UNIT I
ARCHITECTURE OF 8086 MICROPROCESSOR

1. What is microprocessor? Give the power supply & clock frequency of 8085

A microprocessor is a program controlled semiconductor device (IC), which fetches, decode and executes instructions. It is a multipurpose, programmable logic device that reads binary instructions from a storage device called memory accepts binary data. As input and processes data according to those instructions and provides result as output. The power of 8085 is +5v and clock frequency in 3MHZ.

2. What is Software and Hardware?

The Software is a set of instructions or commands needed for performing a specific task by a programmable device or a computing machine. The Hardware refers to the components or devices used to form computing machine in which the software can be run and tested. Without software the Hardware is an idle machine.

3. What happens to the 8085 processor when it is resetted?

When the 8085 processor is resetted it execute the first instruction at the OOOOH location. The 8085 resets (clears) instruction register, interrupt mask bits and other registers.

4. What is a bus?

Bus is a group of conducting lines that carries data, address and control signals.

5. List the allowed register pairs of 8085.

B-C register pair D-C register pair H-L register pair.

6. Mention the purpose of SID and SOD lines

SID(serial input data line): It is an input line through which the microprocessor accepts serial data.

SOD(serial output data line): It is an output line through which the microprocessor sends output serial data.

7. What are the functions of an accumulator?

The accumulator is the register associated with the ALU operations and sometimes I/O operations. It is an integral part of ALU. It holds one of data to be processed by ALU. It also temporarily stores the result of the operation performed by the ALU.

8. What is an opcode ?

The part of the instruction that specifies the operation to be performed is called the operation code or opcode.

9. What are the operations performed by ALU of 8085?

The operations performed by ALU of 8085 are Addition, Subtraction, Logical AND, OR, Exclusive OR, Compare Complement, Increment, Decrement and Left I Right shift

10. List the 16 – bit registers of 8085 microprossor.

Stack pointer (SP) and program counter(PC).

11. List the allowed register pairs of 8085.

B-C register pair D-C register pair H-L register pair.

12. What is a flag?

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

13. What is the function of IO/M signal in the 8085?

It is a status signal. It is used to differentiate between memory locations and I/O operations when this signal is low (IO/M=0) it denotes the memory related operations. When this signal is high (IO/M=1), it denotes an I/O operation

14. What is meant by wait state?

This state is used by slow peripheral devices. The peripheral devices can transfer the data to or from the microprocessor by using READY input line. The microprocessor remains in the wait state as long as READY line is low. During the wait state, the contents of the address, address/data and control buses are held constant.

15. Why data bus is bi-directional?

The microprocessor has to fetch (read) the data from memory or input device for processing and after processing, it has to store (write) the data to memory or output device. Hence the data bus is bi-directional.

16. Why address bus is unidirectional?

The address is an identification number used by the microprocessor to identify or access a memory location or I / O device. It is an output signal from the processor. Hence the address bus is unidirectional.

17. Steps involved to fetch a byte in 8085?

i) The pc places the 16-bit memory address on the address bus
ii) The control unit sends the control signal RD to enable the memory chip
iii) The byte from the memory location is placed on the data bus
iv) The byte is placed in the instruction decoder of the microprocessor and the task is carried out according to the instruction.

18. Basic concepts in the memory interfacing?

The primary function of memory interfacing is that the microprocessor should be able to read from and write into a given register of a memory chip.to perform these operations the microprocessor should,

1. Be able to select the chip 2. Identify the register 3.Enable the appropriate buffer

19. What is the need for system clock and how it is generated in 8085?

The system clock is necessary for synchronizing various internal operations or devices in the microprocessor and to synchronize the microprocessor with other peripherals in the system.

20. What is a port?

The port is a buffered I/O, which is used to hold the data transmitted from the microprocessor to I/O device or vice-versa.

21. What is the need for Port?

The I/O devices are generally slow devices and their timing characteristics do not match with processor timings. Hence the I/O devices are connected to system bus through the ports.

22. What are the Processor control instructions?

Machine control instructions are used to control the operation of processor. EI, DI, NOP, HLT, SIM, RIM are the Processor control instructions.

23. What is the signal classification of 8085?

All the signals of 8085 can be classified into 6 groups: 1. Address bus 2. Data bus 3. Control and status signals 4. Power supply and frequency signals 5. Externally initiated signals 6. Serial I/O ports

24. What is processor cycle (Machine cycle)?

The processor cycle or machine cycle is the basic operation performed by the processor. To execute an instruction, the processor will run one or more machine cycles in a particular order.

25. What is Instruction cycle?

The sequence of operations that a processor has to carry out while executing the instruction is called Instruction cycle. Each instruction cycle of a processor indium consists of a number of machine cycles.

26. What is fetch and execute cycle?

In general, the instruction cycle of an instruction can be divided into fetch and execute cycles. The fetch cycle is executed to fetch the opcode from memory. The execute cycle is executed to decode the instruction and to perform the work instructed by the instruction.

27. Steps involved to fetch a byte in 8085?

i) The pc places the 16-bit memory address on the address bus
ii) The control unit sends the control signal RD to enable the memory chip
iii) The byte from the memory location is placed on the data bus
iv) The byte is placed in the instruction decoder of the microprocessor and the task is carried out according to the instruction.

28. Define instruction cycle, machine cycle and T-state?

Instruction cycle is defined as the time required completing the execution of an instruction.

Machine cycle is defined as the time required completing one operation of accessing memory, I/O or acknowledging an external request cycle is defined as one subdivision of the operation performed in one clock period.

29. Why status signals are provided in microprocessor?

The status signals can be used by the system designer to track the internal operations of the processor. Also, it can be used for memory expansion (by providing separate memory banks for program & data and selecting the bank using status signals).

30. How many machine cycles does 8085 have, mention them?

The 8085 have seven machine cycles they are : 1. Opcode fetch 2. Memory read 3. Memory write 4. I/O read 5. I/O write 6. Interrupt acknowledge 7. Bus idle

31. Steps involved to fetch a byte in 8085?

HOLD indicates that a peripheral such a DMA controller is requesting the use of address bus, data bus and control bus.

READY is used to delay the microprocessor read or write cycles until a slow responding peripheral is ready to accept or send data.

SID is used to accept serial data bit by bit.

32. Define flags?

The flags are used to reflect the data conditions in the accumulator. The 8085 flags are

SIGN FLAG, ZERO FLAG, AUXILIARY FLAG, PARITY FLAG, CARRY FLAG

D7	D6	D5	D4	D3	D2	D1	D0
S	Z		AC		P		CY

33. What is interfacing?

An interface is a shared boundary between the devices which involves sharing information. Interfacing is the process of making two different systems communicate with each other.

34. What is memory mapping?

The assignment of memory address to various registers in a memory chip is called as memory mapping.

35. What is I/O mapping?

The assignment of addresses to various I/O devices in the memory chip is called as I/O mapping.

36. Difference between memory mapped I/O and peripheral I/O?

MEMORY MAPPEED I/O	PERIPHERAL I/O
16-bit device address	8-bit device address
The data transfer between any general-purpose register and I/O port	The data transfer only between accumulator and I/O port
The memory map(64kb)is shared between I/O device and system memory	The I/O map is independent of the memory map,256 input device and 256 output device
More hardware is required to decode 16-bit address	Less hardware is required to decode 8-bit address

37. Define pipelining?

To speedup the execution of program, the instructions fetching and execution of instructions are overlapped each other. This technique is known as pipelining. In pipelining, when then the instruction is executed, the n+1 the instruction is fetched and thus the processing speed is increased.

38. Discuss the function of instruction queue ?

A 6-byte instruction queue is presented at the Bus Interface Unit (BIU). It is used to pre- fetch and store at the maximum of 6 bytes of instruction code from the memory. Due to this, overlapping instruction fetch with instruction execution increases the processing speed.

39. What are the basic units of microprocessor?

The basic units or blocks of a microprocessor are ALU, an array of registers and control unit

40. Explain the process control instructions

STC – It sets the carry flag & does not affect any other flag
CLC – it resets the carry flag to zero &does not affect any other flag
CMC – It complements the carry flag & does not affect any other flag
STD – It sets the direction flag to 1 so that SI and/or DI can be decremented automatically after execution of string instruction & does not affect other flags
CLD – It resets the direction flag to 0 so that SI and/or DI can be incremented automatically after execution of string instruction & does not affect other flags
STI – Sets the interrupt flag to 1. Enables INTR of 8086.
CLI – Resets the interrupt flagto0. 8086 will not respond to INTR.

41 What is the use of ALE?

The ALE is used to latch the lower order address so that it can be available in T2 and T3 and used for identifying the memory address. During T1 the ALE goes high, the latch is transparent ie, the output changes according to the input data, so the output of the latch is the lower order address. When ALE goes low, the lower order address is latched until the next ALE.

42. Explain the function of ALE in the 8085 architecture? (or) How address and data lines are demultiplexed?

The ALE signal goes high at the beginning of each machine cycle indicating the availability of the address on the address bus, and the signal is used to latch the low-order address bus(A0-A7) by demultiplexing the address/data bus(AD0-AD7),which are multiplexed.

43. What is the function of HOLD and HLDA?

HOLD- It indicates when another device is requesting the use of address and data bus(like DMA controller). HLDA(Hold Acknowledge)- It indicates that HOLD request has been received. After the removal of HOLD request the HLDA goes low.

44. What is the purpose of READY and TRAP pins in 8085 Microprocessor?

READY- It is used to interface slow speed peripherals with microprocessor. TRAP- Vectored and non-maskable hardware interrupt.

45. If a 6Mhz crystal is connected with 8085, how much is the time taken by 8085 to complete opcode fetch cycle and memory read cycle?

Clock frequency = crystal frequency / 2 = 6 Mhz/2 =3Mhz One T-state = 1/ clock freq =1/(3X106) = 0.333µsec

Time for opcode fetch cycle = 4 Xµs 0.33= 1.332 µsec Time for memory read cycle= 43X 0.33=0.999 µsec.

46. Specify the five control signals commonly used by the 8085 MPU.

1. RD-Read signal
2. WR- Write signal
3. READY- Ready signal
4. ALE- Address Latch Enable
5. CLK OUT –Clock Out Signal

47. What is the difference between Opcode and Operand?

Opcode is the part of an instruction that identifies a specific operation.

Operand is a part of an instruction that represents a value on which the instruction acts.

Example: MVI A ,18H

MVI A is Opcode and 18 H is Operand.

48. Why data bus is bi-directional?

The microprocessor has to fetch (read) the date from memory or input device for processing and after processing, it has to store (Write) the data to memory or output device. Hence the data bus is bi-directional. i.e. data flow from the MPU (microprocessor unit)to peripherals or peripherals to MPU.

49. What is the need for timing diagram?

The timing diagram provides information regarding the status of various signals, when a machine cycle is executed. The knowledge of timing diagram is essential for system designer to select matched peripheral devices like memories, latches, ports, etc., to form a microprocessor system.

50. How many machine cycles constitute one instruction cycle in 8085?

Each instruction of the 8085 processor consists of one to five machine cycles.

51. Define (a) Instruction Cycle (b) M/C Cycle (c) T-state

Instruction cycle : Time required to complete the execution of an instruction. One instruction cycle consists of 3 to 6 machine cycles.

Machine cycle: Time required to complete one operation of accessing memory or I/O device. One machine cycle consists of 3 to 6 T-states.

T-State: The portion of the operation performed in one clock period.

52. What is an interrupt?

Interrupt is a signal send by an external device to the processor so as to request the processor to perform a particular task or work.

53. What is Software interrupts?

The Software interrupts are program instructions. These instructions are inserted at desired locations in a program. While running a program, if software interrupt instruction is encountered then the processor executes an interrupt service routine.

54. What is Hardware interrupt?

If an interrupt is initiated in a processor by an appropriate signal at the interrupt pin, then the interrupt is called Hardware interrupt.

55. What is Vectored and Non- Vectored interrupt?

When an interrupt is accepted, if the processor control branches to a specific address defined by the manufacturer then the interrupt is called vectored interrupt. In Non-vectored interrupt there is no specific address for storing the interrupt service routine. Hence the interrupted device should give the address of the interrupt service routine.

56. What is masking and why it is required?

Masking is preventing the interrupt from disturbing the current program execution. When the processor is performing an important job (process) and if the process should not be interrupted then all the interrupts should be masked or disabled. In processor with multiple 'interrupts, the lower priority interrupt can be masked so as to prevent it from interrupting, the execution of interrupt service routine of higher priority interrupt.

57. What is interrupt acknowledge cycle?

The interrupt acknowledge cycle is a machine cycle executed by 8085 processor to get the address of the interrupt service routine in-order to service the interrupt device.

58. Explain priority interrupts of 8085?

The 8085 microprocessor has five interrupt inputs. They are TRAP, RST 7.5,RST 6.5,RST 5.5,and INTR. These interrupts have a fixed priority of interrupt service. If two or more interrupts go high at the same time, the 8085 will service them on priority basis. The TRAP has the highest priority followed by RST7.5, RST6.5, RST5.5. The priority of interrupts in 8085 is shown below.

Interrupts	Priority
TRAP	1
RST7.5	2
RST6.5	3
RST5.5	4
INTR	5