

2. 8085 Architecture

Multiple-choice questions

1. Which of the following interrupt has lowest priority?
 - a) TRAP
 - b) INTR
 - c) RST 7.5
 - d) RST 5.5

Ans: b

2. The SID pin is used to input data serially into
 - a) the microprocessor
 - b) an output port
 - c) an input port
 - d) memory

Ans: a

3. When the result of an arithmetic or logical operation is zero, the zero flag is set to
 - a) 0
 - b) 1
 - c) Z
 - d) X

Ans: b

4. When the result of an arithmetic or logical operation has even number of 1s, then the parity flag is set to
 - a) 0
 - b) 1
 - c) Z
 - d) X

Ans: b

5. Sign flag is set to 1 when
- a) the result of an arithmetic operation is positive
 - b) the result of an arithmetic operation is negative
 - c) the accumulator has 1 in the most significant bit
 - d) none of the above

Ans: c

6. LXI B, 1234 will store
- a) 34H in B register & 12H in C register
 - b) 12H in B register & 34H in C register
 - c) 1234H in B register
 - d) the data pointed by 1234H in B register

Ans: b

7. When the processor is reset, the program counter in 8085 is set to
- a) FFFFH
 - b) 1111H
 - c) 0000H
 - d) XXXXH

Ans: c

8. In the Direct Memory Access (DMA)
- a) the microprocessor directly access the memory
 - b) one memory device directly access another memory device bypassing I/O devices
 - c) I/O devices directly access the memory bypassing the microprocessor
 - d) All the three

Ans: c

9. How many memory locations can be addressed by a microprocessor with sixteen address lines?
- a) 65536
 - b) 64000
 - c) 16000
 - d) 64512

Ans: a

10. The maximum integer that can be stored on an 8-bit accumulator is
- a) 255
 - b) 256
 - c) 16KB
 - d) 8 bits

Ans: a

11. A 32-bit microprocessor has word length equal to
- a) 32 bytes
 - b) 16 bytes
 - c) 8 bytes
 - d) 4 bytes

Ans: d

12. How many address lines are necessary to address 1 Megabytes of memory
- a) 10
 - b) 20
 - c) 16
 - d) 8

ans: b

13. While executing a program, after the 8085 microprocessor fetched the machine code located at the memory address 4100H, the contents of the program counter will be
- a) 4101H
 - b) 4100H
 - c) 00H
 - d) 1011 1111 1010 0000 B

Ans: a

14. Specify the crystal frequency required for an 8085 system to operate at 1.1 MHz
- a) 1.1 MHz
 - b) 2.2 MHz
 - c) 3.14 MHz
 - d) 6.14 MHz

Ans: b

15. The frequency of the driving network connected between pin 1 and 2 of 8085 chip must be

- a) Twice the desired clock frequency
- b) Equal to the desired clock frequency
- c) Thrice the clock frequency
- d) None of the above

Ans: a

16. Assume that the memory location 4100H has a data byte 3EH. Specify the contents of the address bus A15 - A8 and the multiplexed bus AD7 - AD0 when the MPU reads that location.

- a) 4 1 0 0 H
- b) 0100 0001 0000 0001 B
- c) 0100 0001 0000 0000 B
- d) 0100 0001 0011 1110 B

Ans: d

17. Which of the following is not correct?

Multiplexing in microprocessor does not

- a) reduce the pin requirement.
- b) require additional hardware
- c) improve the processor's performance
- d) slower the system operation

Ans: c

18. Which of the following is not correct?

The X1 and X2 pins of 8085 can be connected to

- a) an external Quartz crystal.
- b) an RC circuit
- c) an LC circuit
- d) +5V and GND respectively..

Ans: d

19. The number of flags in 8085 is

- a) 5
- b) 6
- c) 8
- d) 16

Ans: a

20. An instruction cycle is made up of
- a) One or more execute cycle
 - b) One or more fetch cycles
 - c) One opcode and one execute cycle
 - d) One fetch cycle and one or more execute cycle

Ans: d

21. Opcode fetch cycle can have a maximum of
- a) 3 T states
 - b) 4 T states
 - c) 6 T states
 - d) 18 T states

Ans: c

22. An opcode
- a) Translates a mnemonic
 - b) Instructs the processor
 - c) Stores data
 - d) All the above

Ans: b

23. The minimum number of clock cycles in a machine cycle of 8085 is
- a) 3
 - b) 4
 - c) 6
 - d) 1

Ans: a

24. Which of the following is not happening in the bus idle cycle of 8085?
- a) Status signals S_0 and S_1 are made low
 - b) Address and data pins are driven to high impedance state
 - c) Requires 6 T states
 - d) Ready signal is sampled at T_2 state of this cycle.

Ans: d

25. When 8085 executes I/O read or write cycle, 8-bit port address is available on
- a) Lower order address bus
 - b) Higher order address bus
 - c) Both lower order and higher order address bus
 - d) Data bus

Ans: c

26. The following signal is used to identify that the contents of the multiplexed AD bus is an address.

- a) IO/M
- b) Status signals
- c) ALE
- d) HOLD and HLDA
- e) None of these

Ans: c

27. How many general purpose registers are there in 8085 microprocessors?

- a) 4
- b) 10
- c) 32
- d) 8

Ans: d

28. The Program Counter in a microprocessor

- a) Counts the number of instructions executed in a program
- b) Counts the number of programs run by the processor
- c) Points to the next executable instruction
- d) Points to the present or next executable instruction

Ans: d

29. The Program Counter is incremented

- a) at the end of the program
- b) at T2 state
- c) at T4 state of a machine cycle
- d) at the end of an instruction cycle

Ans: b

30. The register which keeps track of the execution of a program and which contains the memory address of the instruction currently being executed is called

- a) Instruction register
- b) Program Counter
- c) Memory address register
- d) Instruction decoder
- e) Index register

Ans: b

31. The flow and timing of data to and from the microprocessor is regulated by
- a) Data pins
 - b) Address pins
 - c) Control pins
 - d) Interrupt pins

Ans: c

32. Which of the following signal is used when a peripheral device request the microprocessor to have DMA operation
- a) IO/**M**
 - b) READY
 - c) HOLD and HLDA
 - d) **RD** and **WR**

Ans: c

33. In microprocessor architecture, flag indicates
- a) The number of microprocessor
 - b) The name of the manufacturer
 - c) The internal status of the processor
 - d) The bit size of the processor

Ans: c

34. To transfer one byte from memory to microprocessor, the number of machine cycles required will be
- a) 1
 - b) 2
 - c) 3
 - d) 4

Ans: a

35. Number of machine cycles required for RET instruction in 8085 microprocessor is
- a) 1
 - b) 2
 - c) 3
 - d) 4

Ans: c

36. The data bus in 8085 microprocessor is a group of
- a) Eight bi-directional lines that are used to transfer 8 bits between the microprocessor and its I/O and memory
 - b) Eight lines used to transfer data among the registers
 - c) Eight unidirectional lines that are used for I/O devices
 - d) Sixteen bi-directional lines that are used for data transfer between the microprocessor and memory

Ans: a

Fill in the blanks

37. When a byte of instruction is fetched by 8085 microprocessor, the program counter holds the address of _____ or the address of _____.

Ans: next byte of instruction, next instruction

38. The processor memory refers to the _____

Ans: processor registers

39. If IO/**M**, S1 and S0 signals are 0,1,1 respectively then the operation performed by 8085 is _____.

Ans: opcode fetch

40. The _____ T state of machine cycle is used for address latching

Ans: first

41. With reference to clock generation in 8085, the _____ circuit is provided internally but requires a feed back circuit to be connected externally.

Ans: Oscillator

42. To operate 8085 at 3 MHz, a crystal of frequency _____ is required.

Ans: 6 MHz

43. The machine cycle, which is lengthier in 8085 is _____ cycle.

Ans: opcode fetch

44. During the last T state of the opcode fetch cycle of 8085 the address and data line will be at _____ state.

Ans: high impedance

45. _____ Machine cycle is executed when extra time is needed for an internal operation of the processor.

Ans: Bus idle

46. The second machine cycle of MOV B,M instruction is a _____ cycle and it uses the control signals _____ and _____.
Ans: memory read, **RD** = 0 , IO/**M** =0

Say true or false

47. The opcode fetch machine cycle of all instructions in 8085 microprocessor use only 4T states.
Ans: F
48. More number of general purpose register, the lesser is the execution time.
Ans: T
49. The word architecture indicates the internal logic design that performs various operations and data flow.
Ans: T
50. The 8085 microprocessor do not require additional circuitry to make it as MPU
Ans: F

Answer the following questions

51. What are the major functional blocks of microprocessor architecture?
52. What are the components of 8085 microprocessor architecture?
53. What is a hardware interrupt?
54. What is the use of temporary register found in the architecture of 8085?
55. What is the function of instruction decoder?
56. In which unit the arithmetic and logic operations are performed? Which unit is the destination of the result for these operations?
57. What is the significance of 8085 Flag register?
58. Mention the pins available for serial data communication in the 8085 microprocessor.
59. Why the crystal frequency is divided by two internally in 8085 microprocessor?
60. What is a Bidirectional buffer?
61. How are the memory and IO ports recognized by the microprocessor?
62. What are a unidirectional and a Bidirectional buses? Give examples.
63. Explain the function of address bus and control bus.
64. Draw the logic diagram to generate **MEMR**, **MEMW**, **IOR** and **IOW** signals using Universal gates (NAND gates).
65. Why AD₀ – AD₇ lines are multiplexed?
66. What is the use of ALE signal?
67. What is the difference between microprocessor and a CPU?
68. Why is the data bus bi-directional?
69. Why does the 8085 processor use 8-bit internal data bus?
70. Specify four control signals used in 8085 microprocessor.

71. Specify the control signal and the direction of the data flow on the data bus in a memory-write operation.
72. How is an instruction executed by 8085 microprocessor? Explain with an example and suitable diagrams.
73. Why are the program counter and the stack pointer 16-bit registers?
74. Explain the functions of ALE and IO/M signals of the 8085 microprocessor.
75. Describe the function of the following pins in 8085.
a) READY b) HOLD c) RESET
76. What is the necessity to have two status lines S_1 and S_0 in 8085?
77. What is the use of CLKOUT and RESETOUT signals of 8085 processor?
78. List the internal registers in 8085 A, their abbreviations and lengths. Describe the primary function of each register.
79. What is multiplexing and what is its advantage?
80. What is address/data multiplexing? Explain
81. Draw the timing diagrams for fetching and executing the following 8085 instructions.
1. **PUSH B** 2. **DCR M**
82. Why the 8085 microprocessor issue a **RD** or **WR** signal at T2 state? What will happen if it is issued on T1 state?
83. With a neat diagram explain the architecture of 8085. [Anna University Nov 2004].
84. Give the format of Flag Register in 8085 and explain each flag.
85. Draw the timing diagrams of memory read cycle and I/O write cycle in 8085 and explain them. [Anna University April/May 2005]
86. Give the clock frequency and state time T of 8085 when the crystal frequencies are: (a) 5 MHz (b) 6.144 MHz. [Anna University May 2005]
87. Define:
(a) Instruction cycle
(b) M/c cycle
(c) T-state [Anna University May 2005]
88. What is the function of SID and SOD pins in 8085? [Anna University May 2005]
89. Draw the timing diagram of memory read cycle and I/O write cycle in 8085 and explain them. [Anna University May 2005]
- 90.

Short Questions and Answers

1. Why the 8085 microprocessor is called an 8-bit processor?

Since the registers and ALU of the 8085 microprocessor are of 8-bit size, it can handle 8-bit data directly. So, most of the instructions of the 8085 processor have been designed to handle 8-bit data. The internal and external data buses have also been designed as 8-bit buses. Hence the 8085 microprocessor is an 8-bit processor.

2. What is the function of Accumulator?

It holds the data to be processed and also temporarily stores the result of the operation performed by the ALU.

3. What is a bus? Why we need internal data bus in the microprocessor?

Bus is a group of lines used to transfer bits. All the registers and ALU in a microprocessor communicate between them through the internal data bus.

4. Why does the 8085 processor use 8-bit internal data bus?

Since the registers and ALU of the 8085 microprocessor are of 8-bit size, the internal data bus is also of 8-bit size, which helps to transfer 8 bits simultaneously and hence 8085 is an 8-bit microprocessor.

5. What is the use of temporary register found in architecture of 8085?

When an instruction has two operands (e.g. ADD instruction) one operand is stored in Accumulator and the other operand is stored / transferred to temporary register. The ALU performs the operation (addition operation) on these two operands/data directly and stores the result in the Accumulator.

6. What is the function of instruction decoder?

The Instruction decoder decodes the first byte of the instruction because this generally indicates the operation to be performed. Then it decides the number of machine cycles to be generated.

7. Name the five flags of 8085.

The five flags of 8085 are Sign flag (S), Zero flag (Z), Auxiliary Carry Flag (AC), Parity Flag (P) and Carry flag (C).

8. Mention the general purpose and special purpose registers available in 8085 microprocessors.

General purpose registers:

B, C, D, E, H and L.

Special purpose registers:

Stack Pointer (SP), Program Counter (PC), Accumulator and Flag register

9. List the 16-bit registers of 8085

Stack Pointer (SP) and Program Counter (PC) are the 16-bit registers available in 8085.

10. How does the number of general-purpose registers affect the performance of an MPU?

The general-purpose registers are used to store the data for arithmetic and logical operations. The execution time of an instruction is reduced when internal registers are used. When more number of general purpose registers are provided, the number of instructions available with less execution time will also be more.

11. What is the function of the program counter?

The program counter holds the address of either the first byte of the next instruction or the address of the next byte of the current multi-byte instruction. In either case PC is automatically incremented to access the memory sequentially. The user can change the sequence by using instructions such as CALL and JMP.

12. Specify how a program counter is useful in program execution. [Anna University Nov 2004]

When the processor is reset, the program counter is reset to 0000H. Since the program counter has to provide address to access the program, it starts to execute the program from the 0000H location of the memory. After reading the first byte of the instruction, the program counter is automatically incremented to access the next byte of the instruction or to access the next instruction of the program.

13. What is the function of Timing and Control unit?

The Timing and Control unit generates the control signals needed for coordinating the activities like transferring data between microprocessor and Memory/IO devices. The control signals are synchronized with a clock signal.

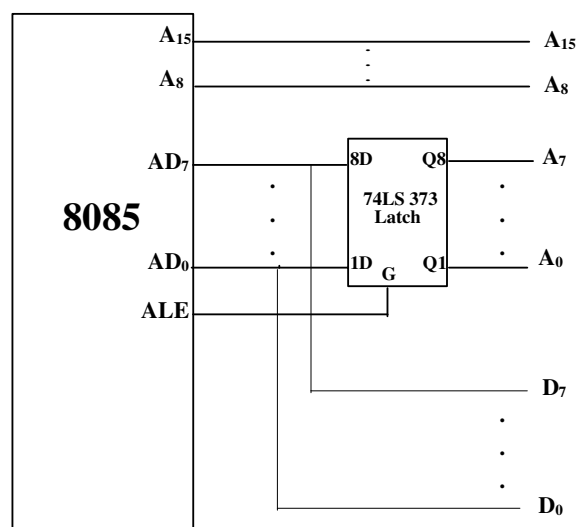
14. What is a micro processing unit? Is 8085 microprocessor a MPU?

A Micro Processing Unit (MPU) is a group of devices that can communicate with memory and executes the instructions stored in the memory.

The 8085 microprocessor can almost be considered as an MPU but it requires circuitry to demultiplex the lower order address and data and to separate memory and I/O devices.

15. How the data and address lines are demultiplexed? [Anna University Nov 2004]

An Octal D-type latch is used for demultiplexing data and address. The input data fed to the D input pins will be transferred to the corresponding Q output pins when the control signal G is high and these outputs will be latched when the control signal goes from high to low. This output will remain same when the G signal is low. When the microprocessor sends the address bits A_0 to A_7 , it also sends a signal ALE (Address Latch Enable). So this ALE signal is used to enable the latch and capture the address. After capturing the address it will be available on the output of the latch for longer time and hence the address will be available on the output pins of the latch when the microprocessor sends the data. This is called Address/Data demultiplexing.



16. What is the significance of ALE signal?

The ALE signal is an indication whether the microprocessor sends the data or the lower order address. The 8085 microprocessor makes this line to logic high while it is transmitting lower order address on AD₀ to AD₇ lines.

17. What are the important buses of a microprocessor

The important buses of a microprocessor are Address Bus, Data Bus and Control bus.

18. 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

19. Why data bus is bi-directional?

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

20. What is tristate logic? Mention its importance in bus oriented system

Tristate logic has three logic states logic 0, logic 1 and high impedance state. A tristate logic device has an enable pin, when this pin is activated, the device functions the same way as conventional logic device. When this enable pin is disabled, the logic device enters into high impedance state. In this state the device does not draw any current i.e. it is electrically disconnected from the system. In a bus oriented system, this device is used to isolate or electrically disconnect the devices connected with this tristate device from the bus.

21. What is an instruction cycle?

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

22. What is machine or processor 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 specific order.

23. What is the difference between a machine cycle and an instruction cycle?

A machine cycle will do only one operation such as memory read, memory write, Input port read and output port write. But, an instruction cycle will do all the operations needed for executing an instruction; actually it will contain many machine cycles.

24. Name machine cycles used in 8085 microprocessor

8085 microprocessor uses seven machine cycles i.e. Opcode fetch cycle, memory read, memory write, I/O read, I/O write, interrupt acknowledge and bus idle machine cycles.

25. 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 reads the opcode from memory. The execute cycle is executed to decode the instruction and to perform the work instructed by the instruction.

26. Why status signals are provided in microprocessor?

The system designer to track the internal operations of the processor and to expand the memory of the system uses the status signals. It differentiates an opcode from address or data. It is also used to identify whether a machine cycle is read cycle or write cycle.

27. Name two instructions which take 6-T states for fetch machine cycle.

SPHL and INX

28. For the instruction LDA 4100H, identify the fourth machine cycle and its control signal.

The fourth machine cycle for this instruction is memory read and its control signals are $IO/\overline{M} = 0$ & $\overline{RD} = 0$.