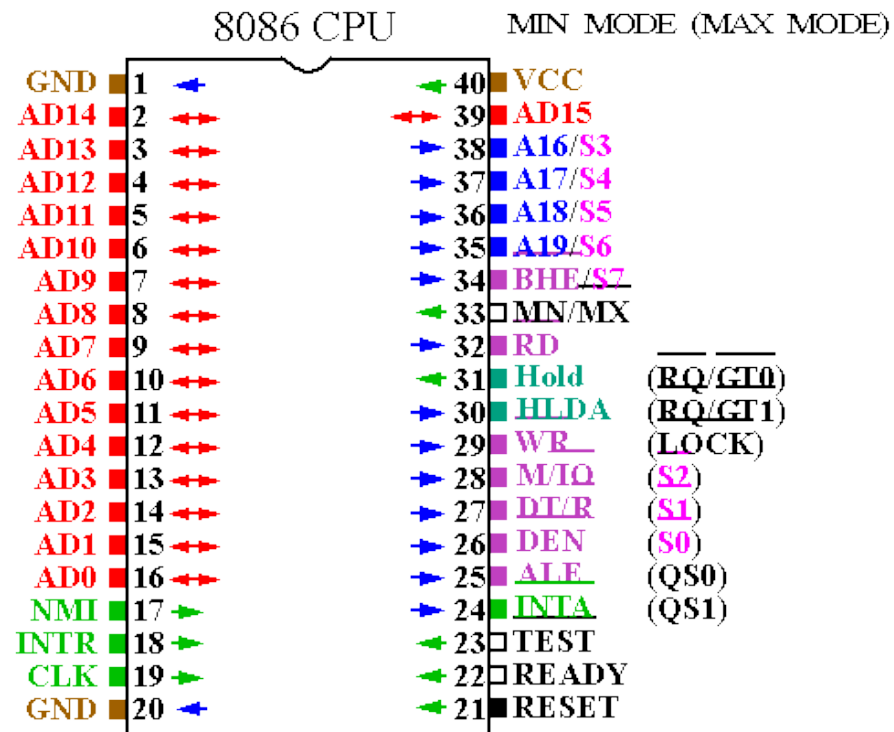
FIGURE   8086 internal block diagram. (*Intel Corp.*)

PIN DIAGRAM OF 8086:

8086 CPU   MIN MODE (MAX MODE)

GND	1		40	VCC	
AD14	2		39	AD15	
AD13	3		38	A16/S3	
AD12	4		37	A17/S4	
AD11	5		36	A18/S5	
AD10	6		35	A19/S6	
AD9	7		34	BHE/S7	
AD8	8		33	MN/MX	
AD7	9		32	RD	
AD6	10		31	Hold	(RQ/GT0)
AD5	11		30	HLDA	(RQ/GT1)
AD4	12		29	WR	(LOCK)
AD3	13		28	M/IO	(S2)
AD2	14		27	DT/R	(S1)
AD1	15		26	DEN	(S0)
AD0	16		25	ALE	(QS0)
NMI	17		24	INTA	(QS1)
INTR	18		23	TEST	
CLK	19		22	READY	
GND	20		21	RESET	

MARRI LAXMAN REDDY
INSTITUTE OF TECHNOLOGY & MANAGEMENT
(Affiliated to JNTU, Hyderabad, Approved by AICTE, New Delhi)
Accredited by NBA, Accredited by NAAC with 'A' Grade & Recognized Under section 2(f) & 12(B) of the UGC act, 1956

Dundigal (Vill .& Mandal), Medchal District, Hyderabad - 500043, Telangana.

Department of Electronics & Communication Engineering

III B.Tech. ECE- II SEM
        L   T/P/D   C

        0   -/3/-   2

(56606)MICROPROCESSORS AND MICROCONTROLLERS LAB

List of Experiments:

The Following programs/experiments are to be written for assembler and execute the same with 8086 and 8051 kits.

1. Programs for 16 bit arithmetic operations for 8086 (using Various Addressing Modes).

2. Program for sorting an array for 8086.

3. Program for searching for a number or character in a string for 8086.

4. Program for string manipulations for 8086.

5. Program for digital clock design using 8086.

6. Interfacing ADC and DAC to 8086.

7. Parallel communication between two microprocessors using 8255.

8. Serial communication between two microprocessor kits using 8251.

9. Interfacing to 8086 and programming to control stepper motor.

10. Programming using arithmetic, logical and bit manipulation instructions of 8051.

11. Program and verify Timer/Counter in 8051.

12. Program and verify Interrupt handling in 8051.

13. UART Operation in 8051.

14. Communication between 8051 kit and PC.

15. Interfacing LCD to 8051.

16. Interfacing Matrix/Keyboard to 8051.

17. Data Transfer from Peripheral to Memory through DMA controller 8237/8257.

   Note: Minimum of 12 experiments to be conducted.

EXECUTION PROCEDURE FOR 8086 (for registers)

    i)   Writing a alp program into processor:

Switch On Power Supply

        Press A 2times

        SG 0 press enter

        DA starting address

        Press enter

        N

        Then display shows @ here you have to write 1st mnemonic

        Press enter

        N (display displays address opcode mnemonic)

        N

        Then display shows @ here you have to write 2nd mnemonic

        Press enter

        N

        N

        -

        -

        Then display shows @ up to last mnemonic

        Press enter

        N

        N

        ! Press enter

        EX press enter

    ii)   Execution of program (for registers):

                                                    G enter starting address

                                                    Press enter

                    iii)   Verify the result (for registers): press R

                                        Press E.

EXECUTION PROCEDURE FOR 8086 (for memory locations)

   i)   Writing a alp program into processor:

Switch On Power Supply

      Press A

      A

      SG 0

      Press enter

      DA starting address

      Press enter

      N

      Then display shows @ here you have to write 1st mnemonic

      Press enter

      N(display displays address opcode mnemonic)

      N

      Then display shows @ here you have to write 2nd mnemonic

      Press enter

      N

      N

      -

                                    -

      -

      -

      Then display shows @ up to last mnemonic

      Press enter

      N

      N

      ! Press enter

      EX press enter

      E (exam byte)

      Here you have to type SI address, give 1st data, 2nd data, -----, nth data,

      Press enter

ii)   Execution of program (for memory locations):

G enter starting address

Press enter

iii)   Verify the result (for memory locations):

E

Then give DI address press, then display shows the result of 1st 8 bit data

For 2nd 8 bit data again press, -------, nth data

Introduction to MASM /TASM

MASM: (Microsoft assembler)

To Create Source File: An editor is a program which allows you to create a file containing the assembly language statements for your program. This file is called a **source file.**

Command to create a source file

C:\MASM\BIN> Edit filename. asm

The next step is to process the source file with an assembler. When you run the assembler, it reads the source file of your program. On the first pass through the source program, the assembler determines the displacement of named data items, the offset labels, etc. and puts this information in a symbol table. On the second pass through the source program the assembler produces the binary code for each instruction and inserts the offsets, etc. that it calculated during first pass.

C:\MASM\BIN >Masm filename. asm X, Z

With this command assembler generates three files.

1. The first file (X) called the object file, is given the extension .OBJ

The object file contains the binary codes for the instructions and information about the addresses of the instructions.

2. The third file (Z) generated by this assembler is called the cross-reference file and is given the extension .CRF. The cross-reference file lists all labels and pertinent information required for cross – referencing.

NOTE : The Assembler only finds syntax errors : It will not tell you whether program does what it is supposed to do. To determine whether your program works, you have to run the program and test it.

Next step is to process the object file with linker.

C:\MASM\BIN>LINK filename. obj

Run File [Filename1.exe] : "filename1.exe"

List file[nul.map]: NUL

Libraries [.lib]:library name

Definitions File [nul.def]:

Creation of Library: Refer Modular Programming Section

A Linker is a program used to join several object files into one layer object file.

NOTE: On IBM PC – type Computers, You must run the LINK program on your .OBJ file even
if it contains only one assembly module.

The linker produces a link file with the .EXE extension (an execution file)

Next Run **C:\MASM\BIN> filename**

LIST OF EQUIPMENTS

1. ALS-SDA-86 8086 MEL Microprocessor Trainer.
2. ALS-SDA-51 8051 MEL Microcontroller Trainer.
3. ALS-NIFC-01 Single Stepper Motor Interface.
4. ALS-NIFC-12 LCD Interface.
5. ALS-NIFC-09 Keyboard Display Interface.
6. ALS-NIFC-53 DC Motor Controller Interface.
7. ALS-NIFC-07 ADC Interface.
8. ALS-NIFC-06 DAC Interface.
9. 8086 Communication Package.
10. 8051 Communication Package.

ACCESSORIES

1. Power Supply for Stepper Motor.
2. 26 Core Cables.
3. 50 Core Cables.
4. UP Power Supplies for 8086 &8051.
5. Keyboards for 8086 & 8051.
6. Motor.
7. 4 Way Power Cables.
8. 4 Way Relimate Cables.

Features of the ALS-SDA-86 8086 MEL Microprocessor Trainer

- 8086 CPU operating at 5 MHz MAX mode.

- Provision for on-board 8087 coprocessor.

- Provision for 256 KB of EPROM & 256 KB of RAM onboard

- Battery backup facility for RAM.

- 48 programmable I/O lines using two 8255's

- Three 16 bit timers using 8253A

- Priority Interrupt Controller (PIC) for eight input using 8259A

- Computer compatible Keyboard.

- Display is 16 x 2 line LCD.

- Designed & engineered to integrate user's application specific interface conveniently at a minimum cost.

- Powerful & user-friendly keyboard / serial monitor, support in development of application programs.

- Software support for development of programs on Computer, the RS-232C interface cable connecting to computer from the kit facilitates transfer of files between the trainer kit & computer for development & debugging purposes.

- High quality reliable PCB with solder mask on both sides & clear legend prints with maximum details provided for the user.

SPECIFICATIONS:

❖ **CPU**   : Intel 8086 operating at 5Mhz in
   MAX mode.

❖ **MEMORY**   : Total 256KB of memory is
   in the Kit provided.
   ➢ EPROM   : 2 JEDEC compatible sockets for
                        EPROM.
   ➢ RAM   : 2 JEDEC compatible sockets for
                        RAM.

❖ **PARALLEL I/O**   : 48 I/O lines using two 8255's.
❖ **SERIAL I/O**   : One RS-232C compatible interface
   Using USART 8251A**.**

❖ **TIMER**   : Three 16 bit counter / timers 8253A
                        Counter 1 is used for serial I/O
                        Baud rate generation.

❖ **PIC**   : Programmable Interrupt controller
   Using 8253A provides interrupt
                        Vectors for 8 jumpers selectable
                        Internal /External sources.

❖ **KEYBOARD / DISPLAY**
   ➢ Keyboard   : Computer keyboard can be hocked on to the trainer.
   ➢ Display   : LCD 2x16 display.

❖ **INTERRUPTS**

➢ NIM   : Provision for connecting NMI to a key

                switch

➢ INTR   : Programmable Interrupt controller

   using 8259A provides Interrupt

                vectors for 8 jumper selectable Internal

                / External Sources.

❖ **INTERFACE BUS SIGNALS**

➢ CPU BUS   : All address, data & control lines are

                TTL compatible & are terminated in

                berg strip header.

➢ PARALLEL I/O: All signals are TTL compatible &

   Terminated in berg strip header

   For PPI expansion.

➢ SERIAL I/O: Serial port signals are terminated in

Standard 9-pin 'D' type connector.

❖ **MONITOR SOFTWARE**

                128KB of serial / Keyboard monitor with

                Powerful commands to enter, verify and

                Debug user programs, including onboard

                Assembler and disassemble commands.

❖ **COMPUTER INTERFACE**

                This can be interfaced to host computer

                System through the main serial port, also

                Facilitates uploading, downloading of Intel

                Hex files between computer and the trainer.

❖ **POWER REQUIREMENTS**

                +5V DC with 2.5 Amps current rating

            (Max).

1.2 OPERATING CONFIGURATION

Two different modes of operation trainer are possible. They are

(i) Serial operation

(ii) Keyboard operation

The first configuration requires a computer system with an RS-232C port, can be used as the controlling device. When a computer system is interfaced to trainer, the driver program must be resident in the computer system.

The second mode of operation is achieved through Onboard KEYBOARD / DISPLAY. In this mode, the trainer kit interacts with the user through a computer keyboard and 16x2 LCD Display. This configuration eliminates the need for a computer and offers a convenient way for using the trainer as a stand – alone system.

Exp No.1: Programs for 16 bit arithmetic operations for 8086 (using Various Addressing Modes).

1.Addition:

a. **AIM: -**   To write an assembly language program for Addition of two 16-bit numbers (register mode).

APPARATUS: 1.8086 microprocessor kit/MASM   ----1

2.RPS (+5V)   ----1

PROGRAM:

i) **By using MASM:**

Assume cs: code

Code segment

Start: MOV AX, 4343

MOV BX, 1111

ADD AX, BX

INT 3

Code ends

End start

ii)   **By using 8086 kit:**

MEMORY LOCATION	OP-CODE	LABEL	MNEMONIC
4000			MOV AX,4343
			MOV BX,1111
			ADD AX,BX
			INT 3

OUTPUT:

Input		output	
Register	**Data**	**Register**	**Data**
AX	4343	**AX**	**5454**
BX	1111		

b. Aim: 16-Bit Addition in Location mode using 8086 Microprocessor Kit(location mode).

Apparatus:

1. 8086 Microprocessor Trainer Kit.

2. Compatible Keyboard.

3. µP Power Supply.

Program:

i)   By using MASM:

Assume cs: code

Code segment

Start: MOV SI, 2000

MOV AX, [SI]

ADD SI, 02

MOV BX, [SI]

ADD AX, BX

MOV DI, 3000

MOV [DI], AX

INT 03

Code ends

End start

ii)   By using 8086 kit:

MEMORY LOCATION	OP-CODE	LABEL	MNEMONIC
4000			MOV SI,2000
			MOV AX,[SI]
			ADD SI,02
			MOV BX,[SI]
			ADD AX,BX
			MOV DI,3000
			MOV [DI],AX
			INT 03

OUTPUT:

Output			
MEMORY LOCATION	Data	MEMORY LOCATION	Data
2000	12	3000	68
2001	34	3001	AC
2002	56		
2003	78		

2. Subtraction:

a. AIM: -   To write an assembly language program for subtraction of two 16-bit numbers (register mode).

APPARATUS: 1.8086 microprocessor kit/MASM   ----1

2. RPS (+5V)   ----1

PROGRAM:

i)   By using MASM:

Assume cs: code

Code segment

Start: MOV AX, 4343

MOV BX, 1111

SUB AX, BX

INT 3

Code ends

End start

ii)   By using 8086 kit:

MEMORY LOCATION	OP-CODE	LABEL	INSTRUCTION
4000			MOV AX,4343
			MOV BX,1111
			SUB AX,BX
			INT 3

OUTPUT:

Input		output	
Register	Data	Register	Data
AX	4343	AX	3232
BX	1111		

b. Aim: 16-Bit Addition in Location mode using 8086 Microprocessor Kit (location mode).

Apparatus:

1. 8086 Microprocessor Trainer Kit.

2. Compatible Keyboard.

3. μP Power Supply.

PROGRAM:

      i)   By using MASM:

      Assume cs: code

Code segment

Start: MOV SI, 2000

MOV AX, [SI]

  ADD SI, 02

  MOV BX, [SI]

   SUB AX, BX

   MOV DI, 3000

   MOV [DI], AX

   INT 03

   Code ends

   End start

      ii)   By using 8086 kit:

MEMORY LOCATION	OP-CODE	LABEL	MNEMONIC
4000			MOV SI,2000
			MOV AX,[SI]
			ADD SI,02
			MOV BX,[SI]
			SUB AX,BX
			MOV DI,3000
			MOV [DI],AX
			INT 03

OUTPUT:

output			
MEMORY LOCATION	**Data**	**MEMORY LOCATION**	**Data**
2000	78	3000	44
2001	56	3001	44
2002	34		
2003	12		

3. Multiplication:

a. AIM: - To write an assembly language program for multiplication of two 16-bit numbers (register mode).

APPARATUS: 1.8086 microprocessor kit/MASM   ----1

2. RPS (+5V)   ----1

PROGRAM:

   i)   By using MASM:

                   Assume cs: code

                   Code segment

      Start: MOV AX, 0040

                   MOV BX, 0002

                   MUL BX

                   INT 3

                   Code ends

                   End start

   ii)   By using 8086 kit:

MEMORY LOCATION	OP-CODE	LABEL	MNEMONIC
4000			MOV AX,0040
			MOV BX,0020
			MUL BX
			INT 3

   OUTPUT:

Input		Output	
Register	Data	Register	Data
AX	0040	AX	0080
BX	0002	DX	0000

b.AIM: -   To write an assembly language program for multiplication of two 16-bit signed numbers (location mode).

APPARATUS: 1.8086 microprocessor kit/MASM   ----1

                         2. RPS (+5V)   ----1

PROGRAM:

       i)   By using MASM:

Assume cs: code

Code segment

Start: MOV SI, 2000

MOV AX, [SI]

ADD SI, 02

MOV BX, [SI]

MUL BX

  MOV DI, 3000

  MOV [DI], AX

  INT 03

  Code ends

  End start

    ii)   By using 8086 kit:

MEMORY LOCATION	OP-CODE	LABEL	MNEMONIC
400			MOV SI, 2000
			MOV AX, [SI]
			ADD SI, 02
			MOV BX, [SI]
			MUL BX
			MOV DI, 3000
			MOV [DI], AX
			INT 03

OUTPUT:

Input		output	
MEMORY LOCATION	**Data**	**MEMORY LOCATION**	**Data**
2000	40	3000	80
2001	00	3001	00
2002	02		
2003	00		

4. Division:

a. AIM: -   To write an assembly language program for multiplication of two 16-bit numbers (register mode).

APPARATUS: 1.8086 microprocessor kit/MASM   ----1

                        2. RPS (+5V)   ----1

PROGRAM:

A) By using MASM:

                    Assume cs: code

                    Code segment

        Start: MOV AX, 0040

                    MOV BX, 0002

                    DIV BX

                    INT 3

                    Code ends

                    End start

B) By using 8086 kit:

MEMORY LOCATION	OP-CODE	LABEL	MNEMONIC
4000			MOV AX,0040
			MOV BX,0002
			DIV BX
			INT 3

OUTPUT:

Input		output	
Register	Data	Register	Data
AX	0040	AX	0020
BX	0002		

b. AIM: - To write an assembly language program for multiplication of two 16-bit numbers (location mode).

APPARATUS: 1.8086 microprocessor kit/MASM   ----1

                       2. RPS (+5V)   ----1

PROGRAM:

   A) By using MASM:

   Assume cs: code

   Code segment

   Start: MOV SI, 2000

   MOV AX, [SI]

   ADD SI, 02

   MOV BX, [SI]

    DIV BX

    MOV DI, 3000

    MOV [DI], AX

    INT 03

    Code ends

    End start

   B) By using 8086 kit:

MEMORY LOCATION	OP-CODE	LABEL	MNEMONIC
400			MOV SI, 2000
			MOV AX, [SI]
			ADD SI, 02
			MOV BX, [SI]
			DIV BX
			MOV DI, 3000
			MOV [DI], AX
			INT 03

OUTPUT:

Input		output	
MEMORY LOCATION	Data	MEMORY LOCATION	Data
2000	40	3000	80
2001	00	3001	00
2002	02		
2003	00		

RESULT: 16 bit arithmetical operations are performed by using different addressing modes.

Viva:

1) How many bit 8086 microprocessor is?

2) What is the size of data bus of 8086?

3) What is the size of address bus of 8086?

4) What is the max memory addressing capacity of 8086?

5) Which are the basic parts of 8086?

6) Difference between 8085 and 8086?

7) Define Minimum mode operation in 8086?

8) Define Maximum mode operation in 8086?

9) What is the purpose of AX register?

10) What is the purpose of CX register?

11) What are the features of Intel 8086 ?

12) What are the flags in 8086?

13) What is 1st / 2nd / 3rd / 4th generation processor?

14) How many bit combinations are there in a byte?

15) What are the different functional units in 8086?

16) What are the various segment registers in 8086?

17) Which Stack is used in 8086?

18) What is SIM and RIM instructions?

19) What is meant by Interrupt?

20) What is an Instruction?

21) What is Microprocessor?

22) Define Compiler

23) Define Interpreter

24) Define Assembler

25) What is Assembly leve l language?

26) Abbreviate MASM & TASM

27) Differentiate micro & macro

28) Define two pass assembler

29) What are the advantages of modular programming?

30) What is linking and relocation?

EXERCISE:

1. Write an alp program for multi byte addition?

2. Write an alp program for multi byte subtraction?

3. Write an alp program for one word addition?

4. Write an alp program for one byte subtraction?

5. Write an alp program for one word addition?

6. Write an alp program for one word subtraction?

7. Write an alp program for one byte multiplication?

8. Write an alp program for one byte multiplication?

9. Write an alp program for one byte division?

10. Write an alp program for one byte division?

11. Write alp program for 8 bit signed multiplication?

12. Write alp program for 8 bit signed division?

13. Write alp program for 8 bit unsigned addition?

14. Write alp program for 8 bit unsigned subtraction?

15. Write an ALP program to displaying the system clock time shows 01:25:30?

16. Write alp program for 16 bit signed addition?

17. Write alp program for 16 bit signed subtraction?

18. Write alp program for 16 bit signed multiplication?

19. Write alp program for 16 bit signed division?

20. Write an alp program for addition and subtraction of two 16bit numbers?

    1)A278 2) B634

Industrialapplications: Calculators,Vending-machines.
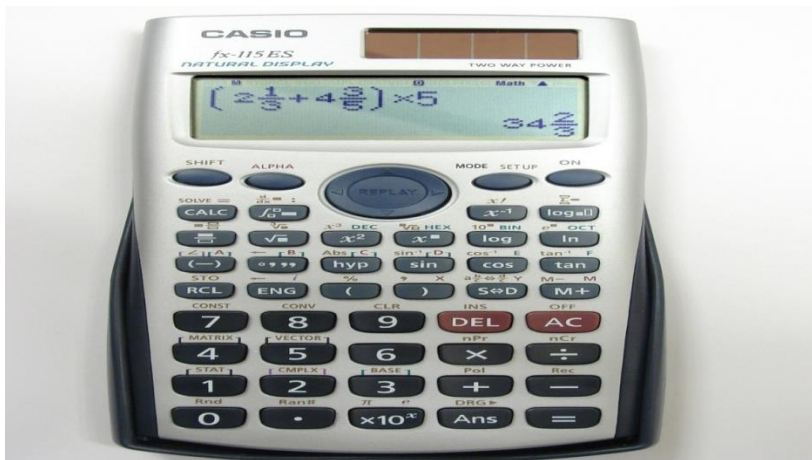
A calculator is a device that performs arithmetic operations on numbers. The simplest calculators can do only addition, subtraction, multiplication, and division. More sophisticated calculators can handle exponent ial operations, roots, logarithm s, trigonometric functions, and hyperbolic functions. Internally, some calculators actually perform all of these functions by repeated processes of addition.

EXP NO.2: Program for sorting an array for 8086.

a) **ASCENDING ORDER**

AIM:-Program to sort the given numbers in ascending order

APPARATUS: 1.8086 microprocessor kit/MASM   ----1

2. RPS (+5V)   ----1

PROGRAM:

A) **By using MASM:**

```
              ASSUME CS: CODE
              CODE SEGMENT
START:        MOV AX, 0000H
              MOV CH, 0004H
              DEC CH
UP1 :          MOV CL, CH
        MOV SI, 2000
UP:           MOV AL, [SI]
              INC SI
              CMP AL, [SI]
              JC DOWN
              XCHG AL, [SI]
              DEC SI
              MOV [SI], AL
              INC SI
DOWN:         DEC CL
              JNZ UP
              DEC CH
              JNZ UP1
              INT 3
CODE   ENDS
     END START
```

B) By using 8086 kit:

MEMORY LOCATION	OP-CODE	LABEL	MNEMONIC
4000			MOV AX, 0000H
			MOV CH, 0004H
			DEC CH
		UP1:	MOV CL, CH
			MOV SI,2000
		UP:	MOV AL,[SI]
			INC SI
			CMP AL,[SI]
			JC DOWN
			XCHG AL,[SI]
			DEC SI
			MOV [SI],AL
			INC SI
		DOWN:	DEC CL
			JNZ UP
			DEC CH
			JNZ UP1
			INT 3

OUTPUT:

Input		output	
MEMORY LOCATION	**Data**	**MEMORY LOCATION**	**Data**
2000	03	2000	03
2001	06	2001	04
2002	07	2002	06
2003	04	2003	07

b) DESCENDING ORDER

AIM:-Program to sort the given numbers in descending order

APPARATUS: 1.8086 microprocessor kit/MASM   ----1

                        2. RPS (+5V)   ----1

PROGRAM:

A) By using MASM:

```
                ASSUME CS: CODE
                CODE SEGMENT
    START:      MOV AX, 0000H
                MOV CH, 0004H
                DEC CH
    UP1 :        MOV CL, CH
          MOV SI, 2000
    UP:         MOV AL, [SI]
                INC SI
                CMP AL, [SI]
                JNC DOWN
                XCHG AL, [SI]
                DEC SI
                MOV [SI], AL
                INC SI
    DOWN:       DEC CL
                JNZ UP
                DEC CH
                JNZ UP1
                INT 3
 CODE   ENDS
        END START
```

B) By using 8086 kit:

MEMORY LOCATION	OP-CODE	LABEL	MNEMONIC
4000			MOV AX, 0000H
			MOV CH, 0004H
			DEC CH
		UP1:	MOV CL, CH
			MOV SI,2000
		UP:	MOV AL,[SI]
			INC SI
			CMP AL,[SI]
			JNC DOWN
			XCHG AL,[SI]
			DEC SI
			MOV [SI],AL
			INC SI
		DOWN:	DEC CL
			JNZ UP
			DEC CH
			JNZ UP1
			INT 3

OUTPUT:

Input		output	
MEMORY LOCATION	**Data**	**MEMORY LOCATION**	**Data**
2000	03	2000	07
2001	06	2001	06
2002	07	2002	04
2003	04	2003	03

RESULT: Program for sorting an array performed by using masm software and trainer kit.

Viva:

1) What are the functions of BIU?

2) What are the functions of EU?

3) How many pin IC 8086 is?

4) What IC8086 is?

5) What is the size of instruction queue in 8086?

6) What are the functions of BX register?

7) What are the functions of DX register?

8) How many pin IC 8085 is?

9) What IC8085 is?

10) What is the size of instruction queue in 8085?

11) What does EU do?

12) Difference between JMP and JNC?

13) What are the basic units of a microprocessor ?

14) What is the data and address size in 8086?

15) What are the modes in which 8086 can operate?

16) What are the interrupts of 8086?

17) What are the functional units available in 8086 architecture?

18) When the 8085 processor checks for an interrupt?

19) What is USART?

20) Define stack

21) What is Tri-state logic?

22) What is Program counter?

23) How many bit combinations are there in a byte?

24) What is meant by Maskable interrupts?

25) What is Non-Maskable interrupts?

26) What are the various segment registers in 8086?

27) What does EU do?

28) What are Flag registers?

29)W hat does the 8086 Architecture contain?

30) What are Data Copy/Transfer Instructions?

EXERCISE:

1. Write an alp program for multi byte multiplication in location mode?

2. Write an alp program for multi byte division in location mode?

3. Write an alp program for one byte multiplication in location mode?

4. Write an alp program for one byte division in location mode?

5. Write an alp program for one word multiplication in location mode?

6. Write an alp program for one word division in location mode?

7. Write an alp program for multi byte addition in location mode?

8. Write an alp program for multi byte subtraction in location mode?

9. Write an alp program for one word addition in location mode?

10. Write an alp program for one byte subtraction in location mode?

11. Write an alp program for addition and subtraction of two 16bit numbers?

    1) A278

    2) B634

12. Write an alp program for multiplication and division of two 16bit numbers?
    1)0012
    2)0006
13. Write an alp program for to sort the given number in descending order?
    1)14 2)A2 3)85 4)54
14. Write an alp program to sort the given numbers in ascending order?
    1) 1E2)2A 3) 56 4)98

15. Write an alp program tosearch a number 05 from a given array?
    1)06 2)05 3)08 4)02
16. Write an alp program to search a number 45 from a given array?
    1) 09 2)45 3)22 4)A2

17. Write an alp for insertor delete abyte in a given string with SI memory location is 4000and DI location is 6000?
18. Write an alp for moving or reversing the given stringwith the length of the string is 12?
19. Write an ALP program todisplaying the system clock time shows 10:15:05?
20. Write an alp program for one byte division in location mode?

Applications: Database management.

A **database-management   system** (**DBMS**)   is   a computer-software application that interacts with end-users, other applications, and the database itself to capture and analyze data. A general-purpose DBMS allows the definition, creation, querying, update, and administration   of databases.WellknownDBMSinclude MySQL, PostgreSQL, EnterpriseDB, MongoDB, Mari aDB, Microsoft   SQL   Server, Oracle, Sybase, SAP   HANA, MemSQL, SQLite and IBM DB2.

EXP NO: 3 Program for searching for a number or character in a string for 8086.

AIM: Write an alp program for to search a number or character from a string.

APPARATUS: 1.8086 microprocessor kit/MASM   ----1

2. RPS (+5V)   ----1

PROGRAM:

A) **By using MASM:**

ASSUME CS: CODE, DS: DATA

DATA SEGMENT

LIST DW 53H, 15H, 19H, 02H

DEST EQU 3000H

COUNT EQU 05H

DATA ENDS

CODE SEGMENT

START: MOV AX, DATA

MOV DS, AX

MOV AX, 15H

MOV SI, OFFSET LIST

MOV DI, DEST

MOV CX, COUNT

MOV AX, 00

CLD

REP

SCASW

JZ LOOP

MOV AX, 01

LOOP   MOV [DI], AX

MOV AH, 4CH

INT 3H

CODE ENDS

END START

B) By using 8086 kit:

MEMORY LOCATION	OP-CODE	LABEL	MNEMONIC
4000			MOV AX, 15H
			MOV SI, 2000
			MOV DI, 3000
			MOV CX, 0005
			MOV BX,6000
		BACK:	MOV AL,[SI]
			CMP AL,[BX]
			JZ DOWN
			REP
			MOVSB
			JNZ BACK
			JMP DOWN
		DOWN:	MOV [DI],AL
			JMP DOWN2
		DOWN1:	MOV AX, 00
			MOV [DI], AL
			INT 3H

OUTPUT:

Input		output	
MEMORY LOCATION	Data	MEMORY LOCATION	Data
2000	53	3000	15
2001	15		
2002	19		
2003	02		
6000	15		

RESULT: Program for search a number or character from a stringperformed by using masm software and trainer kit.

Viva:

1) What is the size of instruction queue in 8086?

2) Which are the registers present in 8086?

3) What do you mean by pipelining in 8086?

4) How many 16 bit registers are available in 8086?

5) Specify addressing modes for any instruction?

6) Define segmentation?

7) Describe General purpose registers?

8) Describe special purpose registers?

9) Describe the segment registers?

10) Define ALU?

11) What is Bandwidth ?

12) What is Clock Speed ?

13) What are the features of Intel 8086 ?

14) What is Logical Address:?

15) What is the size of instruction queue in 8086?

16) Which are the registers present in 8086?

17) What do you mean by pipelining in 8086?

18) How many 16 bit registers are available in 8086?

19) Specify addressing modes for any instruction?

20) What are Machine Control Instructions?

21) What are Flag Manipulation Instructions?

22) What are String Instructions?

23) What are different parts for 8086 architecture?

24) What is an Interrupts

25) What is an Opcode?

26) What is an Operand?

27) Explain the difference between a JMP and CALL instruction?

28) What is meant by Interrupt?

29) What is an Instruction?

30) What is Microcontroller and Microcomputer?

EXERCISE:

Write an alp program for median of an array?

Write an alp program for next number of median in an array?

1. Write an alp program to find out how many multiples of given number in a given array?
2. Write an alp program to find how many divisible numbers by given number in array?
3. Write alp program for 8 bit signed addition?
4. Write alp program for 8 bit signed subtraction?
5. Write alp program for 8 bit signed multiplication?
6. Write alp program for 8 bit signed division?
7. Write alp program for 8 bit unsigned addition?
8. Write alp program for 8 bit unsigned subtraction?
9. Write alp program for 8 bit unsigned addition?

10. Write alp program for 8 bit unsigned subtraction?

11. Write an ALP program to displaying the system clock time shows 01:25:30?

12. Write an ALP program to displaying the system clock time shows 10:15:05?

13. 16Bit Addition in Location mode using 8086 Microprocessor Kit.

14. 16Bit subtraction in Location mode using 8086 Microprocessor Kit

15. Write an alp program to find the smallest number in an array using masm software

16. Write an alp program to find the largest number in an array using masm software.

17. Write an alp program to find the ASCII number to the given BCD number 56

18. using 8086 triner kit

19. Write an alp program to find the unpacked BCD to the given BCD number 56

20. using 8086 triner kit

Applications: Search engines.

How search engines work (nutshell version).
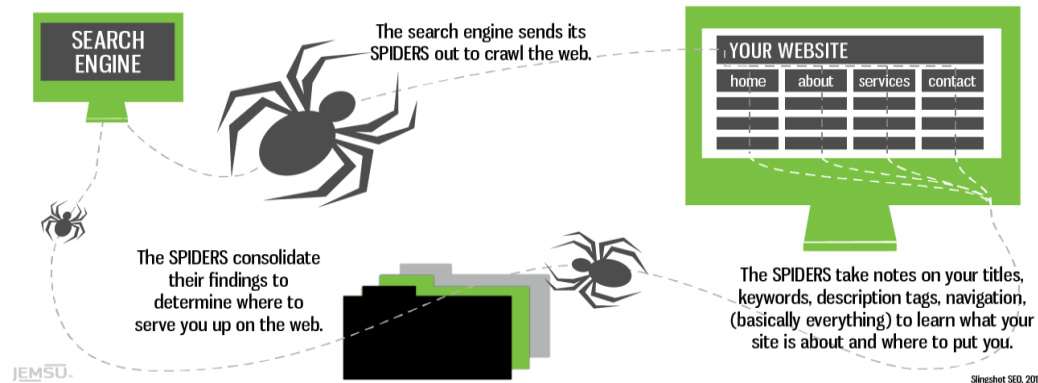
A **web search engine** is a software system that is designed to search for information on the World Wide Web. The search results are generally presented in a line of results often referred to as search engine results pages (SERPs). The information may be a mix of web pages, images, and other types of files. Some search engines also mine data available in databases or open directories. Unlike web directories, which are maintained only by human editors, search engines also maintain real-time information by running an algorithm on a web crawler.

EXP NO.4: Program for string manipulations for 8086.

1) INSERT A BYTE IN A GIVEN STRING

AIM: Write an alp for insert a new byte in a given string.

APPARATUS: 1. 8086 microprocessor kit/MASM ----1

    2. RPS (+5V)   ----1

PROGRAM:

A) By using MASM:

```
        ASSUME CS: CODE
        CODE SEGMENT
START:      MOV SI, 2000
            MOV DI, 3000
            MOV BX, 5000
            MOV CX, 0005
            CLD
    L1:     MOV AL, [SI]
            CMP AL, [BX]
            JZ L2
            MOVSB
            JMP L3
    L2:     MOVSB
            MOV BX, 7000
            MOV AL, [BX]
            MOV [DI], AL
            DEC CX
            INC DI
            REP MOVSB
    L3:     INT 3
        CODE ENDS
        END START
```

B) By using 8086 kit:

MEMORY LOCATION	OP-CODE	LABEL	MNEMONIC
4000			MOV SI,2000
			MOV DI,3000
			MOV BX,5000
			MOV CX,0005
			CLD
		L1	MOV AL,[SI]
			CMP AL,[BX]
			JZ L2
			MOVSB
			JMP L3
		L2	MOVSB
			MOV BX,7000
			MOV AL,[BX]
			MOV [DI],AL
			DEC CX
			INC DI
			REP
			MOVSB
		L3	INT 3

OUTPUT:

Input		output	
MEMORY LOCATION	Data	MEMORY LOCATION	Data
2000	02	3000	02
2001	04	3001	04
2002	43	3002	43
2003	76	3003	08
2004	01	3004	76
5000	43	3005	01
7000	08		

2) DELETE A BYTE IN A GIVEN STRING

AIM: To write an alp for delete a byte in a given string

APPARATUS: 1.8086 microprocessor kit/MASM with pc   ----1

                            2. RPS (+5V)   ----1

PROGRAM:

A) By using MASM:

```
        ASSUME CS: CODE
        CODE SEGMENT
START:      MOV SI, 2000
            MOV DI, 3000
            MOV BX, 5000
            MOV CX, 0005
            CLD
    L1:     MOV AL, [SI]
            CMP AL, [BX]
            JZ L2
            MOVSB
            LOOP L1
            JMP L3
    L2:     INC SI
            DEC CX
            REP MOVSB
    L3:     INT 3
        CODE ENDS
        END START
```

B) By using 8086 kit:

MEMORY LOCATION	OP-CODE	LABEL	MNEMONIC
4000			MOV SI,2000
			MOV DI,3000
			MOV BX,5000
			MOV CX,0005
			CLD
		L1	MOV AL,[SI]
			CMP AL,[BX]
			JZ L2
			MOVSB
			LOOP L1
			JMP L3
		L2	INC SI
			DEC CX
			REP
			MOVSB
		L3	INT 3

OUTPUT:

| Input		output	
MEMORY LOCATION	Data	MEMORY LOCATION	Data
2000	01	3000	01
2001	02	3001	02
2002	03	3002	03
2003	04	3003	05
2004	05		
5000	04		

RESULT: Program for string manipulation performed by using masm software and trainer kit.

Viva:

1) What do you mean by assembler directives?

2) What .model small stands for?

3) What is the supply requirement of 8086?

4) What is the relation between 8086 processor frequency & crystal Frequency?

5) What are the functions of Accumulator or AX register?

6) What are the functions of BX register?

7) What are the functions of CX register?

8) What are the functions of DX register?

9) What are the functions of CS register?

10) What are the functions of DS register?

11) What do you mean by assembler directives?

12) What .model small stands for?

13) What is the supply requirement of 8086?

14) What is the relation between 8086 processor frequency & crystal Frequency?

15) Functions of Accumulator or AX register?

16) What is meant by Maskable interrupts?

17) What is Non-Maskable interrupts?

18) What are the various segment registers in 8086?

19) What are the flags in 8086?

20) What are the different types of Addressing Modes?

21) What is Assembler?

22) Define Variable?

23) Explain Dup?

24) Why address bus is unidirectional?

25) What is macro?

26) What is the difference between Macro and Procedure?

27) How 8086 is faster than 8085?

28) What does microprocessor speed depend on?

29) What is the size of data bus and address bus in 8086?

30) What is the maximun memory addressing capability of 8086

EXERCISE:

1. Write an alp for moving a string from one location to another location?

2. Write an alp for reversing the given string with the length of the string is 12?

3. Write an alp for arranging given a string in alphabetical order?

4. Write alp program for 16 bit signed addition?

5. Write alp program for 16 bit signed subtraction?

6. Write alp program for 16 bit signed multiplication?

7. Write alp program for 16 bit signed division?

8. Write alp program for 16 bit unsigned addition?

9. Write alp program for 16 bit unsigned subtraction?

10. Write alp program for 16 bit unsigned multiplication?

11. Write an alp for insertor delete abyte in a given stringwith SI memory location is 4000 & DI location is 6000?

12. Write an alp for moving or reversing the given stringwith the length of the string is 12?

13. Write an alp program to perform OR operation using 8051microcontroller trainerKit?

14. Write an alp program to perform addition and subtraction operation using 8051

   A) 56

   B) 12

15. Write an ALP program to study timer1 gated mode

16. Write an alp program tofind the lengthofthe given array using masm software.

17. Write an alp program tofind the sum of„n‟ numbers using masm software.

18. Write an alp program to perform an operation to find the sum of squares of a given array using masm software.

19. Write an alp program to perform an operation to find the cubesof squares of a given array using masm software

20. Write alp program for 16 bit signed addition?

Applications: Voice-sassistants.
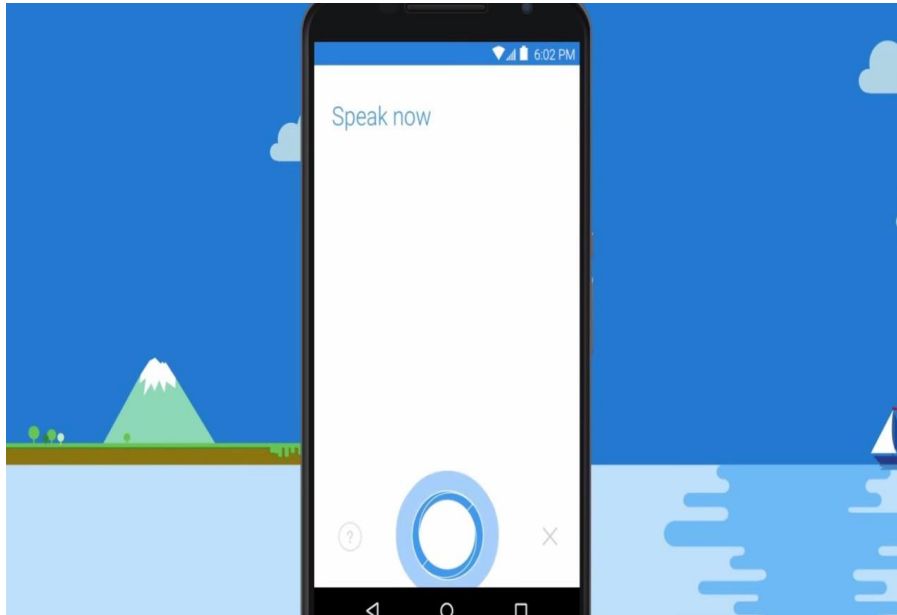
Voice assistants are the next big thing. Some say they're the next mobile, though I don't even know if that's accurate or an understatement. All the major platform companies have one, and startups building them appear ever faster, making it hard to even keep track of everything. The point is, they are going to be everywhere and are going to dominate the way we interact with our computers. Yet I hear many questioning if these assistants are even viable from a business perspective. The argument goes that by moving people away from screens, assistants may be diminishing traditional screen based revenue streams. How is Google going to sell ads along their search results if the user gets taken directly to the information they desire without ever looking at a list of results?

Content providers may indeed have a harder time turning their work into paychecks. If you're running a blog or publication, your main business is placing ads next to your reporting. When more people move away from screens and have their news read to them by an AI instead, less people will see your ads. Though if that is something people are actually going to do in significant quantities remains to be seen. For the companies operating the voice assistants, however, they will become a gold mine. Even better, their value proposition for the customer is precisely what makes them valuable for the operating businesses.

EXP.NO.5: Program for digital clock design using 8086.

AIM: To write an ALP program for displaying the system clock.

APPARATUS:1.MASM

   2. PC

PROGRAM:

```
            ASSUME CS: CODE
            CODE SEGMENT
      EXTERN GET_TIME: NEAR
      .MODEL      SMALL
      .STACK      100H
      .DATA
      TIME_BUF    DB      '00:00:00$'
      CODE
      MAIN PROC
                        MOV AX,@DATA
                        MOV DS, AX
                        LEA BX, TIME_BUF
                        CALL GET_TIME
                        LEA DX, TIME_BUF
                        MOV AH, 09H
                        INT 21H
                        MOV AH, 4CH
                        INT 21H
      MAIN ENDP
      END   MAIN
```

   RESULT: Program for displaying the system clock performed using masm software.

Viva:

1) Functions of BX register?

2) Functions of CX register?

3) Functions of DX register?

4) How Physical address is generated?

5) Which are pointers present in this 8086?

6) What are the functions of BIU?

7) What are the functions of EU?

8) How many pin IC 8086 is?

9) What IC8086 is?

10) What is the size of instruction queue in 8086?

11) What are the different types of ADC?

12) What is an Interrupt?

13) Define opcode and operand?

14) What is DMA?

15) Define machine cycle?

16) What are the interrupts of 8086?

17) What is the data and address size in 8086?

18) Define bit, byte and word?

19) What is assembly language?

20) Difference between JMP and JNC?

21) Stack is used in 8086?

22) What is macro?

23) What is a compiler?

24) What is the disadvantage of microprocessor?

25) Which Stack is used in 8086?

26) What is the difference between 8086 and 8088?

27) What are the functional units in 8086?

28) What is a Microprocessor?

29) What is meant by Maskable Interrupts?

30) Give example for Non-Maskable Interrupts?

EXERCISE:

1. Write an ALP program to displaying the system clock time shows 01:25:30?
2. Write an ALP program to displaying the system clock time shows 10:15:05?
3. Write an ALP to perform average of 1 to 10 natural numbers
4. Write an ALP to perform the Armstrong number.
5. Write an ALP to perform the reverse operation of a given number.
6. Write an ALP to perform the decimal to binary conversion for the given number.
7. Write an ALP to perform the binary to decimal conversion for the given number.
8. Write an ALP to perform the decimal to hexadecimal conversion for the given number
9. Write an ALP to perform average of 1 to 20 natural numbers
10. Write an ALP to perform the percentage of 1 to 20 natural numbers
11. Write an alp program to perform an operation to find the squares of a given number using masm software.
12. Write an alp program to perform an operation to find the squares of a given number using MP trainer kit
13. Write an alp program to perform an operation to find the cubes of a given number using masm software
14. Write an alp program to perform an operation to find the cubes of a given numbers using MP trainer kit
15. Write an alp program for addition of multi byte numbers.
16. Write an alp program to divide 32 bit by the 16 bit.
17. Write an alp program for median of an array.
18. Write an ALP to perform average of 1 to 20 natural numbers
19. Write an ALP to perform the percentage of 1 to 20 natural numbers
20. Write an ALP program to displaying the system clock time shows 10:15:05?

Indusrialapplications:

Digital clocks

A **digital clock** is a type of clock that displays the time digitally (i.e. in numerals or other symbols), as opposed to an analog clock, where the time is indicated by the positions of rotating hands.Digital clocks are often associated with electronic drives, but the "digital" description refers only to the display, not to the drive mechanism. (Both analog and digital clocks can be driven either mechanically or electronically, but "clockwork" mechanisms with digital displays are rare.) The biggest digital clock is the *Lichtzelt Pegel* ("Light Time Level") on the television tower Rheinturm Düsseldorf, Germany.

Digital clocks typically use the 50 or 60 hertz oscillation of AC power or a 32,768hertz crystal oscillator as in a quartz clock to keep time. Most digital clocks display the hour of the day in 24-hour format; in the United States and a few other countries, a more commonly used hour sequence option is 12-hour format (with some indication of AM or PM). Some timepieces, such as many digital watches, can be switched between 12-hour and 24-hour modes. Emulations of analog-style faces often use an LCD screen, and these are also sometimes described as "digital".

EXP.NO.6: Interfacing ADC and DAC to 8086.

AIM:

    1. To write a program for conversion of analog data to digital output.

    2. To write a program for conversion of digital data to analog output. The analog output

    will be in the form of triangular wave, saw tooth wave, square wave/rectangular wave.

APPARATUS:

    1. 8086 Trainer.

    2. Power supply for trainer and interface module.

    3. A/D, D/A interface module.

    4. Power mate connector.

    5. FRC connector.

    6. Cathode ray oscilloscope.

PROCEDURE:-

1. Connect the 26 core FRC connector to the 8086 trainer at connector no CN4 and the interface module.

2. Connect the power mate connector to the interface module and the other side of the connector to the power supply. The connections to the power supply are given below.

   Connections: (power supply)

             Black & Red: Gnd.

             Blue & Green: +5V

   3. 5- Way power mate is wired to the motor. This power mate is to be inserted into the male socket provided on the interface. Care should be taken such that, below given code for the particular colored wire coincides with the code on the interface.

             A- GREEN

             C- RED & WHITE

             B- GREEN & WHITE

             D- RED

             V_{DD}- BLACK & WHITE.

4. After the completion of the program and connections enter the program as given in the listing below.

   G0< STARTING ADDRESS< ENTER (on the key board of trainer).

D/A CONVERTER:

PROGRAM TO GENERATE SQUARE WAVE:

MEMORY LOCATION	OPCODE	LABEL	MNEMONIC
			MOV AL,80
			MOV DX,0FFC6
			OUT DX
			MOV DX,0FFC2
		A0	MOV AL,00
			OUT DX
			CALL DELAY 1
			MOV AL,0FF
			OUT DX
			CALL DELAY2
			JMP A0

DELAY PROGRAM1

ADDRESS	OPCODE	LABEL	MNEMONIC
		A1	MOV CX,0020
			LOOP A1
			RET

DELAY PROGRAM2

ADDRESS	OPCODE	LABEL	MNEMONIC
		A2	MOV CX,0020
			LOOP A2
			RET

A/D CONVERTER
PROGRAM:

MEMORY LOCATION	OPCODE	LABEL	MNEMONIC
			MOV AL,90
			MOV DX,0FFC6
			OUT DX
			MOV AL,07

MEMORY LOCATION	OPCODE	LABEL	MNEMONIC
			MOV DX,FFC4
			OUT DX
			MOV AL,0F
			MOV DX,0FFC6
			OUT DX
			MOV CX,3FFF
		D1	LOOP **D1**
			MOV AL,0E
			MOV DX,0FFC6
			OUT DX
			MOV AL,0C
			MOV DX,0FFC6
			OUT DX
		D2	MOV DX,0FFC0
			IN DX
			AND AL,80
			CMP AL,80
			JNZ**D2**
			MOV AL,0D
			MOV DX,0FFC6
			OUT DX
			MOV DX,0FFC0
			IN DX
			MOV DX,0FFC2
			OUT DX
			JMP **D3**

OUTPUT:

INPUT: OUTPUT:

   POWER SUPPLY: 05V   DISPLAY SHOWS: FF

    CHANNEL NO:'00 T0

RESULT: Program for interfacing ADC and DAC to 8086 performed.

Viva:
1) Which is by default pointer for CS/ES?
2) How many segments present in it?
3) What is the size of each segment?
4) Basic difference between 8085 and 8086?
5) Which operations are not available in 8085?
6) What is the size of instruction queue in 8086?
7) Which are the registers present in 8086?
8) What do you mean by pipelining in 8086?
9) How many 16 bit registers are available in 8086?
10) Specify addressing modes for any instruction?
11) What is the size of instruction queue in 8086?
12) Which are the registers present in 8086?
13) What do you mean by pipelining in 8086?
14) How many 16 bit registers are available in 8086?
15) Specify addressing modes for any instruction?
16) What is the difference between min mode and max mode of 8086?
17) What is the difference between near and far procedure?
18) What is the difference between Macro and procedure?
19) What is the difference between instructions MUL & IMUL?
20) What is the difference between instructions RET & IRET?
21) How many bit 8086 microprocessor is?
22) What is the size of data bus of 8086?
23) What is the size of address bus of 8086?
24) What is the max memory addressing capacity of 8086?
25) Which are the basic parts of 8086?
26) What are the functions of BIU?
27) What are the functions of EU?
28) How many pin IC 8086 is?
29) What IC8086 is?
30) What is the size of instruction queue in 8086?

EXERCISE:
1. Write an ALP to search a number in given string.
2. Write an ALP to search a character in the given string.
3. Write an ALP to convert binary to gray code.
4. Write an ALP to convert gray to binary code.
5. Write an ALP to find out **square root** of given number. **Num = (225) D**
6. Write an ALP to find **factorial** of given number.(N=6)
7. Write an ALP to find number of times letter 'e' exist in the given string 'exercise'.
8. Write an ALP to **LCM** of two numbers.
9. Write an ALP to **HCF** of two numbers.
10. Write an ALP to find number of times letter 'i' exist in the given string 'exercise'.
11. Write an alp program for addition and subtraction of two 16bit numbers?
12. Write an alp program for multiplication and division of two 16bit numbers?
13. Write an alp program to sort the given numbers in ascending order?

14 2) A2 3) 85 4) 54

14. Write an alp program for to sort the given number in descending order?

1) 1E 2) 2A 3)56 4) 98

15. Write an alp program for median of an array.

16. Write an alp program to divide 32 bit by the 16 bit.

17.Write an ALP to search a character in the given string.

18. Write an ALP to convert binary to gray code.
19. Write an ALP to convert gray to binary code.
20. Write an alp program for addition and subtraction of two 16bit numbers?

Industrialapplications: Drones.

main areas of applications:
- **Search and rescue** – Drones are very useful in searching and rescuing operations. For example, they are used in firefighting to determine the amount of the certain gasses in air (CO, CO_2, and the like) using the special measuring equipment.
- **Security** – Many authorities use drones to protect people during various emergencies. For instance, they are able to help coordinate a variety of security operations and can preserve evidence alike.
- **Inspections** – Many systems such as power lines, wind turbines, and pipelines can be checked by drones.
- Surveillance – A drone allows recording and monitoring from the sky, and therefore, they are suitable to monitor public events, protests, or any suspicious happening without being heard and seen. A great tool for the police!

EXP.NO.7: Parallel communication between two microprocessors using 8255.

AIM: To write an alp for parallel communication between two microprocessors by using 8255.

APPARATUS: 8086 Trainer kit-2, 8255, Power Supply and connectors.

PROCEDURE:-

1. Connect the 26 core FRC connector to the 8086 trainer at connector no CN4 and the interface module.

2. Connect the power mate connector to the interface module and the other side of the connector to the power supply. The connections to the power supply are given below.

Connections: (power supply)

Black & Red: Gnd.

Blue & Green: +5V

3. 5- Way power mate is wired to the motor. This power mate is to be inserted into the male socket provided on the interface. Care should be taken such that, below given code for the particular colored wire coincides with the code on the interface.

A- GREEN

C- RED & WHITE

B- GREEN & WHITE

D- RED

V_{DD}- BLACK & WHITE.

4. After the completion of the program and connections enter the program as given in the listing below.

G0< STARTING ADDRESS< ENTER (on the key board of trainer).

PROGRAM:

MEMORY LOCATION	OPCODE	LABEL	MNEMONICS
4000			MOV AL,90
			MOV DX,3006
			OUT DX
		LOOP1	MOV DX,3000
			IN AL,DX
			NOT AL
			MOV DX,3002
			OUT DX
			MOV AL,02
			MOV DX,3006
			OUT DX
			CALL **DELAY**
			MOV AL,03
			MOV DX,3006
			OUT DX
			CALL **DELAY**
			MOV AL,0A
			MOV DX,3006
			OUT DX
			CALL **DELAY**
			MOV AL,0B
			MOV DX,3006
			OUT DX
			CALL **DELAY**
			MOV AL,0E
			MOV DX,3006
			OUT DX
			CALL DELAY
			MOV AL,0F

			MOV DX,3006
			OUT DX
			CALL DELAY
			JMP **LOOP1**

DELAY PROGRAM

MEMORY LOCATION	OPCODE	LABEL	MNEMONICS
4500		**NEXT**	MOV CX,7FFF
			LOOP **NEXT**
			RET

RESULT: Program for parallel communication between two microprocessors by using 8255performed.

Viva:

1) What is the difference between min mode and max mode of 8086?

2) What is the difference between near and far procedure?

3) What is the difference between Macro and procedure?

4) What is the difference between instructions RET & IRET?

5) What is the difference between instructions MUL & IMUL?

6) What do you mean by assembler directives?

7) What .model small stands for?

8) What is the supply requirement of 8086?

9) What is the relation between 8086 processor frequency & crystal Frequency?

10) Functions of Accumulator or AX register?

11)What is the size of flag register?

12) Can you perform 32 bit operation with 8086? How?

 13) Whether 8086 is compatible with Pentium processor?

14) What is 8087? How it is different from 8086?

15) While accepting no. from user why u need to subtract 30 from that?

16) What is the size of instruction queue in 8086?

17) What do you mean by pipelining in 8086?

18) How many 16 bit registers are available in 8086?

19) Specify addressing modes for any instruction?

20) Which are the registers present in 8086?

21) What do you mean by assembler directives?

22) What .model small stands for?

23) What is the supply requirement of 8086?

24) What is the relation between 8086 processor frequency & crystal Frequency?

25) Functions of Accumulator or AX register?

26) Functions of BX register?

27) Functions of CX register?

28) Functions of DX register?

29) How Physical address is generated?

30) Which are pointers present in this 8086?

EXERCISE:

1. Write an alp program for binary to ASCII?
2. Write an alp program for ASCII to BCD?
3. Write an ALP to count the number of 0's and 1's in the given data. **Num = (25) H**
4. Write an ALP to find **square and cube** of a number.(N=6)
5. Write an ALP to 16-bit signed multiplication.
6. Write an ALP to 8-bit signed division.
7. Write an ALP to **insert** a character in the given string.
8. Write an ALP to **delete** a character from the given string.
9. Write an ALP to find the **median** from the list of numbers
10. Write an ALP to convert given Hexadecimal number into its equivalent ASCII number.
11. Write an ALP to convert given Hexadecimal number into its equivalent ASCII number.
12. Write an alp program to search a number 05 from a given array?
    1) 02 2) 06 3) 05 4) 08
13. Write an alp program to search a number 45 from a given array?
    1) 09 2) 45 3) 22 4)A2

14. Write an alp for insert or delete a byte in a given string with SI memory location is 4000and DI location is 6000?

15. Write an alp for moving or reversing the given string with the length of the string is 12?

16. Write an ALP program to displaying the system clock time shows 01:25:30?

17. Write an ALP program to displaying the system clock time shows 10:15:05?

18. Write an ALP to 16-bit signed multiplication.

19. Write an ALP to 8-bit signed division.

20. Write an ALP to **insert** a character in the given string.

Applications: PIC and other controllers
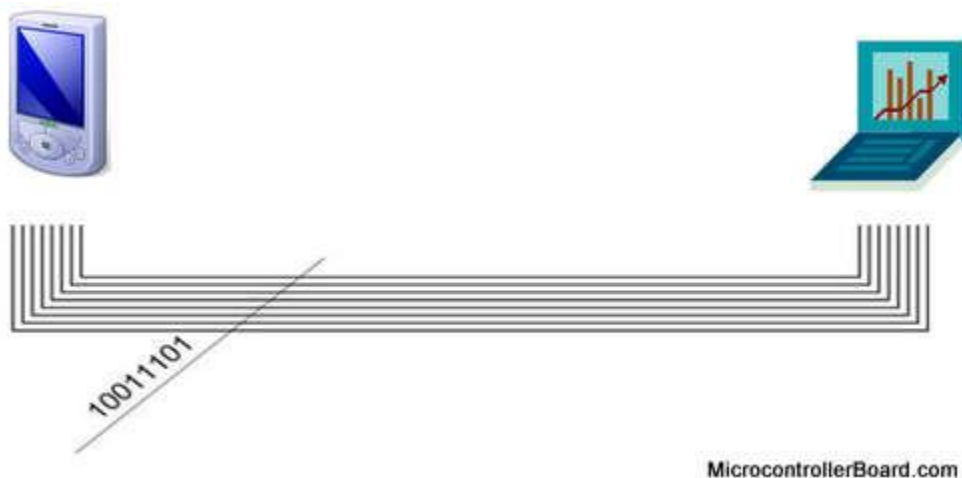
In data transmission, **parallel communication** is a method of conveying multiple binary digits (bits) simultaneously. It contrasts with serial communication, which conveys only a single bit at a time; this distinction is one way of characterizing a communications link.

The basic difference between a parallel and a serial communication channel is the number of electrical conductors used at the physical layer to convey bits. Parallel communication implies more than one such conductor. For example, an 8-bit parallel channel will convey eight bits (or a byte) simultaneously, whereas a serial channel would convey those same bits sequentially, one at a time. If both channels operated at the same clock speed, the parallel channel would be eight times faster. A parallel channel may have additional conductors for other signals, such as a clock

signal to pace the flow of data, a signal to control the direction of data flow, and handshaking signals.

Parallel communication is and always has been widely used within integrated circuits, in peripheral buses, and in memory devices such as RAM. Computer system buses, on the other hand, have evolved over time: parallel communication was commonly used in earlier system buses, whereas serial communications are prevalent in modern computers.

EXP.NO.8:Serial communication between two microprocessor kits using 8251

AIM: Interface the 8251 USART to the two 8086 microprocessor kits.

APPARATUS:

1. 8086 Trainer kit-2no's
2. 8251 USART
3. Power Supply
4. Connectors.

PROCEDURE:-

1. Connect the 26 core FRC connector to the 8086 trainer at connector no CN4 and the interface module.
2. Connect the power mate connector to the interface module and the other side of the connector to the power supply. The connections to the power supply are given below.

Connections: (power supply)

Black & Red: Gnd.

Blue & Green: +5V

3. 5- Way power mate is wired to the motor. This power mate is to be inserted into the male socket provided on the interface. Care should be taken such that, below given code for the particular colored wire coincides with the code on the interface.

A- GREEN

C- RED & WHITE

B- GREEN & WHITE

D- RED

V_{DD}- BLACK & WHITE.

4. After the completion of the program and connections enter the program as given in the listing below.

G0< STARTING ADDRESS< ENTER (on the key board of trainer).

PROGRAM:

MEMORY LOCATION	OPCODE	LABEL	MNEMONICS
4000			MOV AL,36
			MOV DX,0086H
			OUT DX,AL
			MOV DX,0080H
			MOV AL,0A
			OUT DX,AL
			MOV AL,00
			OUT DX,AL
			MOV SP,3000
			MOV DX,0092
			OUT DX,AL
			OUT DX,AL
			OUT DX,AL
			OUT DX,AL
			CALL DELAY
			MOV AL,40
			OUT DX,AL
			CALL DELAY
			MOV AL,CE
			OUT DX,AL
			CALL DELAY
			MOV AL,27
			OUT DX,AL
			CALL DELAY
			MOV SI,2100
		L1	MOV DX,0092
			IN AL,DX
			CMP AL,1B

			JE L1
			MOV DX,0090
			IN AL,DX
			AND AL,81
			CMP BL,AL
			JE L3
		L2	MOV DX,0092
			IN AL,DX
			AND AL,81
			CMP AL,81
			JNE L2
			MOV AL,BL
			MOV DX,0090
			OUT DX,AL
			OUT DX,AL
			MOV [SI],AL
			INC SI
			JMP L1
			OUT DX,AL
			INC SI
			JMP L2
		L3	INT 03

DELAY PROGRAM:

MEMORY LOCATION	OPCODE	LABEL	MNEMONIC
4500			MOV CX,0002
		A3	LOOP A3
			RET

RESULT: Program for serial communication between two microprocessors by using8251Performed

Viva:
1) What is the difference between instructions DIV & IDIV?
2) What is difference between shifts and rotate instructions?
3) Which are strings related instructions?
4) Which are addressing modes and their examples in 8086?
5) What does u mean by directives?
6) Which is by default pointer for CS/ES?
7) How many segments present in it?
8) What is the size of each segment?
9) Basic difference between 8085 and 8086?
10) Which operations are not available in 8085?
11) Which is by default pointer for CS/ES?
12) How many segments present in it?
13) What is the size of each segment?
14) Basic difference between 8085 and 8086?
15) Which operations are not available in 8085?
16) What is the difference between min mode and max mode of 8086?
17) What is the difference between near and far procedure?
18) What is the difference between Macro and procedure?
19) What is the difference between instructions RET & IRET?
20) What is the difference between instructions MUL & IMUL?
21) What is the difference between instructions DIV & IDIV?
22) What is difference between shifts and rotate instructions?
23) Which are strings related instructions?
24) Which are addressing modes and their examples in 8086?
25) What does u mean by directives?
26) What does u mean by Prefix?
27) What .model small means?
28) Difference between small, medium, tiny, huge?
29) What is dd, dw, db?
30) Interrupts in 8086 and there function

EXERCISE:
   1. Write an alp program to find the smallest number in an array using masm software.
   2. Write an alp program to find the largest number in an array using masm software.
   3. Write an ALP to perform average of 1 to 10 natural numbers
   4. Write an ALP to perform the Armstrong number.
   5. Write an ALP to perform the reverse operation of a given number.

6. Write an ALP to perform the decimal to binary conversion for the given number.
7. Write an ALP to perform the binary to decimal conversion for the given number.
8. Write an ALP to perform the decimal to hexadecimal conversion for the given number.
9. Write an ALP to perform the reverse operation of a given string.
10. Write an ALP to convert binary to gray code.
11. 16-Bit Addition in Location mode using 8086 Microprocessor Kit
12. 16-Bit subtraction in Location mode using 8086 Microprocessor Kit.
13. Write an alp program to find the smallest number in an array using masm software.
14. Write an alp program to find the largest number in an array using masm software.
15. Write an alp program to find the unpacked BCD to the given BCD number 56 using 8086 trainer kit?
16. Write an alp program to find the ASCII number to the given BCD number 56 using 8086 trainer kit?
17. Write an ALP to perform average of 1 to 10 natural numbers
18. Write an ALP to perform the Armstrong number.
19. Write an ALP to perform the reverse operation of a given number.
20. Write an ALP to perform the decimal to binary conversion for the given number

Industrial Applications:

LAN and Optical communications.

Optical communication, also known as **optical telecommunication**, is communication at a distance using light to carry information. It can be performed visually or by using electronic devices. The earliest basic forms of optical communication date back several millennia, while the earliest electrical device created to do so was the photo phone, invented in 1880.

An optical communication system uses a transmitter, which encodes a message into an optical signal, a channel, which carries the signal to its destination, and a receiver, which reproduces the message from the received optical signal. When electronic equipment is not employed the 'receiver' is a person visually observing and interpreting a signal, which may be either simple (such as the presence of a beacon fire) or complex (such as lights using color codes or flashed in a Morse code sequence).

Free-space optical communication has been deployed in space, while terrestrial forms are naturally limited by geography, weather and the availability of light. This article provides a basic introduction to different forms of optical communication.

EXP.NO.9: Interfacing to 8086 and programming to control stepper motor.

AIM: Write an Assembly Language Program to rotate the Stepper Motor in clockwise as well as anti-clockwise direction.

APPARATUS: 8086 Trainer kit, Stepper,

Motor Interface Card,

Stepper Motor,

Power supply.

PROCEDURE:-

1. Connect the 26 core FRC connector to the 8086 trainer at connector no CN4 and the interface module.
2. Connect the power mate connector to the interface module and the other side of the connector to the power supply. The connections to the power supply are given below.

    Connections: (power supply)

    >   Black & Red: Gnd.
    >   Blue & Green: +5V

3. 5- Way power mate is wired to the motor. This power mate is to be inserted into the male socket provided on the interface. Care should be taken such that, below given code for the particular colored wire coincides with the code on the interface.

    >   A- GREEN
    >   C- RED & WHITE
    >   B- GREEN & WHITE
    >   D- RED
    > V_{DD}- BLACK & WHITE.

4. After the completion of the program and connections enter the program as given in the listing below.

    G0< STARTING ADDRESS< ENTER (on the key board of trainer).

Program to rotate in clockwise direction

MEMORY LOCATION	OPCODE	LABEL	MNEMONIC
4000			
			MOV AL,80
			MOV DX,0FFC6
			OUT DX
		A0	MOV BX,02
		A1	MOV CX,00FF
		A2	MOV AL,77
			MOV DX,0FFC4
			OUT DX
			CALL DELAY
			MOV AL,0BB
			MOV DX,0FFC4
			OUT DX
			CALL DELAY
			MOV AL,0DD
			MOV DX,0FFC4
			OUT DX
			CALL DELAY
			MOV AL,0EE
			MOV DX, 0FFC4
			OUT DX
			CALL DELAY
			LOOP A1
			DEC BX
			JNZ A2

Program to rotate in Anti clockwise direction

MEMORY LOCATION	OPCODE	LABEL	MNEMONIC
4000			MOV AL,80
			MOV DX,OFFC6
			OUT DX
		A0	MOV BX,0002
		A1	MOV CX,00FF
		A2	MOV AL,0EE
			MOV DX,0FFC4
			OUT DX
			CALL DELAY
			MOV AL,0DD
			MOV DX,0FFC4
			OUT DX
			CALL DELAY
			MOV AL,0BB
			MOV DX,0FFC4
			OUT DX
			CALL DELAY
			MOV AL,077
			MOV DX,0FFC4
			OUT DX
			CALL DELAY
			LOOP A1
			DEC BX
			JNZ A2

DELAY PROGRAM:

MEMORY LOCATION	OPCODE	LABEL	MNEMONIC
4500			MOV AX,0500
		A3	NOP
			NOP
			DEC AX
			JNZ A3
			RET

RESULT: An operation to interface Stepper Motor with8086 Microprocessor performed.

Viva:

1) What does u mean by Prefix?
2) What .model small means?
3) Difference between small, medium, tiny, huge?
4) What is dd, dw, db?
5) Write   Interrupts in 8086 and there function.
6) Expand USART?
7) Where do we prefer the serial communication?
8) What is the function of instruction pointer (IP) register?

9) What is the difference between IN and OUT instructions?

10) What is MODEM?

11)What is the reset address of 8086?

12) What is the size of flag register in 8086? Explain all.

13) What is the difference between 08H and 01H functions of INT 21H?

14) Which is faster- Reading word size data whose starting address is at even or at odd address of memory in 8086?

15) Which is the default segment base: offset pairs?

16) What is the difference between instructions DIV & IDIV?

17) What is difference between shifts and rotate instructions?
18) Which are strings related instructions?
19) Which are addressing modes and their examples in 8086?

20) What does u mean by directives?

21) While displaying no. from user why u need to add 30 to that?

22) What are ASCII codes for nos. 0 to F

23) How does U differentiate between positive and negative numbers?

24) What is range for these numbers?

25) Which no. representation system you have used?

26) What do you mean by emulator?

27) Stack related instruction?

28) stack 100 means?

29) What do you mean by 20 dup (0)?

30) Which flags of 8086 are not present in 8085?

EXERCISE:

1. Write an alp program to find even or odd numbers in a given array?

2. Write an alp program to find the sum of 'n' numbers?

3   Write an ALP to count the number of 0's and 1's in the given data. **Num = (25) H**

4   Write an ALP   to find **square and cube** of a number.(N=6)

5   Write an ALP to 16-bit signed multiplication.

6   Write an ALP to 8-bit signed division.

7   Write an ALP   to **insert** a character in the given string.

8   Write an ALP to **delete** a character from the given string.

9   Write an ALP to find the **median** from the list of numbers

10 Write an ALP to convert given Hexadecimal number into its equivalent ASCII number

11 Write an alp program to find the smallest number in an array using masm software.

12 Write an alp program to find the largest number in an array using masm software

13 Write an ALP to perform the decimal to binary conversion for the given number.

14 Write an ALP to perform the binary to decimal conversion for the given number.

15 Write an ALP to perform the decimal to hexadecimal conversion for the given number.

16 Write an ALP to perform the reverse operation of a given string.

17 Write an ALP to convert binary to gray code.

18 16-Bit Addition in Location mode using 8086 Microprocessor Kit

19 16-Bit subtraction in Location mode using 8086 Microprocessor Kit.

20 Write an alp program to find the smallest number in an array using masm software.

Industrial Applications:

3D Printers

Every 3D print starts as a digital 3D design file – like a blueprint – for a physical object. Trying to print without a design file is like trying to print a document on a sheet of paper without a text file. This design file is sliced into thin layers which is then sent to the 3D printer. From here on the printing process varies by technology, starting from desktop printers that melt a plastic material and lay it down onto a print platform to large industrial machines that use a laser to selectively melt metal powder at high temperatures. The printing can take hours to complete depending on the size, and the printed objects are often post-processed to reach the desired finish.

EXECUTION PROCEDURE FOR 8051

Writing a alp program into 8051:

Switch on kit

Press reset

Press A (give starting address)

Press enter

Enter 1st mnemonic

Press enter

Enter 2nd mnemonic

Press enter

Enter nth mnemonic

Press enter

Press enter

Press enter

Display: A D G M T S

To compile:

Press G (give starting address)

Press enter

Display: program executed

Result:

Press R

A, B, R0, -------, Rn

Exp.No.10: Programming using arithmetic, logical and bit manipulation instructions of 8051.

I)   **Arithmetical operations:**

i)   **8 bit addition**

AIM: To perform 8 bit addition by using 8051.

APPARATUS: 8051 with keyboard

PROGRAM:

MEMORY LOCATION	OPCODE	LABEL	MNEMONIC
8000			MOV A,#02
			MOV B,#02
			ADD A,B
			LCALL 03

OUTPUT:

Input		output	
REGISTER	Data	REGISTER	Data
A	02	A	04
B	02		

ii)   **8 bit subtraction**

AIM: To perform 8 bit subtraction by using 8051.

APPARATUS: 8051 with keyboard

PROGRAM:

MEMORY LOCATION	OPCODE	LABEL	MNEMONIC
8000			MOV A,#04
			MOV B,#02
			SUBB A,B
			LCALL 03

OUTPUT:

Input		output	
REGISTER	**Data**	**REGISTER**	**Data**
A	04	A	02
B	02		

iii)   8 bit multiplication:

AIM: To perform 8 bit multiplication by using 8051.

APPARATUS: 8051 with keyboard

PROGRAM:

Memory location	Opcode	Label	Mnemonic
8000			MOV DPTR,#9000
			MOVX A,@DPTR
			MOV F0,A
			INC DPTR
			MOVX A,@DPTR
			MUL AB
			LCALL 03

OUTPUT:

Input		output	
MEMORY LOCATION	**Data**	**REGISTER**	**Data**
9000	03	A	06
9001	02		

iv)   8 bit division:

AIM: To perform 8 bit division by using 8051.

APPARATUS: 8051 with keyboard

PROGRAM:

MEMORY LOCATION	OPCODE	LABEL	MNEMONIC
8000			MOV DPTR,#9000
			MOVX A,@DPTR
			MOV R0,A
			INC DPTR
			MOVX A,@DPTR
			MOV F0,A
			MOV A,R0
			DIV AB
			LCALL 03

OUTPUT:

Input		output	
MEMORY LOCATION	**Data**	**REGISTER**	**Data**
9000	03	A	06
9001	02		

II)   logical operations:

i)   AND operation

AIM: To perform AND operation by using 8051.

APPARATUS: 8051 with keyboard

PROGRAM:

MEMORY LOCATION	OPCODE	LABEL	MEMONIC
8000			MOV R0,#DATA 1
			MOV A,#DATA 2
			ANL A,R0
			MOV R1,A
			LCALL 03

OUTPUT:

Input		output	
REGISTER	Data	REGISTER	Data
R0	14 (DATA 1)	R1	10
A	12 DATA 2)		

ii)   XOR operation

AIM: To perform AND operation   by using 8051.

APPARATUS: 8051 with keyboard

PROGRAM:

MEMORY LOCATION	OPCODE	LABEL	MEMONIC
8000			MOV R0,#DATA 1
			MOV A,#DATA 2
			XRL A,R0
			MOV R1,A
			LCALL 03

OUTPUT:

Input		output	
REGISTER	**Data**	**REGISTER**	**Data**
R0	23 (DATA 1)	R1	17
A	34 DATA 2)		

BIT AND BYTE OPERATIONS BY USING 8051

AIM: To write an assembly language program to perform the BIT and BYTE operations like set, reset and swap by using 8051 microcontroller.

APPARATUS:
1. 8051 Micro Controller kit.
2. Key Board.
3. Adapter.

PROGRAM:

  BIT OPERATIONS:

SET A BIT:

```
          MOV        DPTR, #STARTING ADDRESS
          MOVX        A, @DPTR
          SETB       0E5
          INC        DPTR
          MOVX         @DPTR, A
    L4:   SJMP       L4 (OFFSET ADDRESS)
          LCALL      03
```

RESET A BIT:

```
          MOV        DPTR, #STARTING ADDRESS
          MOVX        A, @DPTR
          CLR        0E5
          INC        DPTR
          MOVX         @DPTR, A
    L4:   SJMP       L4 (OFFSET ADDRESS)
```

          LCALL   03

COMPLIMENT A BIT:

	MOV	DPTR, #STARTING ADDRESS
	MOVX	A, @DPTR
	CPL	0E5
	INC	DPTR
	MOVX	@DPTR, A
L4:	SJMP	L4 (OFFSET ADDRESS)
	LCALL	03

OUTPUT:

PROGRAM:

BYTE OPERATONS:

SWAP A BYTE:

	MOV	DPTR, #STARTING ADDRESS
	MOVX	A, @DPTR
	SETB	A
	INC	DPTR
	MOVX	@DPTR, A
L4:	SJMP	L4 (OFFSET ADDRESS)
	LCALL	03

COMPLIMENT A BYTE:

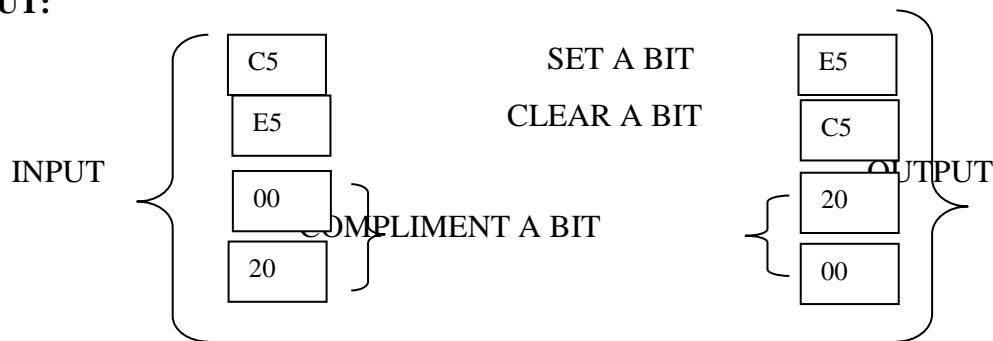|		
	MOV	DPTR, #STARTING ADDRESS
	MOVX	A, @DPTR

```
            CPL        A
            INC        DPTR
            MOVX       @DPTR, A
      L4:   SJMP       L4 (OFFSET ADDRESS)
            LCALL      03
```

OUTPUT:

```
                   ┌  ┌────────┐          SWAP A BYTE       ┌────────┐  ┐
                   │  │  C5    │                            │  5C    │  │
                   │  └────────┘                            └────────┘  │
      INPUT  ┤                                                   OUTPUT ├
                   │  ┌────────┐                            ┌────────┐  │
                   │  │  00    │                            │  FF    │  │
                   │  └────────┘ COMPLIMENT A BYTE          └────────┘  │
                   │  ┌────────┐                            ┌────────┐  │
                   └  │  FF    │                            │  00    │  ┘
                      └────────┘                            └────────┘
```
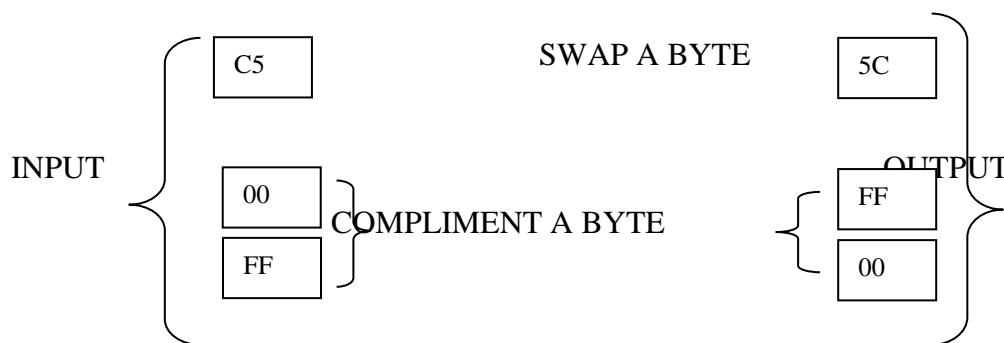
RESULT: Programs for arithmetic, logical and bit manipulation instructions of 8051 performed

Viva:

1) What is the function of 01h of Int 21h?

2) What is the function of 02h of Int 21h?

3) What is the function of 09h of Int 21h?

4) What is the function of 0Ah of Int 21h?

5) What is the function of 4ch of Int 21h?

6) What is Microprocessor

7) Explain the function of CPU in Microprocessor

8) Define Compiler

9) Define Intrepreter

10) Define Assembler

11) What does u mean by Prefix?

12) What .model small means?

13) Difference between small, medium, tiny, huge?

14) What is dd, dw, db?

15) Interrupts in 8086 and there function

16) What is the reset address of 8086?

17) What is the size of flag register in 8086? Explain all.

18) What is the difference between 08H and 01H functions of INT 21H?

19) Which is faster- Reading word size data whose starting address is at even or at odd address of memory in 8086?

20) Which is the default segment base: offset pairs?

21) What is Assembly level language

22) What are Mnemonics

23) Distinguish between Microprocessor & Microcontroller.

24) Define address bus, data bus and control bus

25) What is nibble, byte and word

26) How many bit combinations are there in a byte?

27) Have you studied buses? What types?

28) What is the Maximum clock frequency in 8086?

29) What is meant by Maskable interrupts?

30) What are the different functional units in 8086?

EXERCISE:

1. Write an alp program to find even and odd numbers in a given array?
2. Write an alp program to find sum of even numbers in an array?
3. Write an ALP to **LCM** of two numbers
4. Write an ALP to search a number in given string.
5. Write an ALP to search a character in the given string.
6. Write an ALP to convert binary to gray code.
7. Write an ALP to convert gray to binary code.
8. Write an ALP to find out **square root** of given number. **Num = (225) D**
9. Write an ALP to find **factorial** of given number.(N=6)
10. Write an ALP to find number of times letter 'e' exist in the given string 'exercise'
11. Write an alp program to find the unpacked BCD to the given BCD number 56 using 8086 trainer kit?
12. Write an alp program to find the ASCII number to the given BCD number 56 using 8086 trainer kit?

 13) Which is the default segment base: offset pairs?

 14) What is Assembly level language

 15) What are Mnemonics

 16) Distinguish between Microprocessor & Microcontroller.

 17) Define address bus, data bus and control bus

 18) What is nibble, byte and word

19)Write an ALP to search a number in given string.

20)Write an ALP to search a character in the given string.

Industrial Applications:

Robots.
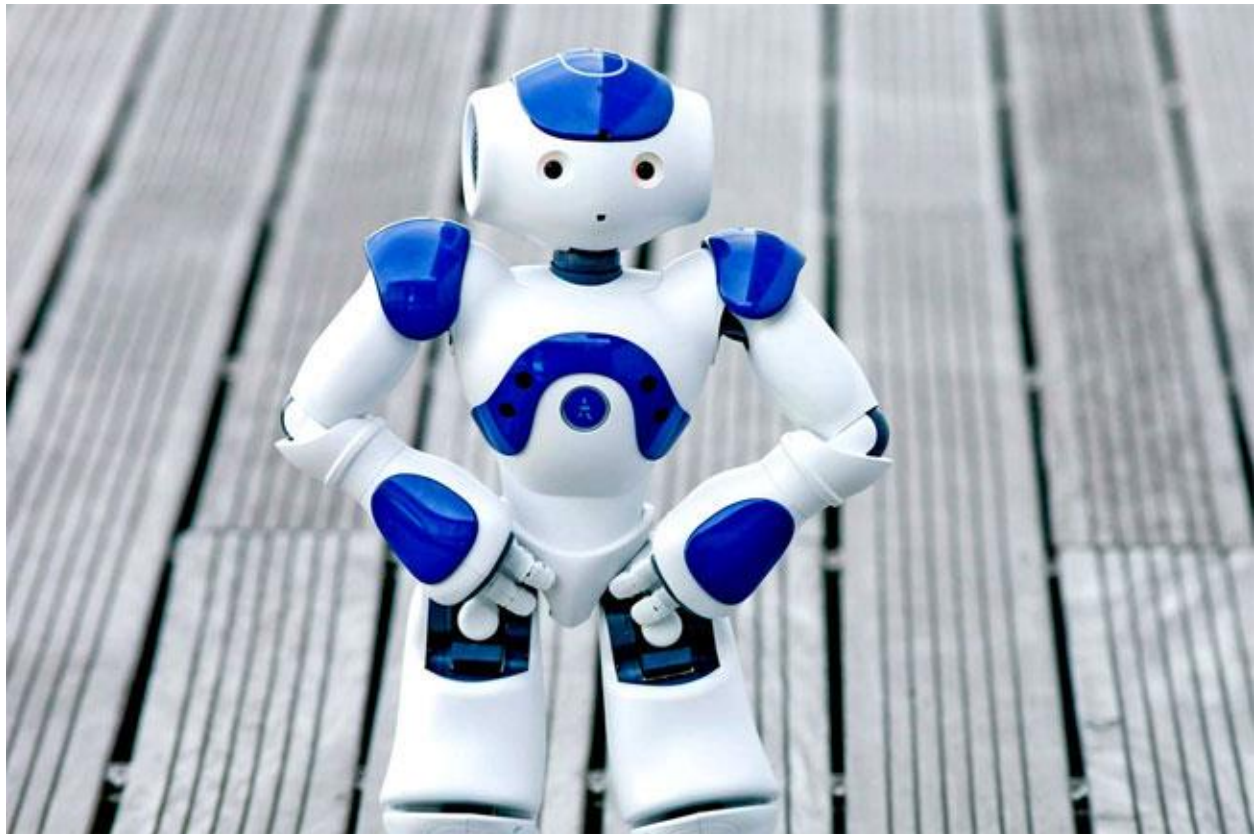
1. Industrial robots – These robots bring into play in an industrialized manufacturing atmosphere. Typically these are articulated arms particularly created for applications like-material handling, painting, welding and others. If we evaluate merely by application then this sort of robots can also consist of some automatically guided automobiles and other robots.

2. Domestic or household robots – Robots which are used at home. This sort of robots consists of numerous different gears for example- robotic pool cleaners, robotic sweepers, robotic vacuum cleaners, robotic sewer cleaners and other robots that can perform different household tasks. Also, a number of scrutiny and tele presence robots can also be considered as domestic robots if brought into play in that sort of environment.

3. Medical robots – Robots employed in medicine and medicinal institutes. First & foremost surgical treatment robots. Also, a number of robotic directed automobiles and perhaps lifting supporters.

4. Service robots – Robots that cannot be classed into any other types by practice. These could be various data collecting robots, robots prepared to exhibit technologies, robots employed for research, etc.

5. Military robots – Robots brought into play in military & armed forces. This sort of robots consist of bomb discarding robots, various shipping robots, exploration drones. Often robots at the start produced for military and armed forces purposes can be employed in law enforcement, exploration and salvage and other associated fields.

6. Entertainment robots – These types of robots are employed for entertainment. This is an extremely wide-ranging category. It begins with model robots such as robo sapien or the running photo frames and concludes with real heavy weights like articulated robot arms employed as movement simulators.

7. Space robots – I would like to distinct out robots employed in space as a split apart type. This type of robots would consist of the robots employed on Canadarm that was brought into play in space Shuttles, the International Space Station, together with Mars explorers and other robots employed in space exploration & other activities.

8. Hobby and competition robots – Robots that is created by students. Sumo-bots, Line followers, robots prepared merely for learning, fun and robots prepared for contests.

EXP.NO.11: PROGRAM AND VERIFY TIMER/COUNTER IN 8051

AIM: To Perform Timer 0 and Timer 1 in Counter Mode and Gated Mode Operation.

APPARATUS: 8051kit with keyboard, timer module kit, FRC cables & power supply.

PROCEDURE:

1. Make the power supply connections from 4-way power mate connector on the ALS-NIFC-09 board.

    - +5V ……...blue wire
    - Ground …..black wire

2. Connect 26-pin flat cable from interface module to P1 of the trainer kit.

3. Enter the program in the RAM location in 9000 and execute the program

    GO<STARTING ADDRESS><EXEC>

PROGRAM TO VERIFY   TIMER '0'- COUNTER MODE:

ADDRESS	OPCODE	LABEL	MNEMONICS
9200		LOOP	MOV A,TMOD (TMOD=89)
			ORL A,#05H
			MOV TMOD,A
			SETB TRO (TRO=8C)
			LCALL 68EAH
			MOV DPTR,#0194H
			MOV A,TLO (TLO=8A)
			MOVX @DPTR,A
			INC DPTR
			MOV A,THO (THO=8C)
			MOVX @DPTR,A
			LCALL 6748H
			SJMP LOOP

Execution:1) short jp1 of 1&2 pins and press sw1 for manual increment

2) Short jp1 of 2&3 pins for auto increment

PROGRAM TO VERIFY TIMER-1 COUNTER MODE:

ADDRESS	OPCODE	LABEL	MNEMONICS
9100			MOV A, TMOD (TMOD=89)
			ORL A,#50H
			MOV TMOD,A
			SETB TR1 (TR1=8E)
		LOOP	LCALL 68EAH
			MOV DPTR,#0194H
			MOV A,TL1 (TL1=8B)
			MOVX @DPTR,A
			INC DPTR
			MOV A,TH1 (TH1=8D)
			MOVX @DPTR,A
			LCALL 6748H
			SJMP LOOP

Execution: 1) short jp1 of 5&6 pins and press sw2 for manual increment

2) Short jp2 of 4&5 pins for auto increment

RESULT: Programs for Timer 0 and Timer 1 in Counter Mode and Gated Mode Operations performed**.**

Viva:

1) What is the reset address of 8086?
2) What is the size of flag register in 8086? Explain all.
3) What is the difference between 08H and 01H functions of INT 21H?
4) Which is faster- Reading word size data whose starting address is at even or at odd address of memory in 8086?
5) Which is the default segment base: offset pairs?
6) What is Assembly level language
7) What are Mnemonics
8) Distinguish between Microprocessor & Microcontroller.
9) Define address bus, data bus and control bus
10) What is nibble, byte and word
11) Can we use SP as offset address holder with CS?

12) Whether micro reduces memory requirements?

13) What do you mean by segment override prefix?

14) Which is the index registers in 8086?

15) Which is the base registers in 8086?

16) What do you mean by macro?

17) What is diff between macro and procedure?

18) Types of procedure?

19) What TASM is?

20) What TLINK is?

21) Name the processor lines of two major manufacturers?

22) How many bit combinations are there in a byte?

23) Have you studied buses? What types?

24) What is the Maximum clock frequency in 8086?

25) What is meant by Maskable interrupts?

26) What are the different functional units in 8086?

27) What are the various segment registers in 8086?

28) What is SIM and RIM instructions?

29) What are the different types of Addressing Modes?

30) What are the General Data Registers & their uses?

EXERCISE:

1. Write an ALP program to find number of odd numbers in a given array.
2. Write an ALP   to **insert** a character in the given string.
3. Write an ALP to **delete** a character from the given string.
4. Write an ALP to find the **median** from the list of numbers
5. Write an ALP to convert given Hexadecimal number into its equivalent ASCII number.
6. Write an ALP   to convert given ASCII number into its equivalent Hexadecimal number.
7. Write an ALP to find **Result = $1 + 2^2 + 3^3$**.
8. Write an ALP to find **Result = $N^2 + N^3$** .(N=6)
9. Write an ALP to find **Result = N^N**.(N=5)
10. Write an ALP to find **Result = $3^N + N^3$ +6** (If N=5)
11. Write an alp program to perform OR operation using 8051 microcontroller trainerKit?
12. Write an alp program to perform addition and subtraction operation using 8051microcontroller trainer Kit?

    A)56 B) 12

13**.** Write an alp program to find the length of the given array using masm software

14. Write an alp program to find the sum ofn" numbers using masm software

15. Write an alp program to perform an operation to find the cubes of squares of a given array using masm software

16. Write an alp program to perform an operation to find the sum of squares of a given array using masm software

17. Write an alp program to find the length of the given array using masm software.

18. Write an alp program to find the sum of 'n' odd numbers using masm software.

19. Write an ALP to search a number in given string.

20. Write an ALP to search a character in the given string.

Industrial Applications: Walk though

The option to skip steps lets users opt out of the familiar or continue if they find it helpful. Further, the walkthrough begins with a bulky arrow that is simultaneously easy to spot or easy to ignore.

Their walkthrough progresses as users take meaningful actions—each tip requires the user to click the element on the page it points to. The action-driven approach eases users through their initial setup—creating a task/project—leading them more quickly to the aha moment.

EXP.NO.12: PROGRAM AND VERIFY INTERRUPT HANDLING IN 8051.

AIM: Write ALP in 8051 to allow the external interrupt 1.

APPARATUS: 8051 with keyboard interrupt kit module.

PROCEDURE:

1. Make the power supply connections from 4-way power mate connector on the ALS-NIFC-09 board.
   - +5V ……...blue wire
   - Ground …..black wire
2. Connect 26-pin flat cable from interface module to P1 of the trainer kit.
3. Enter the program in the RAM location in 9000 and execute the program
   GO<STARTING ADDRESS><EXEC>

PROGRAM:

MEMORY LOCATION	OPCODE	LABEL	MEMONIC
			ORG 0000
		AGAIN	LJMP AGAIN
			ORG 0013
			SETB P1.3
			MOV R3,#255
		BACK	DJNZ R3,BACK
			CLR P1.3
			ORG 30H
		MAIN	MOV IE,#10000100B
		HERE	SJMP HERE
			LCALL 03

OUTPUT:

1. When key is pressed, LED ON.
2. When key is opened, LED OFF

RESULT: program for interrupt handling in 8051 verified.

Viva:

1) Can we use SP as offset address holder with CS?

2) Which is the base registers in 8086?

3) Which is the index registers in 8086?

4) What do you mean by segment override prefix?

5) Whether micro reduces memory requirements?

6) What are different types of instructions. Give examples

7) What are addressing modes

8) Give the different type of data related addressing modes and explain with examples.

9) What are the different types of branch related addressing modes

10) Describe about MUL, IMUL, DIV, IDIV instructions

11) What TD is?

12) What do u mean by assembler?

13) What do u mean by linker?

14) What do u mean by loader?

15) What do u mean by compiler?

16) What do you mean by emulator?

17) Stack related instruction?

18) Stack 100 means?

19) What do you mean by 20 dup (0)?

20) Which flags of 8086 are not present in 8085?

21) What is the function of accumulator?

22) What are the General Features of Microcontroller?

23) What is Microcontroller?

24) How many pin the 8051 has?

25) What is the size of the PC?

26) Explain the general features of 8051 Microcontroller?

27) Differentiate between Program Memory and Data Memory?

28) What is the program counter? What is its use?

29) What is the difference between PC and SP?

30) Describe the 8051 oscillator and clock?

EXERCISE:

1. Write an alp program tofind the length of the given array using masm software.
2. Write an alp program tofind the sum of 'n' odd numbers using masm software.
3. Write an ALP to search a number in given string.
4. Write an ALP to search a character in the given string.
5. Write an ALP to convert binary to gray code.
6. Write an ALP to convert gray to binary code.
7. Write an ALP to find out **square root** of given number. **Num = (225)** D
8. Write an ALP to find **factorial** of given number.(N=6)
9. Write an ALP to **LCM** of two numbers.
10. Write an ALP to **HCF** of two numbers.
11. Write an alp program to performan operation to find the squares of a given number using masm software
12. Write an alp program to perform an operation to find the square of a given number using MP trainer kit

13. Write an alp program to perform an operation to find the cubes of a given numberusing masm software
14. Write an alp program to perform an operation to find the cubesof a given numbers using mp trainer kit?
15. Write an ALP to find out **square root** of given number. **Num = (225)** D

16. Write an ALP to find **factorial** of given number.(N=6)

17 .Write an ALP to find number of times letter 'e' exist in the given string 'exercise'
18. Write an alp program to find the unpacked BCD to the given BCD number 56 using 8086 trainer kit?
19. Write an alp program to find the ASCII number to the given BCD number 56 using 8086 trainer kit?
20. Write an alp program to performan operation to find the squares of a given number using masm software

EXP. NO.13: UART OPERATION IN 8051

AIM: Write ALP Of UART operation in 8051.

APPARATUS: 8051 with keyboard UART module.

PROCEDURE:

1. Make the power supply connections from 4-way power mate connector on the ALS-NIFC-09 board.

    - +5V ….…...blue wire
    - Ground …...black wire

2. Connect 26-pin flat cable from interface module to P1 of the trainer kit.

3. Enter the program in the RAM location in 9000 and execute the program
    GO<STARTING ADDRESS><EXEC>

PROGRAM:

SEND CHAR:

MEMORY LOCATION	OPCODE	LABEL	MEMONIC
			MOV SBUF,A
		B0	JNB TI,B0
			CLR TI
			RET
		N1	JNB RI,N1
			MOV A,SBUF
			CLR RI
			RET
		INITSMOD	MOV SCON,#52
			MOV TMOD,#20
			MOV TH1,#0F4
			SETB TRI
			RET

MODE 0:

MEMORY LOCATION	OPCODE	LABEL	MEMONIC
			MOV SCON,#0D
			CLR TI
		LOOP	MOV SBUF,#0AA
		HERE	JNB TI,HERE
			CLR TI
			SJMP LOOP
			LCALL 03

MODE 1:

MEMORY LOCATION	OPCODE	LABEL	MEMONIC
			MOV SCON,#40
			MOV TMOD,#20
			MOV TH,#0D0
			MOV TCON,#40
			CLR TI
		LOOP	MOV SBUF,#0AA
		W1	JNB TI,W1
			CLR TI
			JMP LOOP

INTERRUPT DRIVEN MODE:

MEMORY LOCATION	OPCODE	LABEL	MEMONIC
			JMP SERIAL_INT
		MAIN	MOV SCON,#50
			MOV TMOD,#20
			MOV TMI,#0DD
			MOV PCON,#80
			MOV IE,#90
			CLR RI
		LOOP	JMP LOOP
		SERIAL_INT	CLR RI
			MOV PI,SBUF
			RETI
			LCALL 03

RESULT: Program for URAT operation in 8051 performed.

Viva:

1) What do you mean by macro?

2) What is diff between macro and procedure?

3) Types of procedure?

4) What TASM is?

5) What TLINK is?

6)Give examples of conditional branch instructions

7) Give examples of unconditional branch instructions

8) What are flag manipulation instructions ? Give examples

9) Explain about DAA instruction

10) Explain shift and rotate instructions

11) What TD is?

12) What do u mean by assembler?

13) What do u mean by linker?

14) What do u mean by loader?

15) What do u mean by compiler?

16) Name the general purpose registers available in 8086?

17) Explain the functions of BIU and EU?

18) Give the syntax of MUL and DIV instructions?

19) What is meant by segmentation? Why is it necessary?

20) Illustrate with examples, the instructions PUSH and POP?

21) Give a comparison between CISC and RISC processors?

22) Differentiate between procedure and macro?

23) Classify the interrupts available in 8086?

24) Name the special registers available in 8086?

25) Name the flags available in 8086?

26) Explain the Immediate Addressing Mode?

27) Write a note on the Stack and the Stack Pointer?

28) What are the different addressing modes supported by 8051 Microcontroller ?

29) Explain how the 8051 implement the Harvard Architecture?

30) What is the size of SP?

EXERCISE:

1. Write an alp program to perform an operation to find the sum of squares of a given array using masm software.
2. Write an alp program to perform an operation to find the cubes of squares of a given array using masm software
3. Write an ALP to search a number in given string.
4. Write an ALP to search a character in the given string.
5. Write an ALP to convert binary to gray code.
6. Write an ALP to convert gray to binary code.
7. Write an ALP to find out **square root** of given number. **Num = (225) D**
8. Write an ALP to find **factorial** of given number.(N=6)
9. Write an ALP to find number of times letter 'e' exist in the given string 'exercise'.
10. Write an ALP to **LCM** of two numbers.
11. Write an alp program to performan operation to find the squares of a given number using masm software
12. Write an alp program to perform an operation to find the square of a given number using MP trainer kit

   13.Write an alp program to perform an operation to find the cubes of a given numberusing

14. Write an alp program to perform an operation to find the cubesof a given numbers using mp trainer kit?

15. Write an alp program to performan operation to find the squares of a given number using masm software

16. Write an alp program to perform an operation to find the square of a given number using MP trainer kit

17. Write an alp program to perform an operation to find the cubes of a given numberusing masm software

18. Write an alp program to perform an operation to find the cubesof a given numbers using mp trainer kit?

19. Write an ALP to find out **square root** of given number. **Num = (225) D**

20. Write an ALP to find **factorial** of given number.(N=6)

INDUSTRIAL APPLICATIONS:

Development of embedded developmet board

The rate at which data is transmitted or received must be always be set using the baud rategenerator unless the USART is being   used in synchronous slave mode. The   baud rate is set bywriting to the SPBRG register.   The SYNC bit selects between synchronous and   asynchronousmodes, and these   modes have different baud rates for a particular value   in the SPBRG   register.For asynchronous mode, the SYNC bit must be cleared and the   BRGH bit is used to select between high and low speed options for greater flexibility in setting the baud rate

EXP.NO 14: COMMUNICATION BETWEEN 8051 KIT AND PC.

AIM: Interface an 8051 microcontroller trainer kit to pc and establish a communication between them through RS 232.

APPARATUS:

1. ESA 8051 Trainer kit
2. 8251 USART,
3. PC
4. Power Supply
5. Connectors.

PROCEDURE:

1. Make the power supply connections from 4-way power mate connector on the ALS-NIFC-09 board.

   - +5V ….…...blue wire
   - Ground …..black wire

2. Connect 26-pin flat cable from interface module to P1 of the trainer kit.

3. Enter the program in the RAM location in 9000 and execute the program
   GO<STARTING ADDRESS><EXEC>

PROGRAM:

ADDRESS	OPCODE	LABEL	MNEMONICS
			MOV A,#36
			MOV DPTR,#2043
			MOVX @DPTR,A
			MOV DPTR,#2040
			MOV A,#0A
			MOVX @DPTR,A
			MOV A,#00
			MOVX @DPTR,A

			MOV R1,#3000
			MOV DPTR,#0092
			MOVX @DPTR,A
			MOVX @DPTR,A
			MOVX @DPTR,A
			MOVX @DPTR,A
			CALL DELAY
			MOV A,#40
			MOVX @DPTR,A
			CALL DELAY
			MOV A,#CE
			MOVX @DPTR,A
			CALL DELAY
			MOV A,#27
			MOVX @DPTR,A
			CALL DELAY
			MOV DPTR,9000
			MOV DPTR,#0092
		UP	MOVX @DPTR,A
			CMP A,1B
			JE UP
			MOV DPTR,#0090
			MOVX @DPTR,A
			ANL A,81
			CJNE B,A.DOWN
			MOV DPTR,#0092
		UP1	MOVX @DPTR,A
			ANL A,81
			CJNE AL,81.UP1
			MOV A,B
			MOV DPTR,#0090

			MOVX @DPTR,A
			MOVX @DPTR,A
			MOV R3,9700
			MOV R3,A
			INC R3
			JMP UP
			MOVX @DPTR,A
			INC R3
			JMP UP
			INT 03
		DOWN	MOV CX,0002
		DELAY	LOOP HERE
		HERE	RET

RESULT: Thus, the 8251 USART can be used to establish communication between two processors by receiving the characters from the USART and displaying these characters on the console.

Viva:

1) What is assembler directive?

2) What do u mean by assembler?

3) What do u mean by linker?

4) What do u mean by loader?

5) What do u mean by compiler?

6) What happens when the 8086 execute the out instruction?

7) Define Memory mapped I/O.

8) What is CMA?

9) What is the function of CALL instruction?

10) Give the difference between JZ and JNZ?

11)What do you mean by emulator?

12) Stack related instruction?

13) .stack 100 means?

14) What do you mean by 20 dup (0)?

15) Which flags of 8086 are not present in 8085?

16) Give examples for 8 / 16 / 32 bit Microprocessor?

17) What is the difference between primary & secondary storage device?

18) Difference between static and dynamic RAM?

19) What is called ìScratch pad of computerî?

20) Differentiate between RAM and ROM?

21) Which processor structure is pipelined?

22) Can ROM be used as stack?

23) What is NV-RAM?

24) What are the various interrupts in 8086?

25) What is Non-Maskable interrupts?

26) What are the various segment registers in 8086?

27) Which interrupts are generally used for critical events?

28) Logic calculations are done in which type of registers?

29) What are the different functional units in 8086?

30) What does EU do?

EXERCISE:

1. Write an alp program to perform an operation to find the squares of a given number using masm software.
2. Write an alp program to perform an operation to find the squares of a given number using MP trainer kit
3. Write an alp program for multi byte addition in 8051 kit?
4. Write an alp program for multi byte subtraction in 8051 kit?
5. Write an alp program for one word addition in 8051 kit?
6. Write an alp program for one byte subtraction in 8051 kit?
7. Write an alp program for one word addition in 8051 kit?
8. Write an alp program for one word subtraction in 8051 kit?
9. Write an alp program for one byte multiplication in 8051 kit?

10. Write an alp program for one byte multiplication in 8051 kit?

11. Write an alp program to perform an operation to find the cubes of a given numbers using masm software

12. Write an alp program to perform an operation to find the cubesof a given numbers using MP trainer kit
13. Write an ALP to search a number in given string.
14. Write an ALP to search a character in the given string.
15. Write an ALP to convert binary to gray code.
16. Write an ALP to convert gray to binary code.
17. Write an ALP to find out **square root** of given number. **Num = (225) D**
18. Write an ALP to find **factorial** of given number.(N=6)
19. Write an ALP to find number of times letter 'e' exist in the given string 'exercise'.
20. Write an ALP to **LCM** of two numbers.

INDUSTRIAL APPLICATION: RS232

Microsoft deprecated support for the RS-232 compatible serial port of the original IBM PC design. Today, RS-232 has mostly been replaced in personal computers by USB for local communications. Advantages compared to RS-232 are that USB is faster, uses lower voltages, and has connectors that are simpler to connect and use. Disadvantages of USB compared to RS-232 are that USB is far less immune to EMI and that maximum cable length is much shorter (15 meters for RS-232 v.s. 3 - 5 meters for USB depending on USB speed used).

In fields such as laboratory automation or surveying, RS-232 devices may continue to be used. PLCs, VFDs, servo drives, and CNC equipment are programmable via RS-232. Some manufacturers have responded to this demand by re-introducing the DE-9M connector on their computers.

RS-232 ports are also commonly used to communicate to headless systems such as servers, where no monitor or keyboard is installed, during boot when operating system is not running yet and therefore no network connection is possible. A computer with an RS-232 serial port can communicate with the serial port of an embedded system (such as a router) as an alternative to monitoring over Ethernet.

EXP.NO.15: Interfacing LCD to 8051.

AIM: Interface an LCD with 8051 microcontroller.

APPARATUS:

1. 8051 Trainer kit
2. LCD module
3. FRC cables
4. Power Supply.

PROCEDURE:

1. Make the power supply connections from 4-way power mate connector on the ALS-NIFC-09 board.

   - +5V ……...blue wire
   - Ground …..black wire

2. Connect 26-pin flat cable from interface module to P1 of the trainer kit.

3. Enter the program in the RAM location in 9000 and execute the program

   GO<STARTING ADDRESS><EXEC>

PROGRAM:

```
CNTRL          EQU   2043H              ; 8255 control port address
PORTC          EQU   2042H              ; 8255 port C address
PORTB          EQU   2041H              ; 8255 port B address
PORTA          EQU   2040H              ; 8255 port A address
FUNCTION_SET   EQU   38H                ; display commands
DIS_ON_OFF EQU  0EH
RETURN_HOME    EQU   02H
MODE_SET   EQU  06H
CLEAR_DIS   EQU  01H
DDRAM_ADD      EQU   80H
CNT   EQU 40H
CNT1 EQU 41H
CNT2 EQU 42H
```

ADDRESS	OP CODE	LABEL	MNEMONICS
			MOV SP,#50H
			MOV PSW,#00H
			MOV CNT2,#10H
			MOV R0,#14H
			MOV R1,#FFH
			LCALL DELAY
			MOV DPTR,#CNTRL
			MOV A,#80H
			MOVX@DPTR,A
			LCALLSET_CON_LINES
		BACK	MOVR2,#03H
			LCALLSET_WR_CON_LINES
			MOV A,#00H
			MOVX@DPTR,A
			MOV DPTR,#PORTA
			MOV A,#FUNCTION_SET
			MOVX@DPTR,A MOV DPTR,#CNTRL
			MOV A,#05H
			MOVX@DPTR,A
			NOP
			NOP
			MOV A,#04H
			MOVX@DPTR,A
			MOV R0,#06H
			MOV R1,#E4H
			LCALL DELAY
			DJNZ R2,BACK
			LCALL CHK_BUSY

			LCALL SET_WR_CON_LINES
			MOV A,#00H
			MOVX @DPTR,A
			MOV DPTR,#PORTA
			MOV A,#DIS_ON_OFF
			MOVX @DPTR,A
			MOV DPTR,#CNTRL
			MOV A,#05H
			MOVX @DPTR,A
			NOP
			NOP
			MOV A,#04H
			MOVX @DPTR,A
			LCALL CHK_BUSY
			LCALL SET_WR_CON_LINES
			MOV A,#00H
			MOV DPTR,#PORTA
			MOV A,#RETURN_HOME
			MOVX @DPTR,A
			MOV DPTR,#CNTRL
			MOV A,#05H
			MOVX @DPTR,A
			NOP
			NOP
			MOV A,#04H
			MOVX @DPTR,A
			LCALL CHK_BUSY
			LCALL SET_WR_CON_LINES
			MOV A,#00H
			MOVX @DPTR,A
			MOV DPTR,#PORTA

			MOV A,#MODE_SET
			MOVX@DPTR,A
			MOV DPTR,#CNTRL
			MOV A,#05H
			MOVX@DPTR,A
			NOP
			NOP
			MOV A,#04H
			MOVX@DPTR,A
			LCALLCHK_BUSY
			LCALLSET_WR_CON_LINES
			MOV A,#00H
			MOVX@DPTR,A
			MOV DPTR,#PORTA
			MOV A,#CLEAR_DIS
			MOVX@DPTR,A
			MOV DPTR,#CNTRL
			MOV A,#05H
			MOVX@DPTR,A
			NOP
			NOP
			MOV A,#04H
			MOVX@DPTR,A
			MOV CNT1,#02H
			MOV CNT,#08H
			MOV R0,#DDRAM_ADD
			LCALL CHK_BUSY
			LCALL SET_WR_CON_LINES
			MOV A,#00H
			MOV DPTR,#PORTA
			MOV A,R0

			MOVX@DPTR,A
			MOV DPTR,#CNTRL
			MOV A,#05H
			MOVX@DPTR,A
			NOP
			NOP
			MOV A,#04H
			MOVX@DPTR,A
			CLR A
			MOV DPTR,#MSG
			MOVXA,@DPTR
	BACK3		MOV R1,A
			INCDPTR
			PUSH DPH
			PUSH DPL
			LCALL CHK_BUSY
			LCALL SET_WR_CON_LINES
			MOV A,#01H
			MOVX@DPTR,A
			MOV DPTR,#PORTA
			MOV A,R1
			MOVX@DPTR,A
			MOV DPTR,#CNTRL
			MOV A,#05H
			MOVX@DPTR,A
			NOP
			NOP
			MOV A,#04H
			MOVX@DPTR,A
			POP DPL
			POP DPH

			CLR A
			PUSH R0
			PUSH R1
			MOV R0,#7FH
			MOV R1,#FFH
			LCALL DELAY
			POP R1
			POP R0
			DJNZ CNT,BACK3
			DJNZ CNT1,F1
			DJNZ CNT2,FORW1
			LJMP FORW
			MOV CNT,#08H
	F1		PUSH DPH
			PUSH DPL
			LCALL CHK_BUSY
			LCALL SET_WR_CON_LINES
			MOV A,#00H
			MOVX@DPTR,A
			MOV DPTR,#PORTA
			MOV A,#C0H
			MOVX@DPTR,A
			MOV DPTR,#CNTRL
			MOV A,#05H
			MOVX@DPTR,A
			NOP
			NOP
			MOV A,#04H
			MOVX@DPTR,A
			POP DPL
			POP DPH

			CLR A
			LJMP BACK3
			PUSH DPH
		FORW1	PUSH DPL
			MOV R0,#DDRAM_ADD
			LCALL CHK_BUSY
			LCALLSET_WR_CON_LINES
			MOV A,#00H
			MOVX@DPTR,A
			MOV DPTR,#PORTA
			MOV A,R0
			MOVX@DPTR,A
			MOV DPTR,#CNTRL
			MOV A,#05H
			MOVX@DPTR,A
			NOP
			NOP
			MOV A,#04H
			MOVX@DPTR,A
			MOV CNT,#08H
			MOV CNT1,#02H
			POP DPL
			POP DPH
			CLR A
			LJMP BACK3
		FORW	:LCALL 0003H
		SET_CON_LINES:	MOV DPTR,#CNTRL
			MOV A,#01H
			MOVX@DPTR,A
			MOV A,#03H
			MOVX@DPTR,A

			MOV A,#04H
			MOVX@DPTR,A
			RET
		CHK_BUSY:	MOV DPTR,#CNTRL
			MOV A,#90H
			MOVX@DPTR,A
			MOV A,#04H
			MOVX@DPTR,A
			MOV A,#00H
			MOVX@DPTR,A
			MOV A,#03H
			MOVX@DPTR,A
		BACK2	MOVA,#05H
			MOVX@DPTR,A
			MOV DPTR,#PORTA
			MOVXA,@DPTR
			MOV B,A
			MOV DPTR,#CNTRL
			MOV A,#04H
			MOVX@DPTR,A
			MOV A,B
			JNB A.7,F2
			LJMP BACK2
		F2	MOV DPTR,#CNTRL
			MOV A,#80H
			MOVX@DPTR,A
			RET
		SET_WR_CON_LINES:	MOVDPTR,#CNTRL
			MOV A,#04H
			MOVX@DPTR,A
			MOV A,#02H

			MOVX@DPTR,A
		DELAY:	RET
		LOOP1:	PUSHR1
		LOOP:	NOP
			DJNZ R1,LOOP
			POP R1
			DJNZ R0,LOOP1
			RET

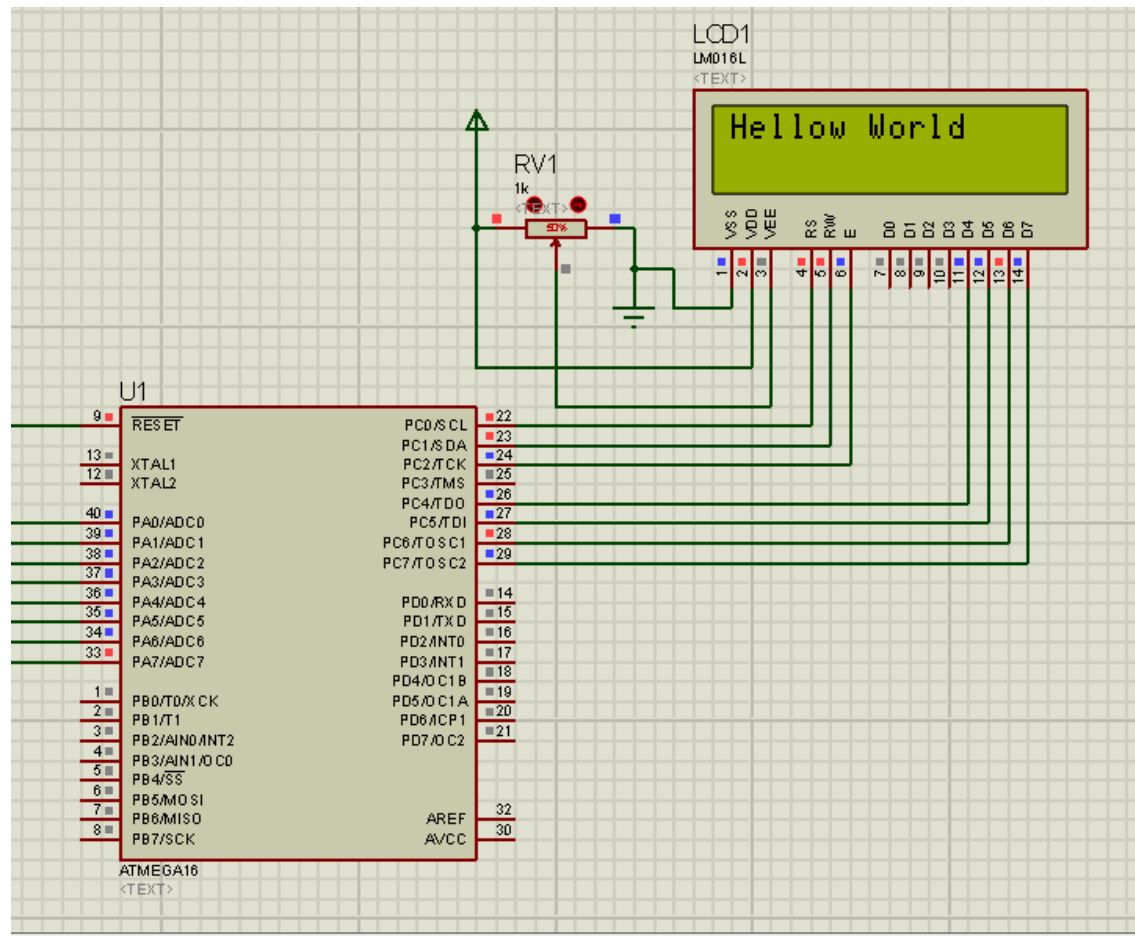**RESULT:**program for interfacing an LCD with 8051 microcontroller performed.

Viva:

1) What do you mean by emulator?

2) Stack related instruction?

3) .stack 100 means?

4) What do you mean by 20 dup (0)?

5) Which flags of 8086 are not present in 8085?

6) Define ASCII code.

7) What is STA in data transfer instruction?

8) What is an IN instruction?

9) What is an OUT instruction?

10) Give the difference between JC and JNC?

11) What is the size of flag register?

12) Can you perform 32 bit operation with 8086? How?

13) Whether 8086 is compatible with Pentium processor?

14) What is 8087? How it is different from 8086?

15) While accepting no. from user why u need to subtract 30 from that?

16) What is range for these numbers?

17) What are ASCII codes for nos. 0 to F?

18) How does U differentiate between positive and negative numbers?

19) Which no. representation system you have used?

20) While displaying no. from user why u need to add 30 to that?

21) What is stack?

22) Which processor structure is pipelined?

23) What is a compiler?

24) What is called .Scratch pad of computer?

25) What is cache memory?

26) Difference between static and dynamic RAM?

27) What is meant by LATCH?

28) Is the data bus is Bi directional?

29) Define HCMOS?

30) Give examples for 8 / 16 / 32 bit Microprocessor?

EXERCISE:

1. Write an alp program to perform an operation to find the cubes of a given number using masm software
2. Write an alp program to perform an operation to find the cubes of a given numbers using MP trainer kit
3. Write an alp program to find out how many multiples of given number in a given array?
4. Write an alp program to find how many divisible numbers by given number in a given array?
5. Write alp program for 8 bit signed addition in 8051 kit?
6. Write alp program for 8 bit signed subtraction in 8051 kit?
7. Write alp program for 8 bit signed multiplication in 8051 kit?
8. Write alp program for 8 bit signed division in 8051 kit?
9. Write alp program for 8 bit unsigned addition in 8051 kit?
10. Write alp program for 8 bit unsigned subtraction in 8051 kit?
11. Write an alp program for addition of multi byte numbers
12. Write an alp program for multiplication of given number in location mode
    A)0060
    B)0002
13. Write an alp program to divide 32 bit by the 16 bit.
14. Write an alp program for median of an array

INDUSTRIAL APPLICATIONS:

Interfacing is one of the important concepts in microcontroller 8051 because the microcontroller is a CPU that can perform some operation on a data and gives the output. However to perform the operation we need an input device to enter the data and in turn output device displays the results of the operation. Here we are using keyboard and LCD display as input and output devices along with the microcontroller.

Interfacing is the process of connecting devices together so that they can exchange the information and that proves to be easier to write the programs. There are different type of input and output devices as for our requirement such as LEDs, LCDs, 7segment, keypad, motors and other devices.

EXP.NO.16: Interfacing Matrix/Keyboard to 8051.

AIM: Interface a Keyboardto8051 microcontroller.

APPARATUS:8051 Trainer kit, keyboard module, FRC cables, &Power Supply.

PROCEDURE:

1. Make the power supply connections from 4-way power mate connector on the ALS-NIFC-09 board.

   - +5V ……...blue wire

   - Ground …..black wire

2. Connect 26-pin flat cable from interface module to P1 of the trainer kit.

3. Enter the program in the RAM location in 9000 and execute the program

   GO<STARTING ADDRESS><EXEC>

PROGRAM:

```
        CNTRL      EQU   2043H          ;CONTROL PORT ADDRESS OF  8255
PORTA       EQU   2040H          ;PORTA ADDRESS OF 8255
     PORTB      EQU   2041H          ;PORTB ADDRESS OF 8255
     PORTC      EQU   2042H          ;PORTC ADDRESS OF 8255
```

ADDRESS	OPCODE	LABEL	MNEMONICS
			MOV A,#90H
			MOV DPTR,#CNTRL
			MOVX @DPTR,A
			MOV B,#20H
		BLINK2	MOV DPTR,#PORTB
			MOV A,#FFH
			MOVX@DPTR,A
			MOV DPTR,#PORTC
			MOV A,#00H
			MOVX@DPTR,A
			MOV A,#F0H
			MOVX@DPTR,A

			DJNZ B,BLNK2
		BACK	MOV A,#FEH
			MOV B,#21H
		BLINK1	MOV DPTR,#PORTB
			MOVX@DPTR,A
			MOV DPTR,#PORTC
			MOV A,#00H
			MOVX@DPTR,A
			MOV A,#F0H
			MOVX@DPTR,A
			LCALL DELAY
			RL A
			DJNZ B,BLNK1
			SJMP BACK
		DELAY:	MOV R0,#F7H
		OLOOP:	MOV R1,#FFH
		ILOOP:	DJNZ R1,ILOOP
			DJNZ R0,OLOOP
			RET

RESULT: program for interfacing a keyboard to 8051 microcontroller performed.

Viva:

1) What is the size of flag register?
2) Can you perform 32 bit operation with 8086? How?
3) Whether 8086 is compatible with Pentium processor?
4) What is 8087? How it is different from 8086?
5) While accepting no. from user why u need to subtract 30 from that?
6)Define instruction cycle
7) What is an instruction set?
8) Give the functional categories of 8086 microprocessor instructions of data transfer operations?
9) Define Op-code and operand
10) Define the types of branching operations.
10) Define the types of branching operations?
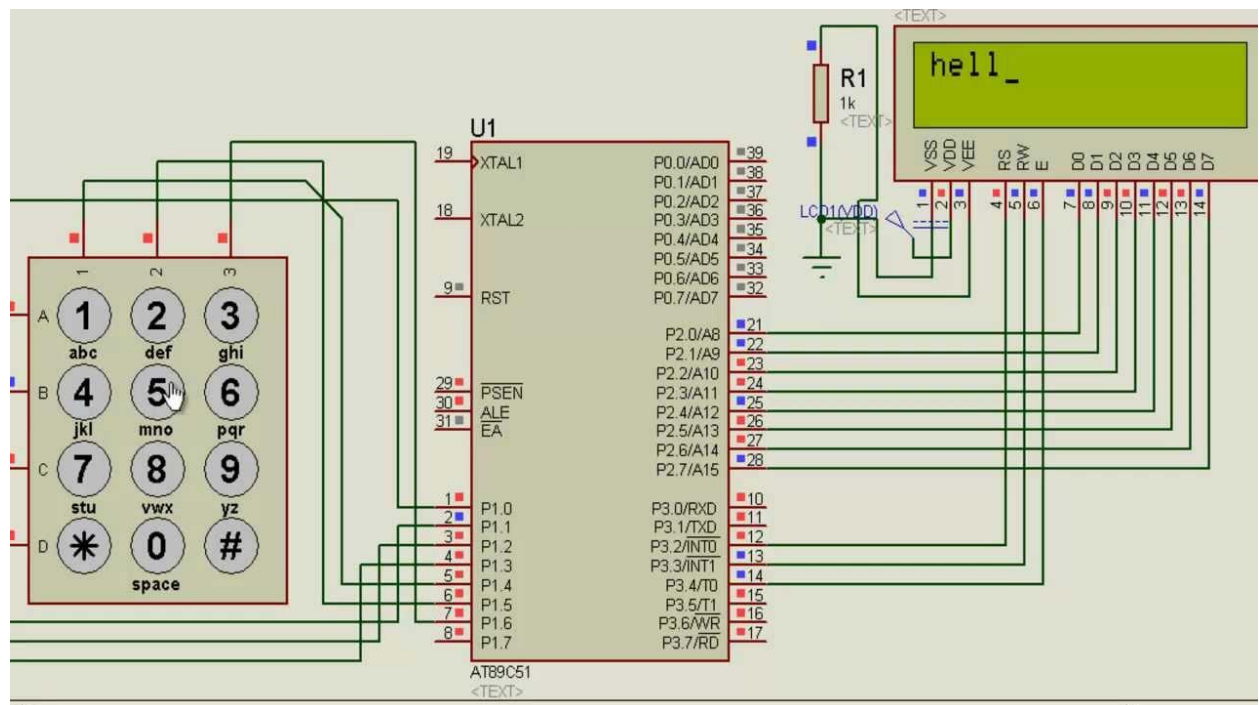11) Explain the function of CPU in Microprocessor Define Compiler?

12) Define Intrepreter?

13) What is Assembly level language?

14) Define Assembler?

15) What is Microprocessor?

16) What is Logical Address:?

17) What is The Effective Address:

18) What is Physical Address?

19) What are the flags in 8086?

20) What is Tri-state logic?

21) Why crystal is a preferred clock source?

22) What happens when HLT instruction is executed in processor?

23) What are the different functional units in 8086?

24) What is the position of the Stack Pointer after the PUSH instruction?

25) What is the position of the Stack Pointer after the POP instruction?

26) Bring out the differences between 8086 and 8088?

27) What is meant by ìbootstrap loader?

28) Give practical applications where macro can be used?

29) Briefly describe how ìdirectî and ìindirectî Jumps take place in 8086?

30) Discuss the syntax of macro

EXERCISE:

1. Write an alp program for division of 32 bit number by 16 bit number.
2. Write an alp program for multiplication of given number in location mode
3. Write an alp for moving a string from one location to another location?
4. Write an alp for reversing the given string with the length of the string is 12?
5. Write an alp for arranging given a string in alphabetical order?
6. Write alp program for 16 bit signed addition in 8051 kit?
7. Write alp program for 16 bit signed subtraction in 8051 kit?
8. Write alp program for 16 bit signed multiplication in 8051 kit?
9. Write alp program for 16 bit signed division in 8051 kit?
10. Write alp program for 16 bit unsigned addition in 8051 kit?

11. What are the internal devices of 8255 ?

Industrial Applications:

Interfacing is one of the important concepts in microcontroller 8051 because the microcontroller is a CPU that can perform some operation on a data and gives the output. However to perform the operation we need an input device to enter the data and in turn output device displays the results of the operation. Here we are using keyboard and LCD display as input and output devices along with the microcontroller.

Interfacing is the process of connecting devices together so that they can exchange the information and that proves to be easier to write the programs. There are different type of input and output devices as for our requirement such as LEDs, LCDs, 7segment, keypad, motors and other devices.

EXP.NO.17: Data Transfer from Peripheral to Memory through DMA controller 8237/8257.

AIM: Write a alp program for data transfer from peripheral to memory through DMA controller 8257.

APPARATUS:

     1. 8086Trainer kit

     2. 8257 module

     3. FRC cables

     4. Power Supply.

PROGRAM:

         DMAL = 00

         DMAH = 50

         TCL = FF

         TCH = 47

ADDRESS	OP CODE	LABEL	MNEMONICS
			MOV AX,DMAL
			OUT 80,AX
			MOV AX,DMAH
			OUT 80,AX
			MOV AL,TCL
			OUT 81,AL
			MOV AL,TCH
			OUT 81,AL
			MOV AL,41
			OUT 88,AL
			INT 3

RESULT: Program for transfer from Peripheral to Memory through DMA controller 8257 performed

Viva:

1) While displaying no. from user why u need to add 30 to that?
2) What are ASCII codes for nos. 0 to F?
3) How does U differentiate between positive and negative numbers?
4) What is range for these numbers?
5) Which no. representation system you have used?
6)Why does the data bus bi-directional?
7) Define control bus.
8) What is a flag?
9) Define memory word
10) Explain the function of ALE and IO/M signals in the 8086 architecture
11) What is Clock Speed ?
12) What are the features of Intel 8086 ?
13) How many bit 8086 microprocessor is?
14) What is the size of data bus of 8086?
15) What is the size of address bus of 8086?
16) What is the max memory addressing capacity of 8086?
17) Which are the basic parts of 8086?
18) Describe about LOOP instructions?
19) Describe about MUL, IMUL, DIV, IDIV instructions?
20) What are addressing modes?
21) What is an instruction?
22) What are the advantages of overlapping segments?
23) Define effective address?
24) What is stack pointer?
25) What is the function of the accumulator
26) Give the features of 8086 microprocessor
27) Why is the data bus bidirectional
28) What is a register
29) What is nibble, byte and word
30)Define address bus, data bus and control bus

EXERCISE:

1. Write an alp program to divide 32 bit by the 16 bit.
2. Write an alp program for median of an array and array length is 15.
3. Write an ALP to convert binary to gray code.
4. Write an ALP to convert gray to binary code.
5. Write an ALP to find out **square root** of given number. **Num = (225) D**
6. Write an ALP to find **factorial** of given number.(N=6)
7. Write an ALP to find number of times letter 'e' exist in the given string 'exercise'.
8. Write an ALP to **LCM** of two numbers.
9. Write an ALP to **HCF** of two numbers.
10. Write an ALP to find number of times letter 'i' exist in the given string 'exercise'

11.

Industrial Applications:

1.Laptop Systems

These interview questions test the knowledge of x86 Intel architecture and 8086 microprocessor specifically.

1. What is a Microprocessor? - Microprocessor is a program-controlled device, which fetches the instructions from memory, decodes and executes the instructions. Most Micro Processor are single- chip devices.

2. Give examples for 8 / 16 / 32 bit Microprocessor? - 8-bit Processor - 8085 / Z80 / 6800; 16-bit Processor - 8086 / 68000 / Z8000; 32-bit Processor - 80386 / 80486.

3. Why 8085 processor is called an 8 bit processor? - Because 8085 processor has 8 bit ALU (Arithmetic Logic Review). Similarly 8086 processor has 16 bit ALU.

4. What is 1st / 2nd / 3rd / 4th generation processor? - The processor made of PMOS / NMOS / HMOS / HCMOS technology is called 1st / 2nd / 3rd / 4th generation processor, and it is made up of 4 / 8 / 16 / 32 bits.

5. Define HCMOS? - High-density n- type Complementary Metal Oxide Silicon field effect transistor.

6. What does microprocessor speed depend on? - The processing speed depends on DATA BUS WIDTH.

7. Is the address bus unidirectional? - The address bus is unidirectional because the address information is always given by the Micro Processor to address a memory location of an input / output devices.

8. Is the data bus is Bi-directional? - The data bus is Bi-directional because the same bus is used for transfer of data between Micro Processor and memory or input / output devices in both the direction.

9. What is the disadvantage of microprocessor? - It has limitations on the size of data. Most Microprocessor does not support floating-point operations.

10. What is the difference between microprocessor and microcontroller? - In Microprocessor more op-codes, few bit handling instructions. But in Microcontroller: fewer op-codes, more bit handling Instructions, and also it is defined as a device that includes micro processor, memory, & input / output signal lines on a single chip.

11. What is meant by LATCH? - Latch is a D- type flip-flop used as a temporary storage device controlled by a timing signal, which can store 0 or 1. The primary function of a Latch is data storage. It is used in output devices such as LED, to hold the data for display.

12. Why does microprocessor contain ROM chips? - Microprocessor contain ROM chip because it contain instructions to execute data.

13. What is the difference between primary & secondary storage device? - In primary storage device the storage capacity is limited. It has a volatile memory. In secondary storage device the storage capacity is larger. It is a nonvolatile memory. Primary devices are: RAM / ROM. Secondary devices are: Floppy disc / Hard disk.

14. Difference between static and dynamic RAM? - Static RAM: No refreshing, 6 to 8 MOS transistors are required to form one memory cell, Information stored as voltage level in a flip flop. Dynamic RAM: Refreshed periodically, 3 to 4 transistors are required to form one memory cell; Information is stored as a charge in the gate to substrate capacitance.

15. What is interrupt? - Interrupt is a signal send by external device to the processor so as to request the processor to perform a particular work.

16. What is cache memory? - Cache memory is a small high-speed memory. It is used for temporary storage of data & information between the main memory and the CPU (center processing unit). The cache memory is only in RAM.

17. What is called .Scratch pad of computer? - Cache Memory is scratch pad of computer.

18. Which transistor is used in each cell of EPROM? - Floating .gate Avalanche Injection MOS (FAMOS) transistor is used in each cell of EPROM.

19. Differentiate between RAM and ROM? - RAM: Read / Write memory, High Speed, Volatile Memory. ROM: Read only memory, Low Speed, Non Volatile Memory.

20. What is a compiler? - Compiler is used to translate the high-level language program into machine code at a time. It doesn't require special instruction to store in a memory, it stores automatically. The Execution time is less compared to Interpreter.

21. Which processor structure is pipelined? - All x86 processors have pipelined structure.

22. What is flag? - Flag is a flip-flop used to store the information about the status of a processor and the status of the instruction executed most recently

23. What is stack? - Stack is a portion of RAM used for saving the content of Program Counter and general purpose registers.

24. Can ROM be used as stack? - ROM cannot be used as stack because it is not possible to write to ROM.

25. What is NV-RAM? - Nonvolatile Read Write Memory also called Flash memory. It is also known as shadow RAM.