

Computer Organization and Architecture

1. What is a Microprocessor?

Microprocessor is a CPU fabricated on a single chip, program-controlled device, which fetches the instructions from memory, decodes and executes the instructions.

2. What is Instruction Set?

It is the set of the instructions that the Microprocessor can execute.

3. What is Band width ?

The number of bits processed by the processor in a single instruction.

4. What is Clock speed ?

Clock speed is measured in the MHz and it determines that how many instructions a processor can processed. The speed of the microprocessor is measured in the MHz or GHz.

6. What is Logical Address?

A memory address on the 8086 consists of two numbers, usually written in hexadecimal and separated by a colon, representing the segment and the offset. This combination of segment and offset is referred to as a logical address

- Logical address=segment: offset

7. What is The Effective Address:

- In general, memory accesses take the form of the following example:
- `Mov ax, [base Reg + index Reg + constant]`
- This example copies a word sized value into the register AX.
- Combined, the three parameters in brackets determine what is called the effective address, which is simply the offset referenced by the instruction

8. What is Physical Address?

Physical memory address pointed by SEGMENT:OFFSET pair is calculated as:

Physical address = ($\text{<Segment Addr>} * 10$) + <Offset Addr>

9. Why crystal is a preferred clock source?

Because of high stability, large Q (Quality Factor) & the frequency that doesn't drift with aging. Crystal is used as a clock source most of the times.

10. What is Tri-state logic?

Three Logic Levels are used and they are High, Low, High impedance state. The high and low are normal logic levels & high impedance state is electrical open circuit conditions. Tri-state logic has a third line called enable line.

11. What happens when HLT instruction is executed in processor?

The Micro Processor enters into Halt-State and the buses are tri-stated.

12. What is Program counter?

Program counter holds the address of either the first byte of the next instruction to be fetched for execution or the address of the next byte of a multi byte instruction, which has not been completely fetched. In both the cases it gets incremented automatically one by one as the instruction bytes get fetched. Also Program register keeps the address of the next instruction.

13. How many bit combinations are there in a byte?

Byte contains 8 combinations of bits.

14. Have you studied buses? What types of Buses are there?

There are three types of buses.

Address bus: This is used to carry the Address to the memory to fetch either Instruction or Data.

Data bus : This is used to carry the Data from the memory.

Control bus : This is used to carry the Control signals like RD/WR, Select etc.

15. What is the Maximum clock frequency in 8086?

An 5 Mhz is the Maximum clock frequency in 8086.

16. What is meant by Maskable interrupts?

An interrupt that can be turned off by the programmer is known as Maskable interrupt.

17.What is Non-Maskable interrupts?

An interrupt which can be never be turned off (ie. disabled) is known as Non-Maskable interrupt

18.What are the different functional units in 8086?

Bus Interface Unit and Execution unit, are the two different functional units in 8086.

19.What are the various segment registers in 8086?

Code, Data, Stack, Extra Segment registers in 8086.

20.What does EU do?

Execution Unit receives program instruction codes and data from BIU, executes these instructions and store the result in general registers.

21.what is the principle of stack used in 8086?

FIFO (First In First Out) stack is used in 8086.In this type of Stack the first stored information is retrieved first.

22.What are the flags in 8086?

In 8086 Carry flag, Parity flag, Auxiliary carry flag, Zero flag, Overflow flag, Trace flag, Interrupt flag, Direction flag, and Sign flag.

23.What is SIM and RIM instructions?

SIM is Set Interrupt Mask. Used to mask the hardware interrupts.

RIM is Read Interrupt Mask. Used to check whether the interrupt is Masked or not.

24.What are the different types of Addressing Modes?

A:- There are 12 different types of Addressing Modes.They are:-

1.Immediate:-The Immediate data is a part of instruction, and appears in the form of successive bytes.

2. Direct:-A 16-bit memory address(offset) is directly specified in the instruction as a part of it.
- 3.Register:-Data is stored in a register and it is referred using the particular register (except IP).
- 4.Register Indirect:-The address of the memory location which contains data or operand is determined in an indirect way.
5. Indexed:-offset of the operand is stored in one of the index registers.
6. Register Relative:-The data is available at an effective address formed by adding an 8-bit or 16-bit displacement with the content of any one of the registers BX,BP,SI and DI in the default (either DS or ES) segment.
7. Based Indexed:-The effective address of the data is formed,in this addressing mode,by adding content of a base register to the content of an index register.
- 8.Relative Based Indexed:- The effective address is formed by adding an 8 or 16-bit displacement with the sum of contents of any one of the base registers and any one of the index registers,in the default segment.
- 9.Intrasegment Direct Mode:-In this mode,the address to which the control is to be transferred lies in the segment in which the control transfer instruction lies and appears directly in the instruction as an immediate displacement value.
10. Intrasegment Indirect Mode:-In this mode,the displacement to which the control is to be transferred,is in the same segment in which the control transfer instruction lies,but it is passed to the instruction indirectly.
11. Intersegment Direct:-In this mode,the address to which the control is to be transferred is in a different segment.
12. Intersegment Indirect:-In this mode,the address to which the control is to be transferred lies in a different segment and it is passed to the instruction indirectly sequentially.

25.What are the General Data Registers & their uses?

The Registers AX,BX,CX,DX are the general Purpose 16-bit registers.AX register as 16-bit accumulator.BX register is used as an offset Storage.CX register is used as default or implied counter.Dx register is used as an implicit operand or destination in case of a few instructions.

26. What are Segment Registers & their uses?

There are 4 Segment Registers Code Segment(CS), Data Segment(DS), Extra Segment(ES) & Stack Segment(SS) registers. CS is used for addressing memory location in code. DS is used to point to the data. ES refers to a segment which is essentially in another data segment. SS is used for addressing stack segment of memory.

27. What are Flag registers?

Divided into 2 parts:- Condition code or status flags and machine control flags.

S-Sign Flag:- Is set when the result of any computation is negative.

Z-Zero Flag:- Is set if the result of the computation or comparison performed by the previous instruction is zero.

C-Carry Flag:- Is set when there is carry out of MSB in case of addition or a borrow in case of subtraction.

T-Trap Flag:- Is set, the processor enters the single step execution mode.

I-Interrupt Flag:- Is set, the maskable interrupts are recognised by the CPU.

D-Direction Flag:- Is set for autoincrementing or autodecrementing mode in string manipulation instructions.

AC-Auxiliary Carry Flag:- Is set if there is a carry from the lowest nibble during addition or borrow for the lowest nibble.

O-Overflow Flag:- Is set if the result of a signed operation is large enough to be accommodated in a destination register.

28. What does the 8086 Architecture contain?

A:- The complete architecture of 8086 can be divided into 2 types :- Bus Interface Unit(BIU) & Execution Unit.

The BIU contains the circuit for physical address calculations and a precoding instruction byte queue & it makes the bus signals available for external interfacing of the devices.

The EU contains the register set of 8086 except segment registers and IP. It has a 16-bit ALU, able to perform arithmetic and Logic operations.

29. What is an Interrupt?

Interrupt is an external signal that causes a microprocessor to jump to a specific subroutine.

An interrupt operation suspends execution of a program so that the system can take special action. The interrupt routine executes and normally returns control to the interrupted procedure, which then resumes execution. BIOS handles Int 00H-1FH, whereas DOS handles INT 20H-3FH.

30. What is an Opcode?

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

31. What is an Operand?

The data on which the operation is to be performed is called as an Operand.

32. Explain the difference between a JMP and CALL instruction?

A JMP instruction permanently changes the program counter.

A CALL instruction leaves information on the stack so that the original program execution sequence can be resumed.

33. What is meant by Polling?

Polling or device Polling is a process which identifies the device that has interrupted the microprocessor.

34. What is an Instruction?

An instruction is a binary pattern entered through an input device to command the microprocessor to perform that specific function.

35. What is Assembler?

The assembler translates the assembly language program text which is given as input to the assembler to their binary equivalents known as object code.

The time required to translate the assembly code to object code is called access time. The assembler checks for syntax errors & displays them before giving the object code.

36. Define Pipelining?

In 8086, to speed up the execution program, the instructions fetching and execution of instructions are overlapped each other. This is known as Pipelining.

37. What is the use of HLDA?

HLDA is the acknowledgment signal for HOLD. It indicates whether the HOLD signal is received or not.

HOLD and HLDA are used as the control signals for DMA operations.

38. Explain about "LEA"?

LEA (Load Effective Address) is used for initializing a register with an offset address.

A common use for LEA is to initialize an offset in BX, DI or SI for indexing an address in memory.

An equivalent operation to LEA is MOV with the OFFSET operator, which generates slightly shorter machine code.

39. Difference between "Shift" and "Rotate".

Shift and Rotate commands are used to convert a number to another form where some bits are shifted or rotated.

A rotate instruction is a closed loop instruction. That is, the data moved out at one end is put back in at the other end.

The shift instruction loses the data that is moved out of the last bit locations.

Basic difference between shift and rotate is shift command makes "fall of " bits at the end of the register.

Where rotate command makes "wrap around" at the end of the register.

40.Difference between JMP and JNC?

JMP is Unconditional Branch.

JNC is Conditional Branch.

41.List the String Manipulation Commands?

REP=Repeat.

MOVS=Move Byte/Word

CMPS=Compare Byte/Word

SCAS=Scan Byte/Word

LODS=Load byte/Wd to AL/AX

STOS=Stor Byte/Wd from AL/A

42.What is the main use of ready pin?

READY is used by the microprocessor to check whether a peripheral is ready to accept or transfer data.

A peripheral may be a LCD display or analog to digital converter or any other.

These peripherals are connected to microprocessor using the READY pin.

If READY is high then the periphery is ready for data transfer. If not the microprocessor waits until READY goes high.

43.Explain about Direction Flag?

This is used by string manipulation instructions.

If this flag bit is 0 , the string is processed beginning from the lowest to the highest address ,i.e.,.Auto increment mode.

Otherwise,the string is processed from the highest towards the lowest address,i.e.,.Auto decrementing mode.

44.What are the basic units of a microprocessor ?

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