Department of Computer Science & Engineering

Practical File

SUBJECT: COMPUTER ORGANIZATION AND ARCHITECTURE LAB

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TASK-01

AIM- Introduction to computer Anatomy- Memory, Ports, Motherboard and add-on cards.

THEORY:

Motherboard:

The motherboard is the computer's main circuit board. It's a thin plate that holds the CPU, memory, connectors for the hard drive and optical drives, expansion cards to control the video and audio, and connections to your computer's ports (such as USB ports). The motherboard connects directly or indirectly to every part of the computer.

CPU/processor:

The central processing unit (CPU), also called a processor, is located inside the computer case on the motherboard. It is sometimes called the brain of the computer, and its job is to carry out commands. Whenever you press a key, click the mouse, or start an application, you're sending instructions to the CPU.

The CPU is usually a two-inch ceramic square with a silicon chip located inside. The chip is usually about the size of a thumbnail. The CPU fits into the motherboard's CPU socket, which is covered by the heat sink, an object that absorbs heat from the CPU.

A processor's speed is measured in megahertz (MHz), or millions of instructions per second; and gigahertz (GHz), or billions of instructions per second. A faster processor can execute instructions more quickly. However, the actual speed of the computer depends on the speed of many different components—not just the processor.

RAM (random access memory):

RAM is your system's short-term memory. Whenever your computer performs calculations, it temporarily stores the data in the RAM until it is needed.

This short-term memory disappears when the computer is turned off. If you're working on a document, spreadsheet, or other type of file, you'll need to save it to avoid losing it. When you save a file, the data is written to the hard drive, which acts as long-term storage.

RAM is measured in megabytes (MB) or gigabytes (GB). The more RAM you have, the more things your computer can do at the same time. If you don't have enough RAM, you may notice that your computer is sluggish when you have several programs open. Because of this, many people add extra RAM to their computers to improve performance.

Hard drive:

The hard drive is where your software, documents, and other files are stored. The hard drive is long-term storage, which means the data is still saved even if you turn the computer off or unplug it.

When you run a program or open a file, the computer copies some of the data from the hard drive onto the RAM. When you save a file, the data is copied back to the hard drive. The faster the hard drive, the faster your computer can start up and load programs.

Expansion cards:

Most computers have expansion slots on the motherboard that allow you to add various types of expansion cards. These are sometimes called PCI (peripheral component interconnect) cards. You may never need to add any PCI cards because most motherboards have built-in video, sound, network, and other capabilities.

However, if you want to boost the performance of your computer or update the capabilities of an older computer, you can always add one or more cards. Below are some of the most common types of expansion cards.

Video card:

The video card is responsible for what you see on the monitor. Most computers have a GPU (graphics processing unit) built into the motherboard instead of having a separate video card. If you like playing graphics-intensive games, you can add a faster video card to one of the expansion slots to get better performance.

Sound card:

The sound card—also called an audio card—is responsible for what you hear in the speakers or headphones. Most motherboards have integrated sound, but you can upgrade to a dedicated sound card for higher-quality sound.

Network card:

The network card allows your computer to communicate over a network and access the Internet. It can either connect with an Ethernet cable or through a wireless connection (often called Wi-Fi). Many motherboards have built-in network connections, and a network card can also be added to an expansion slot.

Bluetooth card (or adapter):

Bluetooth is a technology for wireless communication over short distances. It's often used in computers to communicate with wireless keyboards, mice, and printers. It's commonly built into the motherboard or included in a wireless network card. For computers that don't have Bluetooth, you can purchase a USB adapter, often called a dongle.

TASK-02

AIM: Dismantling and assembling PC.

THEORY: **Dismantling of PC:** When referring to hardware, to disassemble is to break down a device into separate parts. A device may be disassembled to help determine a problem, to replace a part, or take the parts and use them in another device or sell them individually.

Steps for disassembling a PC

1. Unplugged the AC power supply to the PC from the wall socket
2. Remove the Cover or chassis or case.
3. Unplugged bus cables and ATX power cables
4. Remove Adapter Cards if any
5. Now Remove the processor and the heatsink and fan
6. Remove hard disk and CD/ DVD drives
7. Next, remove the Memory Modules
8. Remove the Power Supply (SMPS)
9. Finally, Remove the Motherboard

Assembling of PC: A PC is a modular type of computer that can be assembled using hardware components made by different manufacturers. This allows you to have a custom-built computer that matches your specific needs.

Following are the steps to assemble CPU:

1. Take Inventory
2. Make space and time
3. Prepare your CPU case
4. Install motherboard
5. Install the processor
6. Install the processor heat sink

7. Install the RAM
8. Install SMPS
9. Install the HDD
10. Install CD/DVD drive
11. Connect Expansion cards
12. Install SYS/Rear cooling fan
13. Bus cable connection
14. Power Cable connection
15. Front Panel connector connection

TASK- 03

AIM: Introduction to 8085 kit.

APPARATUS: 1. 8085 Kit

Theory:

SYSTEM SPECIFICATION

CPU: 8 bit Microprocessor, the 8085.

Monitor EPROM: 8K bytes of EPROM loaded with powerful monitor program.

RAM: 8K bytes of user's RAM using 6264 expandable upto 64K.

Timer: 16 bit programmable timer/counter using 8253.

I/O: 24 I/O lines using 8255 22 I/O lines using 8155

Keyboard: 28 Hex Key pad consist of 10 keys for command, 16 keys for hexadecimal data entry, 1 key for Reset & 1 key for RST 7.5 VCT.

Display: 6 Digit Seven Segment Displays (4 for address field & 2 for data field)

Bus: All data, address and control signals (TTL compatible) available at 50 Pin FRC connector

Serial Interface: RS-232C serial interface through SID/SOD line.

Power Supply: +5V/1A & ±12V/250mA.

Physical Size: 32.7cm x 25.33cm.

Operating Temp.: 0 to 50°C.

SYSTEM CAPABILITIES

1. Examine the contents of any memory location.

2. Examine/Modify the contents of any of the up internal register.

3. Modify the contents of any of the RAM location.

4. Move a block of data from one location to another location.

5. Insert one or more instructions in the user program.

6. Delete one or more instructions from the user program.

7. Relocate a program written for some memory area to some other memory area.

8. Fill a particular memory area with a constant.

9. Compare two block of memory.

10. Insert one or more data bytes in the user's program/data area.

11. Delete one or more data bytes from the user's program/data area.

12. Execute a program at full clock speed.

13. Execute a program in single step i.e. instruction by instruction.

Note: All the above commands can be operated through Serial mode provided.

HARDWARE DESCRIPTION

CPU:

The system has got 8085 as the Central Processing Unit. The clock frequency for the system is 3.07 MHz and is generated from a crystal of 6.14 MHz 8085 has got 8 data lines and 16 address lines. The lower 8 address lines and 8 bit data lines are multiplexed. Since the lower 8 address bits appear on the bus during the first clock cycle of a machine cycle and the 8 bit data appears on the bus during the 2nd and 3rd clock cycle, it becomes necessary to latch the lower 8 address bits during the first clock cycle so that the 16 bit address remains available in subsequent cycles. This is achieved using a latch 74-LS-373.

Memory:

NV5585 provides 8K bytes of CMOS RAM using 6264 chip and 8K bytes of Powerful Monitor EPROM.

This trainer has the facility for expanding RAM/ROM in the expansion socket. Total on board memory can be expanded up to 64K bytes.

I/O Devices:

The various I/O chips used in NV5585 are 8279, 8255, 8155 & 8253. The functional role of all these chips is given below:

8279 (Keyboard & Display Controller): 8279 is a general purpose programmable keyboard and display I/O interface device designed for use with the 8085 microprocessor. It provides a scanned interface to 28 contact key matrix provided in NV5585 and scanned interface for the six seven segment displays. 8279 has got 16 x 8 display RAM which can be loaded or interrogated by the CPU. When a key is pressed, its corresponding code is entered in the FIFO queue of 8279 and can now be read by the microprocessor. 8279 also refreshes the display RAM automatically.

8255 (Programmable Peripheral Interface):

8255 is a programmable peripheral interface (PPI) designed to use with 8085 Microprocessor. This basically acts as a general purpose I/O device to interface peripheral devices to the system bus. It is not necessary to have an external logic to interface with peripheral devices since the functional configuration of 8255 is programmed by the system software. It has got three Input/output ports of 8 lines each (PORT-A, PORT-B & PORT-C). Port C can be divided into two ports of 4 lines each named as Port C upper and Port C lower. Any Input/output combination of Port A, Port B, Port C upper and lower can be defined using the appropriate software commands.

8155 (Programmable I/O Port & Timer Interface):

8155 is a programmable I/O ports and timer interface designed to use with 8085 Microprocessor. The 8155 includes 256 bytes of R/W memory, three I/O ports and a Timer. This basically acts as a general purpose I/O device to interface peripheral equipment's to the system bus. It is not necessary to have an external logic to interface with peripheral devices since the functional configuration of 8155 is programmed by the system software. It has got two 8-bit parallel I/O port (Port-A, Port-B) and one 6-bit (Port-C). Ports A & B also can be programmed in the handshake mode, each port using three signals as handshake signals from Port-C. The timer is a 14 bit down counter and has four modes.

8253 (Programmable InternalTimer):

This chip is a programmable internal Timer/Counter and can be used for the generation of accurate time delays under software control. Various other functions that can be implemented with this chip are programmable rate generator, Even Counter, Binary rate Multiplier, Real Time Clock etc. This chip has got three in

dependent 16 bit counters each having a count rate of up to 2 KHz. The first Timer/Counter (i.e. Counter 0) is being used for Single Step operation. However, its connection is also brought at connector. For single step operation CLK0 signal of Counter 0 is getting a clock frequency of 1.535 MHz

Display:

NV5585 provides six digits of seven segment display. Four digits are for displaying the address of any location or name of any register, whereas the rest of the two digits are meant for displaying the contents of a memory location or of a register. All the six digits of the display are in hexadecimal notation.

KEYBOARD DESCRIPTION

NV5585 has 28 keys and six-seven segment display to communicate with the outside world. As NV5585 is switches on, a message '−NVS 85' is displayed on the display and all keys are in command mode. The key board is as shown below.

- RESET: Reset the system.
- VCT INT: Hardware interrupts via keyboard, RST 7.5.
- SHIFT: Provides a second level command to all keys.
- GO: To execute the program.
- SI: To execute the program in single step mode.
- EXREG: Examine Register; allows user to examine and modify the contents of different registers.
- EXMEM: Examine Memory; allows user to examine any memory location and modify any RAM location.
- PRE: Previous is used as an intermediate terminator in case of Examine Memory. It decrements the PC contents and writes the contents of data field to the address displayed in the address location.
- NEXT: Increment is used as a intermediate terminator in case of Examine Memory, Examine Register etc. It increments the PC Contents and writes the data lying in data field at the location displayed at address field.
- . : Terminator is used to terminate the command and write the data in data field at the location is played in address field.
- DEL: Delete the part of program or data, with relocation by one or more bytes.

- INS: Inserts the part of the program or data with relocation, by one or more bytes.
- B.M.: Allows user to move a block of memory to any RAM area.
- FILL: Allows user to fill RAM area with a constant.
- REL: Relocates a program written for some memory area and to be transferred to other memory area.
- INS DATA: Inserts one or more data bytes in the user's program/data area.
- DEL DATA: Deletes one or more data bytes from the user's program/data area.
- STRING: Not used
- MEMC: Memory Compare: Compares two blocks of memory for equality.
- 0-F: Hexadecimal Keys.

TASK. -04

AIM: Write a program to add two 8 bit numbers having sum 8 bits on 8085 Kit.

APPARATUS:

1. 8085 Kit

2. Adapter 1A (for Dyna Log Kit).

PROGRAM:

Memory Address	Machine Code	Labels	Mnemonics	Operands	Comments
4100	21,00,42		LXI	H, 4200H	Address of 1st No. in H-L pair
4103	7E		MOV	A,M	1st No. in A
4104	23		INX	H	Address of 2nd No. in H-L pair
4105	86		ADD	M	1st No. + 2nd No.
4106	32,50,42		STA	4250H	Store sum in 2503H
4109	76		HLT		End of program

DATA:

1. 4200 49

   4201 58

RESULT:

1. 4250 9F

TASK. -05

AIM: Write a program to add two 8 bit numbers having sum 16 bit on 8085 Kit.

APPARATUS:

1. 8085 Kit
2. Adapter 1A (for Dyna Log Kit).

PROGRAM:

Memory Address	Machine code	Labels	Mnemonics	Operands	Comments
4100	21,00,4200		LXI	H, 4200H	Address of 1st No. in H-L Pair
4103	0E,00		MVI	C,00	Initialize Reg. C for carry
4105	7E		MOV	A,M	1st No. in A
4106	23		INX	H	Address of 2nd No. in H-L Pair
4107	86		ADD	M	1st No. + 2nd No.
4108	D2,0C,20		JNC	XYZ	If no carry go to XYZ
410B	0C		INR	C	If carry , increment C
410C	32,50,42	XYZ	STA	4250H	LSB of sum in 4250
410F	79		MOV	A,C	Move MSB in A
4110	32,51,42		STA	4251H	MSB of sum in 4251
4113	76		HLT		

DATA :

1.	4200	98	2.	4200	45
	4201	9A		4251	56

RESULT:

1.	4250	32	2.	4250	9B
	4251	01		4251	00

TASK-06

AIM: Write a program to subtract two 8 bit numbers on 8085 Kit.

APPARATUS:

1. 8085 Kit

2. Adapter 1A (for Dyna Log Kit).

PROGRAM:

Memory Address	Machine code	Labels	Mnemonics	Operands	Comments
4100	21,00,42		LXI	H, 4200H	Address of 1st No. in H-L pair
4103	7E		MOV	A,M	1st No. in A
4104	23		INX	H	Address of 2nd No. in H-Lpair
4105	96		SUB	M	1st No. - 2nd No.
4106	32,50,42		STA	4250H	Store the result in 4250
4109	76		HLT		

DATA:

1.	4200	49	2.	4200	F8
	4201	32		4251	9B

RESULT:

1. 4250 17

2. 4250 5D

TASK-07

AIM: Write a program to find 1's compliment of 8 bit number

APPARATUS:

1. 8085 Kit
2. Adapter 1A (for Dyna Log Kit).

PROGRAM:

Memory Address	Machine code	Labels	Mnemonics	Operands	Comments
4100	3A,00,4200		LDA	4200H	Load 8 bit number into A from 4200
4103	2F		CMA		Compliment the A
4104	32,50,42		STA	4250H	Store result at 4250
4105	76		HLT		

DATA:

1. 4200 96 2. 4200 E4

RESULT:

1. 4250 69 2. 4250 1B

TASK-08

AIM: Write a program to find 1's compliment of 16 bit number.

APPARATUS:

1. 8085 Kit
2. Adapter 1A (for Dyna Log Kit).

PROGRAM:

Memory Address	Machine code	Labels	Mnemonics	Operands	Comments
4100	21,00,42		LXI	H, 4200H	Address of LSBs of No. in H-L pair
4103	7E		MOV	A,M	LSBs of No. in A
4104	2F		CMA	A	
4105	32,50,42		STA	4250H	LSBs of no at 4250
4108	23		INX	H	Increment address
4109	7E		MOV	A,M	Move MSBs in A
410A	2F		CMA	A	Compliment A

4110	32,51,42		STA	4251H	MSBs of sum in 4251
4113	76		HLT		

DATA :

1.	4200	85	2.	4200	7E
	4201	54		4251	89

RESULT:

1.	4250	7A	2.	4250	81
	4251	AB		4251	76

TASK- 09

AIM: Write a program to find 2's compliment of 8 bit number.

APPARATUS:

1. 8085 Kit
2. Adapter 1A (for Dyna Log Kit).

PROGRAM:

Memory Address	Machine code	Labels	Mnemonics	Operands	Comments
4100	3A,00,4200		LDA	4200H	Load 8 bit number into A from 4200
4103	2F		CMA		Compliment the A
4104	3C		INC	A	Add 01 to A

4104	32,50,42		STA	4250H	Store result at 4250
4105	76		HLT		

DATA :

1. 4200 96 2. 4200 E4

RESULT:

1. 4250 6A 2. 4250 1C

TASK- 10

AIM: Write a program to find 2's compliment of 16 bit number.

APPARATUS:

1. 8085 Kit
2. Adapter 1A (for Dyna Log Kit).

PROGRAM:

Memory Address	Machine code	Labels	Mnemonics	Operands	Comments
4100	21,00,42		LXI	H, 4200H	Address of LSBs of No. in H-L pair

4103	06,00		B,00		Use reg B for carry
4105	7E		MOV	A,M	LSBs of No. in A
4106	2F		CMA	A	
4107	C6,01		ADI	01	2's Compliment of LSBs
4109	32,50,42		STA	4250H	LSBs of no at 4250
410C	D2,10,41		JNC	GO	
410F	04		INR	B	Store Carry
4110	23	GO	INX	H	
4111	7E		MOV	A,M	Move MSBs in A
4112	2F		CMA	A	Compliment A
4113	80		ADD	B	Add Carry
4110	32,51,42		STA	4251H	MSBs of sum in 4251
4113	76		HLT		

DATA:

1.	4200	8C	2.	4200	00
	4201	5B		4251	5B

RESULT:

1.	4250	74	2.	4250	00
	4251	A4		4251	A5

TASK- 11

AIM: Write a program to shift 8 bit number by one bit.

APPARATUS:

1. 8085 Kit
2. Adapter 1A (for Dyna Log Kit).

PROGRAM:

Memor	Machine	Labels	Mnemonic	Operands	Comments

y Address	code		s		
4100	3A,00,42		LDA	4200H	Load 8 bit number into A from 4200
4103	87		ADD	A	Shift it left by one bit
4104	32,50,42		STA	4250H	Store result at 4250
4105	76		HLT		

DATA:

1. 4200 65 2. 4200 05

RESULT:

1. 4250 CA 2. 4250 0A

TASK-12

AIM: Write a program to shift 16 bit number by one bit.

APPARATUS:

1. 8085 Kit
2. Adapter 1A (for Dyna Log Kit).

PROGRAM:

Memory Address	Machine code	Labels	Mnemonics	Operands	Comments
4100	2A,00,42		LHLD	4200H	Get data in H-L pair
4103	29		DAD	H	Shift it left by one bit
4104	22,50,42		SHLD	4250H	Store result at 4250
4105	76		HLT		

DATA:

1.	4200	96	2.	4200	BF
	4201	75		4201	00

RESULT:

1.	4250	2C	2.	4250	7E
	4251	EB			01

TASK-13

AIM: Write a program to find largest of two 8 bit numbers.

APPARATUS:

1. 8085 Kit

2. Adapter 1A (for Dyna Log Kit).

PROGRAM:

Memory Address	Machine code	Labels	Mnemonics	Operands	Comments
4100	21,00,42		LXI	H, 4200H	Address of 1st no. in H-L Pair
4103	7E		MOV	A,M	1st no. in A
4104	23		INX	H	Address of 2nd no. in H-L Pair
4105	BE		CMP	M	Compare 2nd no with 1st no.
4106	D2,0A,41		JNC	GO	If no carry, no in A (1st no) is greater
4109	7E		MOV	A,M	2nd no. is greater
410A	32,51,42	GO	STA	4251H	Store larger no in 4250
4113	76		HLT		

DATA:

1.	4200	98	2.	4200	A9
	4201	87		4251	EB

RESULT:

1.	4250	98	2.	4250	EB

TASK-14

AIM: Write a program to find largest among array of ten numbers.

APPARATUS:

1. 8085 Kit.
2. Adapter 1A (for Dyna Log Kit).

PROGRAM:

Memory Address	Machine code	Labels	Mnemonics	Operands	Comments
4100	21,00,42		LXI	H, 4200H	Address of 1st no. in H-L pair
4103	0E,0A		MVI	C, 0A	Use reg C as counter
4105	7E		MOV	A,M	Move 1st no in A
4106	0D		DCR	C	Decrement the counter
4107	23	LOOP	INX	H	Address of 2nd no. in H-L pair
4108	BE		CMP	M	Compare 2nd no with 1st no.
4109	D2,0D,41		JNC	GO	If no carry, no in A (1st no) is greater
410C	7E		MOV	A,M	2nd no. is greater
410D	0D	GO	DCR	C	
410E	C2,07,41		JNZ	LOOP	
4111	32,50,42		STA	4250 H	Store larger no in 4250
4114	76		HLT		

DATA:

1. 4200	0A	1. 4200	AA
4201	0C	4201	AC
4202	05	4202	05
4203	09	4203	09
4204	06	4204	06
4205	02	4205	AE
4206	0E	4206	0E
4207	03	4207	03
4208	0F	4208	0F

4209 04 4209 04

RESULT:

1. 4250 0F 2. 4250 AE

TASK-15

AIM: Write a program to find sum of series of five 8 bit numbers.

APPARATUS:

1. 8085 Kit.
2. Adapter 1A (for Dyna Log Kit).

PROGRAM:

Memory Address	Machine code	Labels	Mnemonics	Operands	Comments
4100	21,00,42		LXI	H, 4200H	Address of 1st no. in H-L Pair
4103	0E,05		MVI	C, 05	Use reg C as counter
4105	3E,00		MVI	A,00	Initialize sum
4107	23	LOOP	INX	H	Address of 2nd no. in H-L Pair
4108	86		ADD	M	Add sum +next number
4109	0D		DCR	C	Decrement the counter
410A	C2,07,41		JNZ	LOOP	Repeat until count <>0
410D	32,50,42		STA	4250 H	Store sum in 4250
4114	76		HLT		

DATA:

1. 4200	04	2. 4200	03
4201	16	4201	02
4202	2B	4202	01
4203	39	4203	04
4204	12	4204	05

RESULT:

1. 4250 8C 2. 4250 0F

TASK-16

AIM: 8-bit binary multiplication.

APPARATUS: 8085 Kit.

Adapter 1A (for Dyna Log Kit).

PROGRAM:

Memory Address	Machine code	Labels	Mnemonics	Operands	Comments
			LXI	H,20C1	Get address of mulyiplicand in HL pair
			MOV	C,M	Multiplicand in register CX
			INX	H	Get address of multiplier in HL pair
			MVI	A,00	Product=00
		NEXT	ADD	M	Product=product + multiplier
			DCR	C	Decrement multiplicand
			JNZ	NEXT	Is multiplicand=00 no, jump to label next
			STA	20C0	Yes store result
			HLT		Stop program execution

DATA:

20C1
20C2

RESULT:

20C0

TASK-17

AIM: Program for binary division

APPARATUS:

8085 Kit.
Adapter 1A (for Dyna Log Kit).

PROGRAM:

Memory Address	Machine code	Labels	Mnemonics	Operands	Comments
			MVI	C,00	Initialize C register for quotient
			LXI	H,20C2	Get address of dividend in HL pair
			MOV	A,M	Load Dividend in accumulator
			INX	H	Get address of divisor in HL pair
		AGAIN	SUB	M	Subtract divisor from dividend
			JC	NEXT	Is Dividend <Divisor?
			INR	C	No, increment quotient
			MOV	B,A	Store remainder in B register
			JMP	AGAIN	Jump to label again

		NEXT	MOV	A,B	Yes move remainder in accumulator
			STA	20C1	Store remainder in memory
			MOV	A,C	Move quotient in accumulator
			STA	20C0	Store quotient in memory
			HLT		Stop program execution

DATA:

20C0 (quotient)

20C1 (Remainder)

RESULT:

20C2(Dividend)
20C3(Divisor)