MICROPROCESSORS & MICROCONTROLLERS

LAB MANUAL

Academic Year	**:**	**2019 - 2020**
Course Code	**:**	**AEC108**
Regulations	**:**	**IARE - R16**
Class	**:**	**VI Semester (ECE)**

Prepared By

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INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal – 500 043, Hyderabad

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LAB WORK BOOK

Name of the Student			
Roll No.			
Branch			
Class		**Section**	

INSTITUTE OF AERONAUTICAL ENGINEERING

(Auotonomous)
Dundigal - 500 043, Hyderabad

Vision

To bring forth professionally competent and socially sensitive engineers, capable of working across cultures meeting the global standards ethically.

Mission

To provide students with an extensive and exceptional education that prepares them to excel in their profession, guided by dynamic intellectual community and be able to face the technically complex world with creative leadership qualities.

Further, be instrumental in emanating new knowledge through innovative research that emboldens entrepreneurship and economic development for the benefit of wide spread community.

Quality Policy

Our policy is to nurture and build diligent and dedicated community of engineers providing a professional and unprejudiced environment, thus justifying the purpose of teaching and satisfying the stake holders.

A team of well qualified and experienced professionals ensure quality education with its practical application in all areas of the Institute.

Philosophy

The essence of learning lies in pursuing the truth that liberates one from the darkness of ignorance and Institute of Aeronautical Engineering firmly believes that education is for liberation.

Contained therein is the notion that engineering education includes all fields of science that plays a pivotal role in the development of world-wide community contributing to the progress of civilization. This institute, adhering to the above understanding, is committed to the development of science and technology in congruence with the natural environs. It lays great emphasis on intensive research and education that blends professional skills and high moral standards with a sense of individuality and humanity.

We thus promote ties with local communities and encourage transnational interactions in order to be socially accountable. This accelerates the process of transfiguring the students into complete human beings making the learning process relevant to life, instilling in them a sense of courtesy and responsibility.

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Certificate

*This is to Certify that it is a bonafied record of Practical work done by Sri/Kum.*_____*bearing the Roll No.* _____ *of*_____*class*

_____ *Branch in the*

_____ *laboratory during the Academic year*_____*under our supervision.*

Head of the Department **Lecture In-Charge**

External Examiner **Internal Examiner**

COURSE OBJECTIVE:

1. The objective of this lab is to teach students various developing of assembly level programs and providing the basics of the microprocessors
2. Provide solid foundation on interfacing the external devices to the processor according to the user requirements to create novel products and solutions for the real time problems
3. Assist the students with an academic environment aware of excellence guidelines and lifelong learning needed for a successful professional carrier
4. Understand various interfacing circuits necessary for various application

COURSE OUTCOMES:

Upon the completion of Microprocessor & Microcontrollers practical course, the student will be able to:

CO1 : Familiarize with the assembly level programming

CO2 : Design circuits for various applications using microcontrollers

CO3 : An in-depth knowledge of applying the concepts on real- time applications

CO4 : Design and apply interfacing circuits for different applications

CO5 : Understand the basic concepts of 8051 microcontroller with their application

COURSE LEARNING OUTCOMES:

The students should enable to:

1. Design and develop an Assembly language program using 8086 microprocessor.
2. Understand the 16 Bit arithmetic and logical operations using WIN862 software.
3. Understand the program to perform multi byte addition, subtraction and3*3 matrix multiplications.
4. Understand the to perform ascending and descending order using 8086
5. Understand the programming concepts on strings
6. Understand the programming for Code converters.
7. Design and interacting stepper motor to 8086.

8. Analyze and interfacing to convert analog to digital.
9. Design and interface Matrix keyboard to 8086.
10. Interface tone generator using 8086Design and interface keyboard to 8051.
11. Interface traffic light controller to 8086
12. Understand the basic programs using 8051
13. Understand the program to verify timer/counter using 8051
14. Design and interface keyboard to 8051.

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ELECTRONICS AND COMMUNICATION ENGINEERING

INSTRUCTIONS TO THE STUDENTS

1. Students are required to attend all labs.

2. Students should work individually in the hardware and software laboratories.

3. Students have to bring the lab manual cum observation book, record etc along with them whenever they come for lab work.

4. Should take only the lab manual, calculator (if needed) and a pen or pencil to the work area.

5. Should learn the prelab questions. Read through the lab experiment to familiarize themselves with the components and assembly sequence.

6. Should utilize 3 hour‟s time properly to perform the experiment and to record the readings. Do the calculations, draw the graphs and take signature from the instructor.

7. If the experiment is not completed in the stipulated time, the pending work has to be carried out in the leisure hours or extended hours.

8. Should submit the completed record book according to the deadlines set up by the instructor.

9. For practical subjects there shall be a continuous evaluation during the semester for 25 sessional marks and 50 end examination marks.

10. Out of 25 internal marks, 15 marks shall be awarded for day-to-day work and 10 marks to be awarded by conducting an internal laboratory test.

Program Outcomes	
PO1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2	**Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3	**Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO4	**Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO6	**The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO7	**Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO8	**Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9	**Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary Settings.
PO10	**Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11	**Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one‟s own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12	**Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.
Program Specific Outcomes	
PSO 1	**Professional Skills:** An ability to understand the basic concepts in Electronics & Communication Engineering and to apply them to various areas, like Electronics, Communications, Signal processing, VLSI, Embedded systems etc., in the design and implementation of complex systems.
PSO 2	**Problem-Solving Skills:** An ability to solve complex Electronics and communication Engineering problems, using latest hardware and software tools, along with analytical skills to arrive cost effective and appropriate solutions.
PSO 3	**Successful Career and Entrepreneurship**: An understanding of social-awareness & environmental-wisdom along with ethical responsibility to have a successful career and to sustain passion and zeal for real-world applications using optimal resources as an Entrepreneur.

LAB SYLLABUS

Recommended Systems/Software /Hardware Requirements:
Pentium based desktop PC with minimum of 166 MHZ or faster processor with at least 64 MB RAM and 100MB free disk space. MASM software

The Following experiments are to be written for assembler and execute the same with8086 and 8051 hardware kits.

ATTAINMENT OF PROGRAM OUTCOMES & PROGRAM SPECIFIC OUTCOMES			
Exp. No.	**Experiment**	**Program Outcomes Attained**	**Program Specific Outcomes Attained**
1	Design and develop an Assembly language program using 8086 microprocessor and to show the following aspects. a. Programming b. Execution c. Debugging To Demonstrate the Tool Chain for MASM and Hardware for 8086 Microprocessor	PO1, PO2	PSO1
2	Write an ALP program to perform 16 Bit arithmetic and logical operations using WIN862 software	PO1, PO2	PSO1
3	a. Write an ALP program to perform multi byte addition and subtraction b. Write an ALP program to perform 3*3 matrix multiplication and addition	PO1, PO2	PSO1, PSO2
4	a. Write an ALP program to perform ascending order using 8086 b. Write an ALP program to perform descending order using 8086	PO1, PO2	PSO1
5	a. write an ALP program to insert or delete a byte in the given string b. Write an ALP program to search a number/character in a given string c. Write an ALP program to move a block of data from one memory location to the other d. Write an ALP program for reverse of a given string	PO1, PO2, PO5	PSO1, PSO2
6	a. Write an ALP program to convert packed BCD to Unpacked BCD b. Write an ALP program to convert packed BCD to ASCII c. Write an ALP program to convert hexadecimal to ASCII	PO1, PO2, PO5	PSO1
7	a. Write an ALP program to rotate stepper motor in clockwise direction b. Write an ALP program to rotate stepper motor in anti clockwise direction	PO1, PO2	PSO1
8	a. Write an ALP program to convert analog to digital using 8086 b. Write an ALP program to convert digital to analog using 8086	PO1, PO2	PSO1
9	Write an ALP program to interfacing keyboard to 8086	PO1, PO2, PO5	PSO1

ATTAINMENT OF PROGRAM OUTCOMES & PROGRAM SPECIFIC OUTCOMES			
Exp. No.	**Experiment**	**Program Outcomes Attained**	**Program Specific Outcomes Attained**
10	a. Parallel communication between two microprocessors using 8255. b. Serial communication between two microprocessor kits using 8251	PO1, PO2, PO5	PSO1, PSO2
11	a. Write an ALP program to interface traffic light controller b. Write an ALP program to interface tone generator	PO1, PO2, PO4, PO5	PSO2
12	Write an ALP program to perform 16 Bit arithmetic and logical operations by using 8051 microcontroller.	PO1, PO2, PO5	PSO2
13	Write an ALP program and verify timer/counter using 8051	PO1, PO2, PO5	PSO2
14	Write an ALP program to interface keyboard to 8051	PO1, PO2, PO5	PSO2

EXPERIMENT NO: 1

DESIGN A PROGRAM USING WIN862

INTRODUCTION:

Features of the ESA -86/88 Microprocessor Trainer

- 8086 CPU operating at 8 MHz MAX mode.
- Provision for on-board 8087 (NDP) coprocessor.
- Provision for 256 KB of EPROM & 128 KB of RAM onboard
- Battery backup facility for RAM.
- 48 programmable I/O lines using two 8255‟s
- Timer1 & Timer2 signals are brought out to header pins
- Priority Interrupt Controller (PIC) for eight input using 8259A
- In standalone mode using on board keypad or with PC compatible system through its RS-232 interface
- Display is 8 seven segment LED
- 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 8 MHz in MAX mode.

MEMORY: Total 1MB of memory is in the Kit provided.

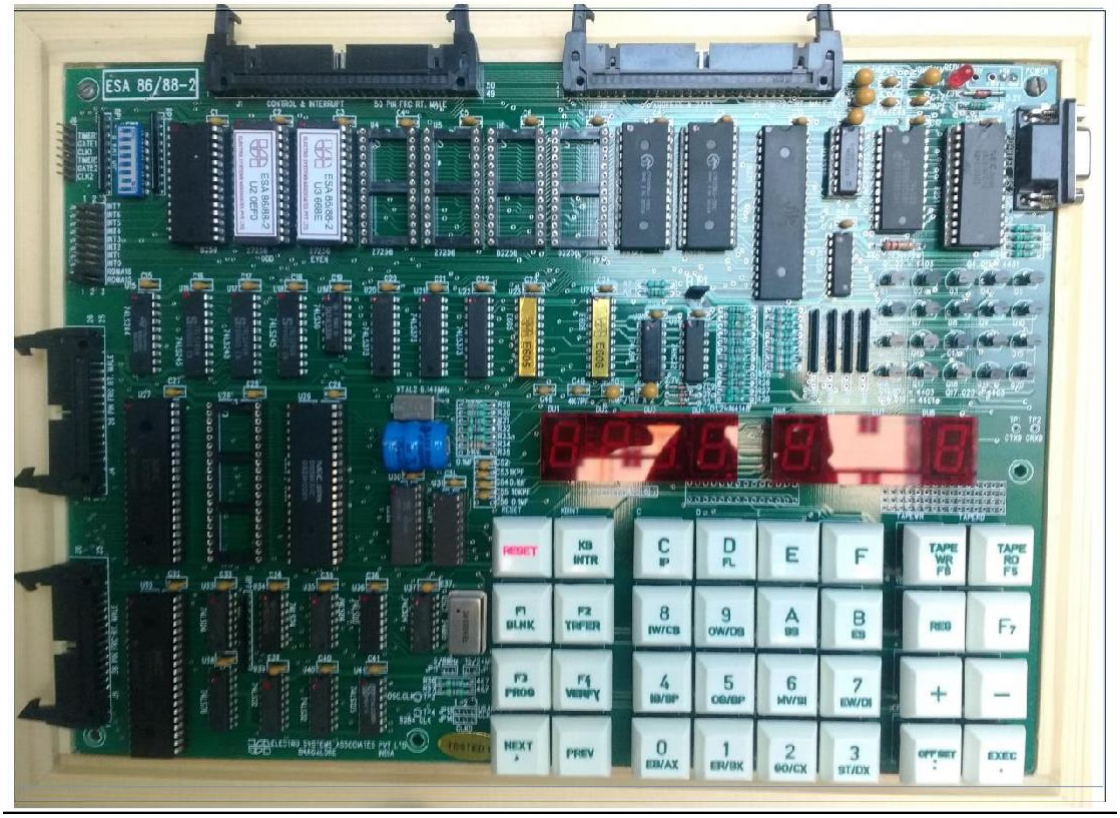
EPROM: 4 JEDEC compatible sockets for EPROM

RAM: 4 JEDEC compatible sockets for RAM

PARALLEL I/O: 48 I/O lines using two 8255

SERIAL I/O: One RS-232C compatible interface Using UART 8251A

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



PIC: Programmable Interrupt controller using 8253A provides interrupts Vectors for 8 jumpers‟ selectable Internal /External sources.

KEYBOARD / DISPLAY:

Keyboard: keyboard on to the trainer.

Display:8 seven segment displays

INTERRUPTS:

NIM: Provision for connecting NMI to a key switch

INTR: Programmable Interrupt controller using 8259A provides Interrupt vectors for 8 jumpers 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 Assemble and disassemble commands.

COMPUTER INTERFACE:

This can be interfaced to host computer System through the main serial port, alsoFacilitates uploading, downloading of Intel Hex files between computer and the trainer.

I/O decoding:

IC U30 is used for on card I/O decoding. The following table gives the list of on card I/O devices and their address map.

I/O device	I/O address	I/O register	usage
8255 I (U14)	FFCO	PORT A	AVAILABLE TO USER
	FFC2	PORT B	
	FFC4	PORT C	
	FFC6	CONTROL PORT	
8255 II (U15)	FFC1	PORT A	AVAILABLE TO USER
	FFC3	PORT B	
	FFC5	PORT C	
	FFC7	CONTROL PORT	
8253 A(U28)	FFC9	TIMER 0	AVAILABLE TO USER
	FFCB	TIMER 1	USED FOR BAUD RATE
	FFCD	TIMER 2	AVAILABLE TO USER
	FFCF	CONTROL	AVAILABLE TO USER
8251A (U13)	FFD0	DATA COMMAND PORT STATUS	
	FFD2		
INPUT PORT TO DIP SWITCH (SW1)		USED AS I/P PORT TO READ SW1 AND CONFIGURE 86ME	
8259A (U12)	FFD8 TO FFDE	PRIORITY INTERRUPT CONTROLLER	

POWER REQUIREMENTS:

+5V DC with 1300 mA current rating (Max).

OPERATING CONFIGURATION:

Two different modes of operation trainer are possible. They are

(i) Serial operation

(ii) Keypad 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.

EXECUTION PROCEDURE FOR 8086 (for registers):

i) Writing a alp PROGRAM into processor:

Switch On Power Supply

Check if DIP switches board is in serial or keyboard mode (Serial mode = 1 on, Board mode = 4 On)

Press Reset

Press „EB"(Examine Byte)

Enter Starting Memory location (Ex: 2000)

Press next button, Enter OP-Code value

Then press next button Enter 2nd memory location and op code

.
.
.

Enter up to nth values

Execution:

Press Exec. Button

Press Go enter starting memory location

Press Exec.

Press ER (Examine Register)

Press AX (Now see the result in Ax)

EXECUTION PROCEDURE FOR 8086 (for memory locations):

ii) Writing a alp PROGRAM into processor:

Switch On Power Supply

Check if DIP switches board is in serial or keyboard mode (Serial mode = 1 on, Board mode = 4

On)

Press Reset

Press „EB" (Examine Byte)

Enter Starting Memory location (Ex: 2000)

Press next button, Enter OP-Code value

Then press next button Enter 2nd memory location and op code

.
.
.

Enter up to nth values

Execution:

Press Exec. Button

Press Go enter starting memory location

Press Exec.

Press EB give input memory location and input values

Press Exec.

Press Go Give starting memory location

Press Exec.

Press Go Now observe the results in memory location

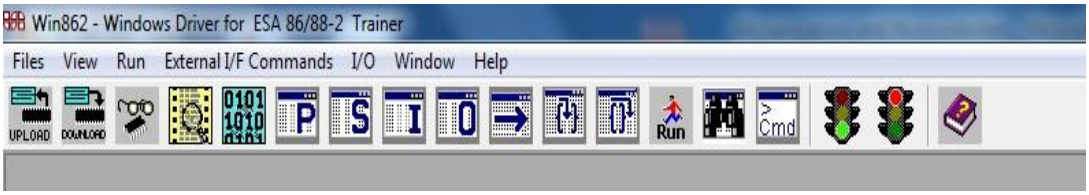
WIN862 Software procedure:

Registers:

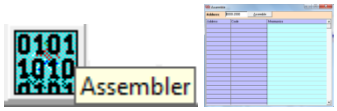
Step 1: Open Win862 icon on desktop (see Fig.1) and opened Window see

fig. 2 1. 

2.



Step 2: Click on Assembler and give starting address (Like 0000:4000) then press Enter button.

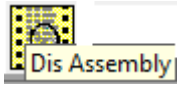


Step 3: Then write 1st Instruction then press enter button.

Step 4: Then write 2nd Instruction then press enter button.

Step 5: Then write up to nth Instruction then press enter button and close the Assembler window.

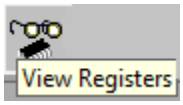
Step 6: Now click on Dis Assembler and give starting address (Like 0000:4000) then press enter button.



Step 7: Click on Set PC then give starting address then press Enter button.

Step 8: Click on Run (check whether program is executed or not)

Step 9: Click on view registers and observe the results in registers.



Memory locations:

Step 1: Open Win862 icon on desktop.

Step 2: Click on Assembler and give starting address (Like 0000:4000) then press Enter button.

Step 3: Then write 1st Instruction then press enter button.

Step 4: Then write 2nd Instruction then press enter button.

Step 5: Then write up to nth Instruction then press enter button and close the Assembler window.

Step 6: Now click on Dis Assembler and give starting address (Like 0000:4000) then press enter button.

Step 7: Click on Set PC then give starting address then press Enter button.

Step 8: Click on Run (check whether program is executed or not)

Step 9: Click on view memory

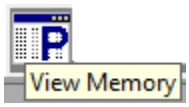
Step 10: Now enter input address

Step 11: Click on Modify and Give desired input values

Step 12: Click on Set PC. Enter initial address and press Dis-Assembler

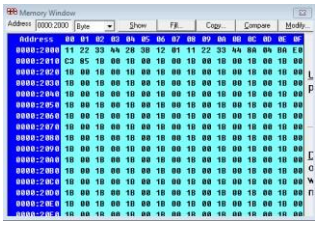
Step 13: Click on Run (check whether program is executed or not)

Step 14: Now observe the result in view memory.



Step 15: Click on view memory and enter destination address then press enter button

Step 16: Now observe the result.



INTRODUCTION OF ALS SDA 8051-MEL:

The Intel‟s family of 8bit single chip microcontroller has become very popular because of their unique and powerful instruction set, architecture and over all philosophy. The 8051 family has three members: 8031,8051 and 8751.the 8031 have no on-chip program memory execution is from external program memory. The 8051 has 4k bytes of factory masked ROM and has the 8751 has 4k bytes of EPROM.

The SDA 51-MEL is a System Design Aid for learning the operation of these Microcontroller devices. It uses 8031/51 as the controller. It is designed to assist students and engineers in learning about the architecture and programming of 8031/51 and designing around this Microcontroller.

The address and data bus controllers separate the 8051 microcontroller multiplexed address/data bus, creating a 16 bit address bus and 8bit data bus.

The monitor program for the SDA 51-MEL is contained in 32kbytes EPROM. The monitor interacts with the user through a CRT terminal host computer system connected through serial I/O interface or through the PC Keyboard (AT) and 16X2 LCD display.

SPECIFICTIONS

CPU: 8051 operating at 11.0592MHZ

MEMORY: **EPROM1**-one JEDEC compatible 28 pin socket to provide up to 32Kbytememory using 27256 with monitor software.

EPROM2-optional-canbe used as program memory, if ram is configured as data only.

RAM1-one JEDEC compatible 28 pin socket to provide up to 32Kbytes of Data memory using 62256.

RAM2-one JEDEC compatible 28 pin socket to provide up to 32Kbytes Program/data or data memory.

I/O PARALLEL: 48 I/O lines using two 8255, terminated in two 26 headers.

I/O SERAL: One RS232 compatible interface, using one chip UART lines. The lines Are terminated in a 9-pin D-type female connector.onchip UART lines are also terminated in a 10 pin FRC connector.

TIMER: Three 16 bit counter/timer using 8253programmable timers terminated in a 20pin berg stick.

KEYBOARD: EXTERNAL PC –AT keyboard

DISPLAY: Alpha numeric LCD module (2linex 16 CHARS)

BUS SIGNALS: All address data and control signals areterminated in a 50 pin header Connector for user expansion. Controller specific lines like port lines T0,T1, INT1 etc are terminated in this connector.

MONITOR SOFTWARE: 32Kbytes of user of user friendly monitor software (27256) that allows Program enter, verification, debugging and execution from the system keyboard or a CRT Terminal or a PC functioning as a terminal. File uploading/downloading option is in serial mode

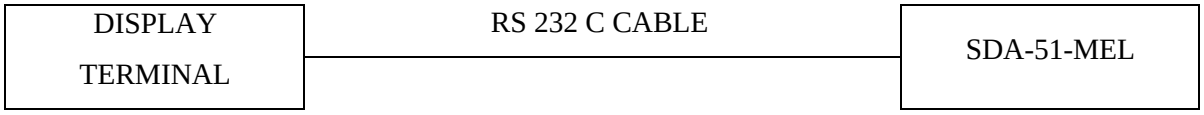
THE EXTERNAL PC: AT keyboard allows users to directly assemble /disassemble mnemonics/instructions for 8051 using the alphanumeric LCD display

OPERATING CONFIGURATION

Two different modes of Operation SDA -51MEL are possible. They are

- **serial operation**

This configuration requires an RS232 compatible terminal as the display and command entry device.



A computer system is interfaced to SDA51-MEL, a driver program must be resident in the computer system. Driver program (b30drv for DOS,TALK setup for windows) for interfacing SDA-51 MEL to a PC has been developed by ALS and is available to the user as an optional accessory.

Keyboard Operation

This mode of operation is achieved through on board KEYBOARD/DISPLAY. In this mode,SDA-51 MEL interacts with the user through an PC/AT Keyboard and a 16x2 alphanumeric LCD display. This eliminates the need for a terminal / host computer and offers a convenient way for using the SDA-51 MEL as a “STAND –ALONE” system.

SERIAL MODE:

SERIAL COMMUNICATION AND SERIAL UTILITIES

OPERATING INSTRUCTIONS

To invoke this mode press < RES> and then the < ESLR> key on the KEYBOARD to transfer control to the CRT terminal/HOST computer the prompt "SERIAL MODE" will be appears on LCD DISPLAY > ALS 8051/31 MONITER V1.0 is displayed on the terminal to indicate that the system interrogation mode and ready to accept the command. All command that be entered through interrogation modes.

SYSTEM MONITER

The SDA-51-MEL operation is controlled by monitor program stored in 32kbytes of EPROM (U5, 27256), located at SDA-51 MEL memory map (0000-7FFF).The system executes the monitor program when ever power is turn ON or when RESET is pressed.

In serial mode, the monitor program allows the user to perform following operations,

- Communicate with the SDA-51-MEL through the CRT terminal/HOST computer, using the on board serial I/O interface.
- Executes user programmers in real time or single step.
- SET break points on program,
- Examine and modify memory locations, registers and bits in SDA-51-MEL on board program/data memory and in the 8051"s on chip data and register memories.
- Upload and download programmers from host computer system like PC/XT/AT(in INTEL HEX FORMAT only)

COMMANDS AVAILABLE

HELP

Syntax: H

Gives the details of the commands used in serial mode of communication**.**

DISPLAY COMMAND

The command is used to display the contents of register, bit memory, internal memory, program memory and external data memory

Syntax: D

On entering this command at the monitor command prompt, the following options are displayed.

DISPLAY(R, B, M, P, D)

The options are,

R for Registers,

B for bit memory

M for Internal memory

P for program memory

D for data memory

Press „enter" to terminate the command.

EDIT COMMANDS

This command is used to edit the contents of register, bit memory, internal memory, program memory and the external data memory.

Syntax: E

On entering the command letter at the monitor command the following options are displayed.

EDIT (R, B, M, P and D).

The options are,

R for registers

P for program memory

B for bit memory

M for internal memory

D for data memory

During editing, the following keys can be used.

P to display the previous location

N or space bar to display the next location

CR to update and display the same location.

All other keys expect 0 to 9 and A to F can be used to abort the command.

PROGRAM EXECUTION COMMANDS:

The following commands are used to control the execution of user programs. The B and C commands set and clear breakpoint address. The GO and Step commands cause the system to enter execution mode from interrogation mode.

G command:

The **G** command initiates program execution at real time (12MHZ crystal, 1micro-second cycle). The real-time execution mode allows the user to run the user code stored in program memory. Execution begins when the user enters a go command in interrogation mode. Real-time execution can be controlled by breakpoints set by the user. If program halts after executing the instruction that contained the

breakpoints address, then it returns to the interrogation mode .if the breakpoints are not used, the program runs until the user terminates execution with a call to the address 0003H.

The different formants of this command and their functions are described below.

8051>G

Enter start address: 8000

This command begins real time execution of the user program beginning with the instruction currently addressed by the program counter. During program execution, the following message is displayed on the screen:

PROGRAM EXECUTION:

Execution continues until one of the following occurs:

A break point is encountered (applies only when breakpoints are enabled)

The program attempts to execute across location 0003H.this location is reserved for system operation. After execution if break point were not specified, then all the register contents will be displayed and the monitor comes back to interrogation mode with the prompt „8051>" meaning that the it is ready to a accept the next command

Note:

- The system uses the current program counter address as the start address.
- It program breakpoint or data breakpoint have been enabled then the program will be executed the command is terminated without execution of the program.

SINGLE STEL COMMAND:

This command executes one instruction at the address in the program counter

8051>S

8051>enter star address=8000<CR>

After each instruction, the system displays the values of the updated program counter, accumulator, data, pointer register, and stack pointer. To terminate this command press ESC or SPACE BAR. The actual format & the output of each of the instruction is given in the section serial communication demo

BREAK COMMAND

SET BREAK COMMAND:

SYNTAX8051<B>

Set breakpoint: up to eight breaks can be set in the user program. After giving the command „B‟ at the prompted with the break number, enter the break no between 1 to 8.press <CR> after the break no. And enter the break address and press <CR>to go to conform the address and press another<CR>to go to the next break address selection or <SP><SP>to terminate the command.

CLEAR BREAKPOINTS

SYNTAX :> C

This command prompts the user for the break no,which has to be cleared. To clear all break points, enter the break number has to be cleared.

FILE UPLOAD FROM SDA-MEL TO PC

This option allows the user to save any program in memory as file in Intel hex format. On entering the command „F10‟ and select option 4 on following this, the driver program prompts for the name of the file in which the data is to be stored and enter the START & END address and press,<CR>.the program assumes a default extension of HEX for the file. This system then receives the data and stores it in the specified file and on completion the main menu will be displayed.

Ex: F10

Select option 4

Enter the file name in which the data is to be stored.

Enter START address = 8000 <CR>

ENTER END address = 805F <CR>

FILE DOWNLOAD FROM PC TO SDA-EL-MEL

This option allows the user to transfer an Intel hex file on a floppy diskette to program/data memory. On processing „:‟ key, the following message is displayed.

Go to the main menu by pressing F10 and select option 3

On following this, the driver program prompts for the name of the file to be downloading. Enter the file name and press <CR>. While the transfer operation in progress, the system displays the number record be transferred.

At the end of the transfer the main menu is displayed. Go to terminal mode press <CR>, the following message

File received O.K. will be displayed

Ex:‟:‟

Go to the main menu by pressing F10 and select option 3

KEY BOARD MODE OF OPERATION

At the power on the monitor automatically goes into keyboard mode, at power on the sign on message SDA 51/31/-STA<E> HELP appears on the LCD display.

THE FUNCTION OF SOME SPECIAL KEYS ON THE PC/AT KEYBOARD ARE LISTED BELOW

KEY LABEL	DESCRIPTION
RESET	Transfers control to the monitor at location 0000H
NXT	The monitor interrupts this key as a delimiter. Different commands are explained later .
ENTER	The monitor command terminator
BMOVE	Selects the monitor block move command
GO	Selects the monitor go command (program execution)
PREV	A monitor delimiter key, and in the next coming section its usage‟s are explained
STEP	Selects the monitor single step function
EREG	Selects the monitor examine / modify cpu register function
EDM	In combination with substitute memory command this key allows the using to examine and modify external data memory
IDM	In combination with substitute memory command this key allows the using to examine and modify internal data memory
IBM	In combination with substitute memory command this key allows the using to examine and modify internal bit memory
EPM	In combination with substitute memory command this key allows the using to examine external program memory
EPGM	Used to program EPROM‟s using EPROM programmer I/F(NIFC 03)
EPRD	Used to read the EPROm contents using EPROM programmer I/F(NIFC 03)
ESRL	Key to invoke serial mode
ASM	Key to invoke assembler mode
DSM	Key to invoke di assembler mode
BS	Provides back facility in assembler mode

SUBSTITUTE MEMORY COMMAND

This command is used to examine/modify the memory functions. This command wills support examine/modification of following memories.

- External data memory (EDM)
- External program memory(EPM)
- internal data memory(IDM)
- internal bit memory(IBM)

This command is invoked using „SMEM‟ key in the ASCII key board the message “SUBSITUTE MEMORY” appears on the display.

Then user can select any one of above mention four memories, and enter the location address to be Examine/modify and press <NXT> to display the data present in that memory location, now user can modify that data byte if required then again he has to press <NXT>, now PC is incremented to show the

contents of the next memory location. If the user wants to see the content of previous location i.e. if 9005H is the current PC content &he wants to see the 9004 location content then he has to press<PREV>key.

EXTERNAL DATA MEMORY

<SMEM><EDM><address of memory location><NXT><new byte if required><NXT>…..<ENTER>. This command is used to enter the data in data memory (0300H to 1FFFH,4000H to 7FFFH) or data/code into data/program memory (8000H to FFFFH).

INTERNAL DATA MEMORY

<SMEM><IDM><Address of the memory location><NXT><new byte if required><NXT>… ..<ENTER>

Internal data memory ranges from 00H to 7FH(128bytes)

INTERNAL BIT MEMORY

<SMEM><IBM><Address of the memory location><NXT><new byte if required><NXT>… ..<ENTER>

Internal bit memory ranges from 00 to 7F(128bits) values entered must be 1 or 0 only.

EXTERNAL PROGRAM MEMORY

<SMEM><EPM><Address of the memory location><NXT<NXT>…<ENTER>

If the user attempts to edit data in this region an ERROR message will be displayed.

EXAMINE/MODIFY CPU REGISTERS COMMAND

The examine/modify register command allows the user to examine/modify the contents of CPU registers. This command is invoked using EREG key in the ASCII keyboard, the message "which register?"appears on the first line of LCD display then the user can select the CPU register which he wants to examine/modify through a key designator (for the key designators see the table given below) then if <NXT> pressed the register name in the registers sequence and its content will be displayed, the registers display sequence if A,B,R0,R1,R2,R3,R4,R5,R6,R7,PCL,PCH,PSW,SP,DPH,DPL.

DESIGNATOR(KEY)	CPU REGISTERS	DESIGNATIOR(KEY)	CPU REGSITERS
0	RO	8	PCL
1	R1	9	PCH
2	R2	A	A
3	R3	B	B
4	R4	C	SP
5	R5	D	DPH
6	R6	E	DPL
7	R7	F	PSW

EXECUTE USER PROGRAM COMMAND

The execute user program command allows user to execute a program that he has entered/downloaded. To invoke this execute user program command press <GO> now the current PC and its data are displayed on the LCD display and then the command is completed when the user press<ENTER>the message "PROGRAM EXECUTED" will be displayed on the LCD display.

SYNTAX: Go<Program starting address><ENTER>

EX: To execute a program which is having the starting address at 8000H<GO>8000<ENTER>

SINGLE STEP COMMAND

The single step command allows the user to „instruction step" through his program, this command is invoked through <STEP> key when the user press<STEP> the current PC content and data of that location are displayed on the LCD module. The user can now change the address, if required and then press <ENTER >,the instruction at that address is executed and its contents are displayed, now by pressing <NXT>key the display updates to next logical address and its contents. To examine register or memory contents at this stages press<ENTER>then <EREG>/<SMEM> or any command provided to user in keyboard mode and again to enter single step press <ENTER>and to continue the stepping process press<NXT><NXT>….

In this single step mode, we use INT0 with its priority bit set. A such the other interrupts are not functional.

SYNTAX:

<STEP><Starting address of user program><ENTER><NXT><NXT>…..

EX:To single step a program with starting address 9000H,and in the third step exam register command has to be invoked to see the content of registers A,B,R0, then again come back for single stepping.

<STEP>8000<ENTER><NXT><NXT><NXT><ENTER>

<EREG><A><NXT><NXT><NXT><ENTER><STEP><ENTER><NXT>

<NXT>…….

TALK software Procedure:

First identify Location of TALK software. If it is in D drive then choose run prompt and select CMD then follow below procedure.

D:\>

ENTER

D:\>cd comm_pack86

ENTER

D:\cd comm_pack86 >cd comm_pack86

Enter

D:\cd comm_pack86 >cd comm_pack86>cd x8086

Enter

D:\cd comm_pack86 >cd comm_pack86>cd x8086>edit file name

Enter

Enter the program

Go to file and save & go to file exit

Press x8086

Enter

Listing destination :d

Enter

Generate cross reference (Y/N): y

Enter

Input filename: GIVE INPUT FILE NAME.ASM

Enter

Output filename:

Enter

Link assembled: Assembled Errors:

Enter

Input filename: GIVE filename.obj

Enter

Enter offset for „cseg‟: 0(Zero)

Enter

Input file name:

Enter

Output file name :

Options<D,S,A,M,X,H,E,T,1,2,3,<CR>=Default>:h

Enter

Exit

Enter

Next selected go to talk

Going to options in settings

Comport-com1

Bit per seconds -9600

Data bit -8

Parity –none

Stop bit -1

Flow control-none

Transfer mode-ASCII key

NEXT PRESS OK

Selected options in that selected target board 8086 kit

Press ok

1st selected in m.p kit as keep 1 and 5 pins ON

Then go to options disconnected and connected, press reset button in kit

Display –als-86 monitor

Go file selected download Intel hex. File<comm._pack86>,<openx8086>,<filename>open

Enter

Display #

Next selected in kit 1&7 pins keeps ON and press reset button in kit

Selected in G

Give the address and press enter

EXPERIMENT NO: 2

16 BIT ARITHMETIC AND LOGICAL OPERATIONS

a) ADDITION:
AIM: -

To write an assembly language PROGRAM for Addition of two 16-bit numbers.

COMPONENTS & EQUIPMENT REQUIRED: -

S.No	Device	Range / Rating	Quantity (in No's)
1	8086 microprocessor kit/Win862 with PC		1
2	Keyboard		1
3	RPS	+5v	1

PROGRAM:

```
MOV AX, 4343
MOV BX, 1111
ADD AX, BX
INT 03
```

Hardware

MEMORY LOCATION	OP-CODE	MNEMONIC OPERAND	COMMENTS

		MOV AX,4343
		MOV BX,1111
		ADD AX,BX
		INT 3	

Observation Table

Input		Output	
Register	**Data**	**Register**	**Data**
AX	4343	**AX**	
BX	1111		

b) SUBTRACTION:

AIM: -

To write an assembly language PROGRAM for subtraction of two 16-bit numbers.

COMPONENTS & EQUIPMENT REQUIRED: -

S.No	Device	Range / Rating	Quantity (in No's)
1	8086 microprocessor kit/Win862 with PC		1
2	Keyboard		1
3	RPS	+5v	1

PROGRAM:

```
MOV AX, 4343
MOV BX, 1111
SUB AX, BX
INT 03
```

Hardware

MEMORY LOCATION	OP-CODE	MNEMONIC OPERAND	COMMENTS

		MOV AX,4343
		MOV BX,1111
		SUB AX,BX
		INT 03	

Observation Table

Input		Output	
Register	**Data**	**Register**	**Data**
AX	4343	AX	3232
BX	1111		

c) MULTIPLICATION

AIM: -

To write an assembly language PROGRAM for multiplication of two 16-bit numbers.

COMPONENTS & EQUIPMENT REQUIRED: -

S.No	Device	Range / Rating	Quantity (in No's)
1	8086 microprocessor kit/Win862with PC		1
2	Keyboard		1
3	RPS	+5v	1

PROGRAM:

```
MOV AX, 4343
MOV BX, 1111
MUL BX
INT 03
```

Hardware

MEMORY LOCATION	OP-CODE	LABEL	MNEMONIC OPERAND	COMMENTS

			MOV AX,4343
			MOV BX,1111
			MUL BX
			INT 3	

Observation Table

Input		Output	
Register	**Data**	**Register**	**Data**
AX	4343	AX	EA73
BX	1111	DX	047B

d) DIVISION

AIM:-

To write an assembly language PROGRAM for multiplication of two 16-bit numbers.

COMPONENTS & EQUIPMENT REQUIRED: -

S.No	Device	Range / Rating	Quantity (in No's)
1	8086 microprocessor kit/Win862 with PC		1
2	Keyboard		1
3	RPS	+5v	1

PROGRAM

```
MOV AX, 4343
MOV BX, 1111
DIV BX
INT 03
```

Hardware

MEMORY LOCATION	OP-CODE	LABEL	MNEMONIC OPERAND	COMMENTS

			MOV AX,4343
			MOV BX,1111
			DIV BX
			INT 3	

Observation Table

Input		Output	
Register	**Data**	**Register**	**Data**
AX	4343	AX	0003
BX	1111	DX	03F2

RESULT:

PRE LAB QUESTIONS:

1. How manybit 8086microprocessor is?
2. What is the sizeof data bus of8086?
3. What is the sizeof address bus of 8086?
4. What is the maxmemoryaddressing capacityof 8086?
5. Which arethe basicparts of8086?

LAB ASSIGNMENT:

1. Write analpprogram foraddition and subtractionoftwo 16bit numbers?

   1) A 2 7 8

   2) B 6 3 4

2. Write analpprogram formultiplicationanddivisionoftwo 16bit numbers?

   1) 0012

   2) 0006

POST LAB QUESTIONS:

1. How to move data from one register to other

2. To swapping the data what type register used

3. What are the advantages of maximum mode

EXPERIMENT NO: 3
MULTIBYTE ADDITION AND SUBRACTION

a) Multi Byte Addition and Subtraction

b) 3*3 Matrix Multiplication and Addition

AIM: -

Program to perform multi byte addition

COMPONENTS & EQUIPMENT REQUIRED: -

S.No	Device	Range / Rating	Quantity (in No's)
1	8086 microprocessor kit/MASM with PC		1
2	Keyboard		1
3	RPS	+5v	1 1

PROGRAM:

```
        MOV  AX,0000H
        MOV   SI,2000H
        MOV   DI,3000H
        MOV BX,2008H
        MOV CL,04H
UP :    MOV  AL,[SI]
        ADD  AL,[BX]
        MOV  [DI],AL
        INC SI
        INC  BX
        INC   DI
        DEC  CL
        JNZ   UP
        INT 03H
```

Hardware:

MEMORY LOCATION	OP-CODE	LABEL	MNEMONIC OPERAND

		UP	MOV AX,0000
			MOV SI, 2000
			MOV DI, 3000
			MOV BX, 2008
			MOV CL, 04
			MOV AL, [SI]
			ADD AL, [BX]
			MOV [DI], AL
			INC SI
			INC BX
			INC DI
			DEC CL
			JNZ UP
			INT 3

Observation Table:

Input				Output	
MEMORY LOCATION	**Data**	**MEMORY LOCATION**	**Data**	**MEMORY LOCATION**	**Data**
2000		2008		3000	
2001		2009		3001	
2002		200A		3002	
2003		200B		3003	
2004					
2005					
2006					
2007					

MULTIBYTE SUBTRACTION

AIM: - PROGRAM to perform multi byte subtraction.

COMPONENTS & EQUIPMENT REQUIRED: -

S.No	Device	Range / Rating	Quantity (in No's)
1	8086 microprocessor kit/MASM with PC		1
2	Keyboard		1
3	RPS	+5v	1

PROGRAM:

```
        MOV  AX,0000H
        MOV   SI,2000H
        MOV   DI,3000H
        MOV BX,2008H
        MOV CL,04H
UP :    MOV  AL,[SI]
        SUB AL,[BX]
        MOV [DI],AL
        INC SI
        INC  BX
        INC   DI
        DEC  CL
        JNZ   UP
        INT 03H
```

Hardware

MEMORY LOCATION	OP-CODE	LABEL	MNEMONIC OPERAND

		UP	MOV AX,0000
			MOV SI, 2000
			MOV DI, 3000
			MOV BX, 2008
			MOV CL, 04
			MOV AL, [SI]
			SUB AL, [BX]
			MOV [DI], AL
			INC SI
			INC BX
			INC DI
			DEC CL
			JNZ UP
			INT 03

Observation Table:

Input				Output	
MEMORY LOCATION	**Data**	**MEMORY LOCATION**	**Data**	**MEMORY LOCATION**	**Data**
2000		2008		3000	
2001		2009		3001	
2002		200A		3002	
2003		200B		3003	
2004					
2005					
2006					
2007					

RESULT:

PRE LAB QUESTIONS:

1. How many bit 8086microprocessor is?

2. What is the size of data bus of8086?

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 of8086?

LAB ASSIGNMENT:

1. Write analpprogram foraddition and subtractionoftwo 16bit numbers?

   1) A 2 7 8

   2) B 6 3 4

2. Write analpprogram formultiplicationanddivisionoftwo 16bit numbers?

   1) 0012

   2) 0006

POST LAB QUESTIONS:

1. How to move data from one register to other
2. To swapping the data what type register used
3. What are the advantages of maximum mode

EXPERIMENT NO: 4
PROGRAMS TO SORT NUMBERS

a) ASCENDING ORDER

AIM:-

Write an assembly language Program to sort the given numbers in ascending order

COMPONENTS & EQUIPMENT REQUIRED: -

S.No	Device	Range / Rating	Quantity (in No's)
1	8086 microprocessor kit/win 862 with PC		1
2	Keyboard		1
3	RPS	+5v	1

PROGRAM:

```
        MOV AX,0000H
        MOV CH,0004H
        DEC CH
UP1 :   MOV CL, CH
        MOV SI, 2000H
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
```

Hardware

MEMORY LOCATION	OP-CODE	LABEL	MNEMONIC OPERAND	COMMENTS
			MOV AX, 0000	
			MOV CH, 0004	
		UP1:	DEC CH	
		UP:	MOV CL, CH	
			MOV SI,2000	
			MOV AL,[SI]	
			INC SI	
			CMP AL,[SI]	
			JC DOWN	
		DOWN:	XCHG AL,[SI]	
			DEC SI	
			MOV [SI],AL	
			INC SI	
			DEC CL	
			JNZ UP	
			DEC CH	
			JNZ UP1	
			INT 03	

Observation Table:

Input		Output	
MEMORY LOCATION	**Data**	**MEMORY LOCATION**	**Data**
2000		2000	
2001		2001	
2002		2002	
2003		2003	

b. DESCENDING ORDER

AIM:-

Write an assembly language Program to sort the given numbers in descending order

COMPONENTS & EQUIPMENT REQUIRED: -

S.No	Device	Range / Rating	Quantity (in No's)
1	8086 microprocessor kit/Win862 with PC		1
2	Keyboard		1
3	RPS	+5v	1

PROGRAM:

```
        MOV AX,0000
        MOV CH,0004
        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
```

Hardware

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

Observation Table

Input		Output	
MEMORY LOCATION	**Data**	**MEMORY LOCATION**	**Data**
2000		2000	
2001		2001	
2002		2002	
2003		2003	

RESULT:

PRE LAB QUESTIONS:

1. What are the functions of BIU?
2. What are the functions of EU?
3. How many pin IC 8086 is?
4. WhatIC8086 is?
5. What is the size of instruction queue in 8086?

LAB ASSIGNMENT:

1. Write an alp program to sort the given numbers in ascending order?

   1) 14

   2) A2

   3) 85

   4) 54

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

   1) 1E

   2) 2A

   3) 56

   4) 98

POST LAB QUESTIONS:

1. How clock signal is generated in 8086
2. What is the maximum internal clock frequency of 8086?
3. What is the need for Port

EXPERIMENT NO: 5

PROGRAM FOR STRING MANIPULATIONS OPERATIONS

a) INSERT A BYTE IN A GIVEN STRING

AIM:-

To write a ALP for insert a new byte in a given string

COMPONENTS & EQUIPMENT REQUIRED: -

S.No	Device	Range / Rating	Quantity (in No's)
1	8086 microprocessor kit/MASM with PC		1
2	Keyboard		1
3	RPS	+5v	1

PROGRAM:

```
        MOV  SI,2000H  MOV
        DI,3000H
        MOV BX,5000H
        MOV CX,0005H
        CLD
L1:     MOV  AL,[SI]
        CMP  AL,[BX]
        JZ          L2
        MOVSB
        LOOP        L1
        JMP L3
L2:     MOVSB
        MOV   BX,7000H
        MOV     AL,[BX]
        MOV      [DI],AL
        DEC CX
        INC DI
        REP MOVSB
L3:     INT 3
```

Hardware

MEMORY LOCATION	OP-CODE	LABEL	MNEMONIC OPERAND

			MOV SI,2000
			MOV DI,3000
			MOV BX,5000
			MOV CX,0005
			CLD
			MOV AL,[SI]
			CMP AL,[BX]
			JZ L2
			MOVSB
			LOOP L1
			JMP L3
			MOVSB
			MOV BX,7000
			MOV AL,[BX]
			MOV [DI],AL
			DEC CX
			INC DI
			REP
			MOVSB
			INT 3

		L1:	
		L2:	
		L3:	

Observation Table

Input		Output	
MEMORY LOCATION	**Data**	**MEMORY LOCATION**	**Data**
2000		3000	
2001		3001	
2002		3002	
2003		3003	
2004		3004	
5000		3005	
7000			

b) DELETE A BYTE IN A GIVEN STRING

AIM:-

To write a alp for delete a byte in a given string

COMPONENTS & EQUIPMENT REQUIRED: -

S.No	Device	Range / Rating	Quantity (in No's)
1	8086 microprocessor kit/MASM with PC		1
2	Keyboard		1
3	RPS	+5v	1

PROGRAM:

```
        MOV  SI,2000H  MOV
        DI,3000H
        MOV BX,5000H
        MOV CX,0005H
        CLD
L1:     MOV  AL,[SI]
        CMP  AL,[BX]
        JZ          L2
        MOVSB
        LOOP        L1
        JMP L3
L2:     INC   SI
        DEC CX
        REP MOVSB
L3:     INT 03H
```

Hardware

MEMORY LOCATION	OP-CODE	LABEL	MNEMONIC OPERAND

			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 INT 3
		L3:	

Observation Table:

Input		output	
MEMORY LOCATION	**Data**	**MEMORY LOCATION**	**Data**
2000		3000	
2001		3001	
2002		3002	
2003		3003	
2004			
5000			

RESULT:

PRE LAB QUESTIONS:

1. What doyoumeanbyassemblerdirectives?
2. What.modelsmall stands for?
3. What is the supplyrequirement of8086?
4. What is the relationbetween 8086 processor frequency&crystalFrequency?
5. Functions of Accumulator orAXregister?

LAB ASSIGNMENT:

1. Write an alp for insert or delete a byte in a given string with SI memory location is 4000and DI location is 6000?
2. Write an alp for moving or reversing the given string with the length of the string is 12?

POST LAB QUESTIONS:

1. Which interrupts are generally used for critical events?
2. Which Stack is used in 8086?
3. What is SIM and RIM instructions

b) SEARCH A NUMBER OR CHARACTER

AIM:-

To Write an ALP program to search a number or character from a string.

COMPONENTS & EQUIPMENT REQUIRED: -

S.No	Device	Range / Rating	Quantity (in No's)
1	8086 microprocessor kit/Win862 with PC		1
2	Keyboard		1
3	RPS	+5v	1

Software

```
        MOV CX, 0004
        MOV  AX,0000
        MOV    SI,2000
        MOV BX,3000
UP:     MOV AL,[SI]
        CMP  AL,[BX]
        JZ      DOWN
        INC SI
        DEC      CL
        JNZ      UP
        MOV  AH,00
        JMP L3
DOWN:   DEC      CL
        MOV AH,01
        MOV [DI], AH
L3:     INT 3
```

Hardware

MEMORY LOCATION	OP-CODE	LABEL	MNEMONIC OPERAND	COMMENTS
			MOV CX, 0004	
			MOV AX,0000	
			MOV SI,2000	
		UP:	MOV BX,3000	
			MOV AL,[SI]	
			CMP AL,[BX]	
			JZ DOWN	
			INC SI	
		DOWN:	DEC CL	
			JNZ UP	
		L3:	MOV AH,00	
			JMP L3	
			DEC CL	
			MOV AH,01	
			MOV [DI], AH	
			INT 03	

Observation Table:

Input		Output	
MEMORY LOCATION	**Data**	**MEMORY LOCATION**	**Data**
2000		3000	
2001			
2002			
2003			

c) TRANSFER BLOCK OF DATA FROM ONE MEMORY LOCATION TO ANOTHER MEMORY LOCATION

AIM:-

To write a alp for transfer block of data from one memory location to another memory location.

COMPONENTS & EQUIPMENT REQUIRED: -

S.No	Device	Range / Rating	Quantity (in No's)
1	8086 microprocessor kit/MASM with PC		1
2	Keyboard		1
3	RPS	+5v	1

PROGRAM:

```
MOV SI, 2000H
MOV DI, 2008H
MOV CX, 0008H
REP MOVSB
INT 03H
```

Hardware

MEMORY LOCATION	OP-CODE	LABEL	MNEMONIC OPERAND

			MOV SI,2000
			MOV DI,2008
			MOV CX,0008
			REP
			MOVSB
			INT3

Observation Table

Input		Output	
MEMORY LOCATION	**Data**	**MEMORY LOCATION**	**Data**
2000		2008	
2001		2009	
2002		200A	
2003		200B	
2004		200C	
2005		200D	
2006		200E	
2007		200F	

d) REVERSE OF A DATA

AIM:-

To write a ALP for reverse of a given string

COMPONENTS & EQUIPMENT REQUIRED: -

S.No	Device	Range / Rating	Quantity (in No's)
1	8086 microprocessor kit/MASM with PC		1
2	Keyboard		1
3	RPS	+5v	1

PROGRAM:

```
        MOV SI, 2000H
        MOV DI, 2008H
        MOV CX, 0008H
        ADD SI, 07H
UP:     MOV  AL,[SI]
        MOV [DI], AL
        DEC SI
        INC  DI
        DEC CX
        JNZ  UP
        INT 03H
```

Hardware

MEMORY LOCATION	OP-CODE	LABEL	MNEMONIC OPERAND

		UP:	MOV SI,2000
			MOV DI,2008
			MOV CX,0008
			ADD SI,07
			MOV AL,[SI]
			MOV [DI],AL
			DEC SI
			INC DI
			DEC CX
			JNZ UP
			INT 3

Observation Table

Input		Output	
MEMORY LOCATION	**Data**	**MEMORY LOCATION**	**Data**
2000		2008	
2001		2009	
2002		200A	
2003		200B	
2004		200C	
2005		200D	
2006		200E	
2007		200F	

RESULT:

PRE LAB QUESTIONS:

1. What is the sizeof instructionqueue in 8086?
2. Which arethe registerspresent in 8086?
3. What doyoumeanbypipelining in 8086?
4. Howmany16 bit registersareavailable in 8086?
5. Specifyaddressing modes for anyinstruction?

LAB ASSIGNMENT:

1. Write an alp program tosearchanumber05fromagiven array?
   1) 02
   2) 06
   3) 05
   4) 08
2. Write an alp program tosearchanumber45fromagiven array?
   1) 09
   2) 45
   3) 22
   4) A2

POST LAB QUESTIONS:

1. Why crystal is a preferred clock source
2. What is Tri-state logic?
3. What happens when HLT instruction is executed in processor?

EXPERIMENT NO 6

CODE CONVERSIONS

a) PACKED BCD TO UNPACKED BCD

AIM:-

To write a ALP to convert the numbers from Packed BCD to Unpacked BCD

COMPONENTS & EQUIPMENT REQUIRED: -

S.No	Device	Range / Rating	Quantity (in No's)
1	8086 microprocessor kit/MASM with PC		1
2	Keyboard		1
3	RPS	+5v	1

PROGRAM:

```
MOV AX,#0000H
MOV AH, #72H
MOV AL,AH
AND AL,#0F
MOV CL,#04H
SHR AH,CL
INT 03H
```

Hardware

MEMORY LOCATION	OP-CODE	LABEL	MNEMONIC OPERAND

			MOV AX,#0000H
			MOV AH, #72H
			MOV AL,AH
			AND AL,#0F
			MOV CL,#04H
			SHR AH,CL
			INT 03H

Observation Table

Input		Output	
REGISTER	**Data**	**REGISTER**	**Data**
AL	72	AL	02
AH	72	AH	07

b) BCD to ASCII

AIM:-

To write a ALP to convert the numbers from BCD to ASCII

COMPONENTS & EQUIPMENT REQUIRED: -

S.No	Device	Range / Rating	Quantity (in No's)
1	8086 microprocessor kit/MASM with PC		1
2	Keyboard		1
3	RPS	+5v	1

PROGRAM:

```
ASSUME CS: CODE
CODE SEGMENT
        START:
        MOV AX,#0000H
        MOV AH, #72H
        MOV AL,AH
        AND AL,#0F
        MOV CL,#04H
        SHR AH,CL
        OR AX,#3030H
        INT 03H
CODE ENDS
END START
```

Hardware

MEMORY LOCATION	OP-CODE	LABEL	MNEMONIC OPERAND

			MOV AX,#0000H
			MOV AH, #72H
			MOV AL,AH
			AND AL,#0F
			MOV CL,#04H
			SHR AH,CL
			OR AX,#3030H
			INT 03H

Observation Table

Input		Output	
REGISTER	**Data**	**REGISTER**	**Data**
AL	72	AL	32
AH	72	AH	37

c) ASCII to BCD

AIM:-

To write a ALP to convert the numbers from ASCII to BCD

COMPONENTS & EQUIPMENT REQUIRED: -

S.No	Device	Range / Rating	Quantity (in No's)
1	8086 microprocessor kit/MASM with PC		1
2	Keyboard		1
3	RPS	+5v	1

PROGRAM:

```
ASSUME CS: CODE
CODE SEGMENT
        START:
        MOV AX,#0000H
        MOV AH, #35H
        MOV AL, #36
        AND AL , #0F
        MOV CL, #04H
        SHL AH,CL
        OR AL, AH
        INT 03H
CODE ENDS
END START
```

Hardware

MEMORY LOCATION	OP-CODE	LABEL	MNEMONIC OPERAND

			MOV AX,#0000H
			MOV AH, #35H
			MOV AL, #36
			AND AL , #0F
			MOV CL, #04H
			SHL AH,CL
			OR AL, AH
			INT 03H

Observation Table

Input		Output	
REGISTER	**Data**	**REGISTER**	**Data**
AL	36	AL	56
AH	35		

RESULT:

PRE LAB QUESTIONS:

6. What is the sizeof instructionqueue in 8086?
7. Which arethe registerspresent in 8086?
8. What doyoumeanbypipelining in 8086?
9. Howmany16 bit registersareavailable in 8086?
10. Specifyaddressing modes for anyinstruction?

LAB ASSIGNMENT:

3. Write an alp program tosearchanumber05fromagiven array?
   1) 02
   2) 06
   3) 05
   4) 08
4. Write an alp program tosearchanumber45fromagiven array?
   1) 09
   2) 45
   3) 22
   4) A2

POST LAB QUESTIONS:

1. Why crystal is a preferred clock source
2. What is Tri-state logic?
3. What happens when HLT instruction is executed in processor?

EXPERIMENT NO 7

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.

COMPONENTS & EQUIPMENT REQUIRED: -

S.No	Device	Range / Rating	Quantity (in No's)
1	8086 microprocessor kit/TALK with PC		1
2	Keyboard		1
3	RPS	+5v	1
4	Stepper motor interfacing card,RS-232		1
5	Stepper motor		1
6	FRC Connector,RS-232 cable		1

THEORY:

A stepper motor is a device used to obtain an accurate position control of rotating shafts. It employs rotation of its shaft in terms of steps, rather than continuous rotation as in case of AC or DC motors. To rotate the shaft of the stepper motor, a sequence of pulses is needed to be applied to the windings of the stepper motor, in a proper sequence. The number of pulses required for one complete rotation of the shaft of the stepper motor are equal to its number of internal teeth on its rotor.

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
   VDD- 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).

a) PROGRAM TO ROTATE IN CLOCKWISE DIRECTION :

```
        MOV     AL,80H
        MOV DX,0FFE6H
        OUT      DX,AL
        MOV     BX,02H
        MOV     AL,33H
        MOV DX,0FFE0H
BACK: OUT DX,AL
        MOV CX, 2DF7H
SELF: LOOP SELF
        ROR AL, 1
        DEC BX
        JNZ BACK
        INT 03H
```

Hardware

MEMORY LOCATION	OPCODE	LABEL	MNEMONIC OPERAND
			MOV AL,80H
			MOV DX,0FFE6H
			OUT DX,AL
			MOV BX,02H
			MOV AL,33H
			MOV DX,0FFE0H
		BACK:	OUT DX,AL
			MOV CX,#2DF7H
		SELF:	LOOP SELF
			ROR AL,1
			DEC BX
			JNZ BACK
			INT 03

b) PROGRAM TO ROTATE IN ANTI-CLOCKWISE DIRECTION :

```
        MOV     AL,80H
        MOV DX,0FFE6H
        OUT      DX,AL
        MOV     BX,02H
        MOV     AL,33H
        MOV DX,0FFE0H
BACK: OUT DX,AL
        MOV CX, 2DF7H
SELF: LOOP SELF
        ROL AL, 1
        DEC BX
        JNZ BACK
        INT 03H
```

MEMORY LOCATION	OPCODE	LABEL	MNEMONIC OPERAND

			MOV AL,80H
			MOV DX,0FFE6H
			OUT DX,AL
			MOV BX,02H
			MOV AL,33H
			MOV DX,0FFE0H
			OUT DX,AL
			MOV CX,#2DF7H
			LOOP SELF
			ROL AL,1
			DEC BX
			JNZ BACK
			INT 03

		BACK:	
		SELF:	

RESULT:

PRE LAB QUESTIONS:

1. Functions of BX register?
2. Functions of CX register?
3. Functions of DX register?
4. How Physicaladdressis generated?
5. Which arepointers present in this 8086?

LAB ASSIGNMENT:

1. Write analpprogram to find the unpacked BCD tothe given BCD number 56using 8086trainerkit?

2. Write analpprogram to find the ASCIInumber to thegiven BCD number 56using 8086trainerkit?

POST LAB QUESTIONS:

1. In string operations which is by default string source pointer
2. What is the size of flag register
3. Can you perform 32 bit operation with 8086? How

EXPERIMENT NO 8
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.

COMPONENTS & EQUIPMENT REQUIRED: -

S.No	Device	Range / Rating	Quantity (in No's)
1	8086 microprocessor kit/TALK with PC		1
2	Keyboard		1
3	RPS	+5v	1 1
4	A/D,D/A Interfacing modules		1
5	Power mate connector		1
6	FRC Connector,RS-232 cable		1
7	CRO		1

THEORY:

The A/D converter is treated as an input device by the microprocessor that sends an initializing signal to the ADC to start the analog to digital data conversion process. The start of conversion signal is a pulse of specific duration. After the conversion is over , ADC sends end of conversion signal to inform the microprocessor about it and result is ready at the output buffer of the ADC.

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: Gnd
Blue: +5V
Red: +12V
Green: -12V

3. After the completion of the PROGRAM and connections enter the PROGRAM as given in the listing below.
4. G0< STARTING ADDRESS< ENTER (on the key board of trainer).

D/A CONVERTER:
PROGRAM TO GENERATE SQUARE WAVE:

```
MOV AL, 80H
MOV DX, 0FFE6H
OUT DX, AL
MOV DX, 0FFE0H
BACK: MOV AL, 00H
OUT DX, AL
MOV CX, 0147H
SELF1: LOOP SELF1
MOV AL, 0FFH
OUT DX, AL
MOV CX, 0147H
SELF2:LOOPSELF2
JMPBACK
```

MEMORY LOCATION	OPCODE	LABEL	MNEMONIC OPERAND

			MOV AL, 80H
			MOV DX, 0FFE6H
			OUT DX, AL
			MOV DX, 0FFE0H
			BACK: MOV AL, 00H
			OUT DX, AL
			MOV CX, 0147H
			SELF1: LOOP SELF1
			MOV AL, 0FFH
			OUT DX, AL
			MOV CX, 0147H
			SELF2:LOOPSELF2
			JMPBACK

PROGRAM TO GENERATE SAWTOOTH WAVE:

```
MOVAL,80H
MOVDX,0FFE6H
OUT DX,AL
L2: MOV AL,00H
MOV DX,0FFE2H
L1: OUT DX,AL
INC AL
CMP AL,0FFH
JB L1
OUT DX,AL
JMPL2
```

i) Hardware

ADDRESS	OPCODE	LABEL	MNEMONIC OPERAND

			MOVAL,80H
			MOVDX,0FFE6H
			OUT DX,AL
			L2: MOV AL,00H
			MOV DX,0FFE2H
			L1: OUT DX,AL
			INC AL
			CMP AL,0FFH
			JB L1
			OUT DX,AL
			JMPL2

PROGRAM TO GENERATE TRAINGULARWAVE:

```
MOV AL,80H
MOV DX,0FFE6H
OUT DX,AL
MOV AL,00H
L3: MOV DX,0FFE2H
L1: OUT DX,AL
INC AL
CMP AL,0FFH
JB L1
L2: OUT DX,AL
DEC AL
CMP AL,00H
JNBE L2
JMPL3
```

i) Hardware

ADDRESS	OPCODE	LABEL	MNEMONIC OPERAND

			MOV AL,80H
			MOV DX,0FFE6H
			OUT DX,AL
			MOV AL,00H
			L3: MOV DX,0FFE2H
			L1: OUT DX,AL
			INC AL
			CMP AL,0FFH
			JB L1
			L2: OUT DX,AL
			DEC AL
			CMP AL,00H
			JNBE L2
			JMPL3

A/D CONVERTER

PROGRAM:

i) Software

```
MOV AL, 98H
MOV DX, 0FFE6
OUT DX,AL
MOV AL, 01H
OUT DX,AL
MOV AL, 00H
OUT DX,AL
MOV AL, 02H
MOV DX, 0FFE2H
OUT DX,AL
MOV DX, 0FFE4H
BACK: IN AL,DX
ROR AL, 1H
JNC BACK
MOV DX, 0FFE0H
IN AL, DX
MOV DI, 2000H
MOV [DI], AL
INT  03
```

ii) Hardware

MEMORY LOCATION	OPCODE	LABEL	MNEMONIC OPERAND

			MOV AL, 98H
			MOV DX, 0FFE6
			OUT DX,AL
			MOV AL, 01H
			OUT DX,AL
			MOV AL, 00H
			OUT DX,AL
			MOV AL, 02H
			MOV DX, 0FFE2H
			OUT DX,AL
			MOV DX, 0FFE4H
			BACK: IN AL,DX
			ROR AL, 1H
			JNC BACK
			MOV DX, 0FFE0H
			IN AL, DX
			MOV DI, 2000H
			MOV [DI], AL
			INT 03

Observation Table:

INPUT	OUTPUT

RESULT:

PRE LAB QUESTIONS

1. Which is bydefaultpointerfor CS/ES?
2. How manysegmentspresent in it?
3. What is the sizeof eachsegment?
4. Basic difference between 8085 and 8086?
5. Which operations arenot available in 8085?

LAB ASSIGNMENT:

1. Using the program generate awaveform andidentifythat

2. Using the program generate awaveform andidentifythat

POST LAB QUESTIONS:

1. Which is the tool used to connect the user and the computer
2. What is the position of the Stack Pointer after the PUSH instruction
3. Logic calculations are done in which type of registers

EXPERIMENT No 9

INTERFACING TRAFFIC LIGHT CONTROLLER

AND TONE GENERATOR

a) INTERFACING TRAFFIC LIGHT CONTROLLER

AIM:-

Write an ALP program to interface traffic light controller

COMPONENTS & EQUIPMENT REQUIRED: -

S.No	Device	Range / Rating	Quantity (in No's)
1	8086 trainer kit with keyboard		1
2	Traffic Light Interface module		1
3	RPS	+5v	1
4	FRC cables		1
5	RS-232 cable		1

PROGRAM:

```
MOV     AL,80H              ; Initialisation of 8255 Mode 0
MOV     DX,0FFE6H
OUT     DX,AL               ; All ports as o/p ports
AGAIN:  MOV     SI,2038H            ; Table of port values
NEXTST: MOV     AL,[SI]
MOV     DX,0FFE0H
OUT     DX,AL               ; PortA value
 INC    SI
ADD     DX,2
MOV     AL,[SI]
OUT     DX,AL               ; PortB value
 INC    SI
ADD     DX,2
MOV     AL,[SI]
OUT     DX,AL               ; PortC value
 INC    SI
CALL    DELAY               ; Calling Delay routine
CMP     SI,2056H            ; Checking for the end of the data values
JNZ     NEXTST
JMP     SHORT AGAIN
DELAY:  MOV     CX,0FFH             ; Delay routine
DLY5:   PUSH    CX
MOV     CX,03FFH
DLY10:  NOP
 LOOP   DLY10
```

```
        POP    CX
        LOOP   DLY5
        RET

ORG     2038H
        PORTVALUES:
        DB     10H,81H,7AH ; State 1
        DB     44H,44H,0F0H          ; All ambers ON
        DB     08H,11H,0E5H          ; State 2
        DB     44H,44H,0F0H          ; All ambers ON
        DB     81H,10H,0DAH          ; State 3
        DB     44H,44H,0F0H          ; All ambers ON
        DB     11H,08H,0B5H          ; State 4
        DB     44H,44H,0F0H          ; All ambers ON
        DB     88H,88H,00H           ; State 5
        DB     44H,44H,0F0H          ; All ambers ON
        DB     00H                   ; Dummy
```

Hardware:

MEMORY LOCATION	OPCODE	LABEL	MNEMONIC OPERAND

			MOV AL,80H
			MOV DX,0FFE6H
			OUT DX,AL ;
			AGAIN: MOV SI,2038H
			NEXTST: MOV AL,[SI]
			MOV DX,0FFE0H
			OUT DX,AL
			INC SI
			ADD DX,2
			MOV AL,[SI]
			OUT DX,AL
			INC SI
			ADD DX,2
			MOV AL,[SI]
			OUT DX,AL
			INC SI
			CALL DELAY
			CMP SI,2056H
			JNZ NEXTST
			JMP SHORT AGAIN
			DELAY: MOV CX,0FFH
			DLY5: PUSH CX

			MOV CX,03FFH DLY10: NOP LOOP DLY10 POP CX LOOP DLY5 RET

b) INTERFACING TONE GENERATOR

AIM:-

Write an ALP program to interface Tone Genertator

COMPONENTS & EQUIPMENT REQUIRED: -

S.No	Device	Range / Rating	Quantity (in No's)
1	8086 trainer kit with keyboard		1
2	Tone Generator Interface module		1
3	RPS	+5v	1
4	FRC cables		1
5	RS-232 cable		1

PROGRAM:

```
        ORG 2000H
        MOV DX,0FFE6H
        MOV AL,80H
        OUT DX,AL

GETKEY: MOV SI,2100H
        CALL FAR 0FF00:0B1CH
        CMP AL,0FH
        JG GETKEY
        MOV BH,00H
        MOV BL,AL
        MOV CL,4FH
        MOV DX,0FFE4H
 FREQ:  MOV AL,00H
        OUT DX,AL
        MOV CH,[BX][SI]
NXTPL:  NOP
        NOP
        NOP
        NOP
        DEC CH
        JNZ NXTPL
        MOV AL,0FFH
        OUT DX,AL
        MOV CH,[BX][SI]
```

```
NXTPH:  NOP
        NOP
        NOP
        NOP
        DEC CH
        JNZ NXTPH
        DEC CL
        JNZ FREQ
        JMP SHORT GETKEY

        ORG 2100H
        DB B7H,A8H,96H,85H,7EH,70H,64H,59H
        DB 54H,4AH,42H,3EH,37H,31H,2CH,29H

        END
```

HARDWARE:

MEMORY LOCATION	OPCODE	LABEL	MNEMONIC OPERAND

			ORG 2000H
			MOV DX,0FFE6H
			MOV AL,80H
			OUT DX,AL
			GETKEY: MOV SI,2100H
			CALL FAR 0FF00:0B1CH
			CMP AL,0FH
			JG GETKEY
			MOV BH,00H
			MOV BL,AL
			MOV CL,4FH
			MOV DX,0FFE4H
			FREQ: MOV AL,00H
			OUT DX,AL
			MOV CH,[BX][SI]
			NXTPL: NOP
			NOP
			NOP
			NOP
			DEC CH
			JNZ NXTPL
			MOV AL,0FFH

			OUT DX,AL MOV CH,[BX][SI] NXTPH: NOP NOP NOP NOP DEC CH JNZ NXTPH DEC CL JNZ FREQ JMP SHORT GETKEY

RESULT:

LAB QUESTIONS:

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?

EXPERIMENT NO 10

PROGRAMMING USING ARITHMETIC AND LOGICAL INSTRUCTIONS OF 8051

AIM:-

Write an ALP program to perform 8 bit arithmetical operations by using 8051.

COMPONENTS & EQUIPMENT REQUIRED: -

S.No	Device	Range / Rating	Quantity (in No's)
1	8051 trainer kit with keyboard		1
2	Talk with PC		1
3	RPS	+5v	1

PROGRAM FOR ADDITION:

i) Software

```
Org     9000h
MOV     A,#02
MOV     B,#02
ADD     A,B
LCALL 03
```

ii) Hardware

MEMORY LOCATION	OPCODE	LABEL	MNEMONIC OPERAND

			MOV A,#02
			MOV B,#02
			ADD A,B
			LCALL 03

OBSERVATION TABLE:

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

PROGRAM FOR SUBTRACTION:

i) Software

```
Org     9000h
MOV     A,#02
MOV     B,#02
SUBB    A,B
LCALL 03
```

ii) Hardware

MEMORY LOCATION	OPCODE	LABEL	MNEMONIC OPERAND

8000			MOV A,#04
			MOV B,#02
			SUBB A,B
			LCALL 03

OBSERVATION TABLE

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

PROGRAM FOR MULTIPLICATION:

i) Software

```
Org 9000h
MOV DPTR,#9000H
MOVX    A,@DPTR
MOV F0,A
INC         DPTR
MOVX A,@DPTR
MUL AB
LCALL 03
```

ii) Hardware

MEMORY LOCATION	OPCODE	LABEL	MNEMONIC OPERAND

8000			MOV DPTR,#9000
			MOVX A,@DPTR
			MOV F0,A
			INC DPTR
			MOVX A,@DPTR
			MUL AB
			LCALL 03

Observation Table

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

PROGRAM FOR DIVISION:

i) Software

```
Org 9000h
MOV DPTR,#9000H
MOVX A,@DPTR
MOV R0,A
INC DPTR
MOVX A,@DPTR
MOV F0,A
MOV A,R0
DIV AB
INC DPTR
MOV @DPTR,A
LCALL 03
```

ii) Hardware

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

OBSERVATION TABLE:

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

LOGICAL OPERATIONS:

AIM:-

To perform logical operations by using 8051.

COMPONENTS & EQUIPMENT REQUIRED: -

S.No	Device	Range / Rating	Quantity (in No's)
1	8051 trainer kit with keyboard		1
2	Talk with PC		1
3	RPS	+5v	1
4	RS – 232		1

PROGRAM FOR AND OPERATION:

i) Software

```
Org 9000h
MOV R0,#DATA 1
MOV A,#DATA 2
ANL A,R0
MOV R1,A
LCALL 03
```

ii) Hardware

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

OBSERVATION TABLE:

Input		Output	
Register	**Data**	**Register**	**Data**
R0		R1	
A			

PROGRAM FOR OR OPERATION:

i) Software

```
Org 9000h
MOV R0,#DATA 1
MOV A,#DATA 2
ORL A,R0
MOV R1,A
LCALL 03
```

ii) Hardware

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

OBSERVATION TABLE:

Input		Output	
REGISTER	**Data**	**REGISTER**	**Data**
R0		R1	
A			

PROGRAM FOR XOR OPERATION:

i) Software

```
Org 9000h
MOV R0,#DATA 1
MOV A,#DATA 2
XRL A,R0
MOVR1,A
LCALL 03
```

ii) Hardware

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

OBSERVATION TABLE:

Input		output	
REGISTER	**Data**	**REGISTER**	**Data**
R0		R1	
A			

RESULT:

PRE LAB QUESTIONS:

1. What is the function of01h ofInt 21h?
2. What is the function of02h ofInt 21h?
3. What is the function of09h ofInt21h?
4. What is the function of0Ah of Int 21h?
5. What is the function of 4ch ofInt 21h?

LAB ASSIGNMENT:

1. Write analpprogram toperform OR operation using 8051 microcontrollertrainerKit?
2. Write analpprogram toperform addition andsubtractionoperation using 8051microcontroller trainer Kit
   a) 56
   b) 12

POST LAB QUESTIONS:

1. What do u mean by emulator
2. What is the size of flag register
3. What are ASCII codes for nos. 0 to F
4. Which no. representation system you have used

EXPERIMENT NO 11

PROGRAM AND VERIFY TIMER/COUNTER IN 8051

AIM:-

Write an ALP program to Perform Timer 0 and Timer 1 in Counter Mode and Gated Mode operation.

COMPONENTS & EQUIPMENT REQUIRED: -

S.No	Device	Range / Rating	Quantity (in No's)
1	8051 trainer kit with keyboard		1
2	Interface Module		1
3	RPS	+5v	1
4	RS – 232		1
5	FRC cables		1

THEORY:

The 8051 has two 16 bit timer/ counters. They can be used either as a timer or event count. Each 16 bit timer accessed as two separate registers as TL0, TL1 and TH0, TH1 bytes.

PROGRAM TO VERIFY TIMER '0'- COUNTER MODE:

```
Org 8000h
MOV A,TMOD (TMOD=89)
ORL A,#05H
MOV TMOD,A
SETB TRO (TRO=8C)
LCALL 68EAH
Loop: 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
```

Hardware

MEMORY LOCATION	OPCODE	LABEL	MNEMONIC OPERANDS

		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:

```
MOV A,TMOD (TMOD=89)
ORL A,#50H
MOV TMOD,A
SETB TR1 (TR1=8E)
LCALL 68EAH
Loop: 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
```

Hardware

Memory location	OPCODE	LABEL	MNEMONIC OPERANDS
			MOVA, TMOD (TMOD=89)
			ORL A,#50H
			MOV TMOD,A
			SETB TR1 (TR1=8E)
			LCALL 68EAH
		LOOP:	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:

PRE LAB QUESTIONS:

1. What is the resetaddress of 8086?
2. What is the sizeof flagregister in 8086?Explain all.
3. What is the differencebetween 08Hand 01H functions ofINT21H?
4. Which is faster- Reading word size datawhosestartingaddress isat even or at oddaddress ofmemoryin 8086?
5. Whichis the defaultsegmentbase: offset pairs?

LAB ASSIGNMENT:

1. write anALPprogram to studytimer-1 gated mode

POST LAB QUESTIONS:

1. Why we indicate FF as 0FF in program?
2. What is a type of queue in 8086
3. While accepting no. from user why u need to subtract 30 from that?

EXPERIMENTNo12

INTERFACING MATRIX/KEYBOARD TO 8051

AIM:-

Interface a Keyboardto8051 microcontroller.

COMPONENTS & EQUIPMENT REQUIRED: -

S.No	Device	Range / Rating	Quantity (in No's)
1	8051 trainer kit with keyboard		1
2	Key board module		1
3	RPS	+5v	1
4	FRC cables		1
5	RS-232 cable		

THEORY:

8255 a general purpose Programmable peripheral interface device. It can be used to interface keyboard with 8051 microcontroller. All the I/O devices require up to 3 I/O ports (Port A, Port B and Port C) which is provided by 8255. Interface circuit also will be simple. Port A is configures as an input port to receive the row-column code. Port B is configures as an output port to display the key(s) pressed. Port C is configures as an output port to output zeros to the rows to detect a key.

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
```

ii) Software

```
        Org     9000h
        MOV A,#90H
        MOV  DPTR,#CNTRL
        MOVX    @DPTR,A
        MOV   B,#20H
Blink 2: 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
```

iii) Hardware

Memory Location	**OPCODE**	**LABEL**	**MNEMONIC OPERANDS**
			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
			MOV A,#FEH
		BACK:	MOV B,#21H
			MOV DPTR,#PORTB

		BLINK1:
		
		DELAY:
		OLOOP:
		ILOOP:
			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
			MOV R0,#F7H
			MOV R1,#FFH
			DJNZ R1,ILOOP
			DJNZ R0,OLOOP
			RET

RESULT:

PRE LAB QUESTIONS:

1. What is the size of flag register?
2. Can you perform 32 bit operation with 8086? How?
3. Whether8086 is compatible with Pentium processor?
4. What is 8087? How itis different from 8086?
5. While accepting no. from user why you need to subtract 30 from that?

LAB ASSIGNMENT:

a. Write an alp program for addition of multi byte numbers.

b. Write an alp program for multiplication of given number in location mode a)0060
b) 0002

POST LAB QUESTIONS:

1. Compare memory interfacing and IO interfacing
2. how the even odd address are assigned through 8086
3. how the cs:ip is working during interrupt