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

Ans: A microprocessor 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 supply of 8085 is +5V and clock frequency in 3MHz.

2. List few applications of microprocessor-based system.

Ans: It is used:

i. For measurements, display and control of current, voltage, temperature, pressure, etc.
ii. For traffic control and industrial tool control.
iii. For speed control of machines.

3. What are the functions of an accumulator?

Ans: 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.

4. List the 16-bit registers of 8085 microprocessor.

Ans: Stack pointer (SP) and Program counter (PC).

5. List the allowed register pairs of 8085.

Ans:

- B-C register pair
- D-E register pair
- H-L register pair
6. Mention the purpose of SID and SOD lines  
**Ans:** 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 is an Opcode?  
**Ans:** The part of the instruction that specifies the operation to be performed is called the operation code or opcode.

8. What is the function of IO/M signal in the 8085?  
**Ans:** 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.

9. What is an Operand?  
**Ans:** The data on which the operation is to be performed is called as an Operand.

10. How many operations are there in the instruction set of 8085 microprocessor?  
**Ans:** There are 74 operations in the 8085 microprocessor.

11. List out the five categories of the 8085 instructions. Give examples of the instructions for each group.  
**Ans:**
- Data transfer group – MOV, MVI, LXI.
- Arithmetic group – ADD, SUB, INR.
- Logical group – ANA, XRA, CMP.
- Branch group – JMP, JNZ, CALL.
- Stack I/O and Machine control group – PUSH, POP, IN, HLT.

12. Explain the difference between a JMP instruction and CALL instruction.  
**Ans:** 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.

13. Explain the purpose of the I/O instructions IN and OUT.  
**Ans:** The IN instruction is used to move data from an I/O port into the accumulator. The OUT instruction is used to move data from the accumulator to an I/O port. The IN & OUT instructions are used only on microprocessor, which use a separate address space for interfacing.

14. What is the difference between the shift and rotate instructions?  
**Ans:** 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.

15. How many address lines in a 4096 x 8 EPROM CHIP?  
**Ans:** 12 address lines.

16. What are the Control signals used for DMA operation?  
**Ans:** HOLD & HLDA.

17. What is meant by Wait State?  
**Ans:** 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 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.
18. List the four instructions which control the interrupt structure of the 8085 microprocessor.
Ans:-
- DI (Disable Interrupts)
- EI (Enable Interrupts)
- RIM (Read Interrupt Masks)
- SIM (Set Interrupt Masks)

19. What is meant by polling?
Ans:- Polling or device polling is a process which identifies the device that has interrupted the microprocessor.

20. What is meant by interrupt?
Ans:- Interrupt is an external signal that causes a microprocessor to jump to a specific subroutine.

Ans:- 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 RST 7.5, RST 6.5, RST 5.5. The priority of interrupts in 8085 is shown in the table.

<table>
<thead>
<tr>
<th>Interrupt</th>
<th>Priority</th>
</tr>
</thead>
<tbody>
<tr>
<td>TRAP</td>
<td>1</td>
</tr>
<tr>
<td>RST 7.5</td>
<td>2</td>
</tr>
<tr>
<td>RST 6.5</td>
<td>3</td>
</tr>
<tr>
<td>RST 5.5</td>
<td>4</td>
</tr>
<tr>
<td>INTR</td>
<td>5</td>
</tr>
</tbody>
</table>

22. What is a microcomputer?
Ans:- A computer that is designed using a microprocessor as its CPU is called microcomputer.

23. What is the signal classification of 8085
Ans:- All the signals of 8085 can be classified into 6 groups
- Address bus
- Data bus
- Control and status signals
- Power supply and frequency signals
- Externally initiated signals
- Serial I/O ports

24. What are operations performed on data in 8085
Ans:- The various operations performed are
- Store 8-bit data
- Perform arithmetic and logical operations
- Test for conditions
- Sequence the execution of instructions
• Store data temporarily during execution in the defined R/W memory locations called the stack

25. Steps involved to fetch a byte in 8085  
**Ans:**:-  
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

26. How many interrupts does 8085 have, mention them  
**Ans:**- The 8085 has 5 interrupt signals; they are INTR, RST7.5, RST6.5, RST5.5 and TRAP

27. Basic concepts in memory interfacing  
**Ans:**- 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  
• Be able to select the chip  
• Identify the register  
• Enable the appropriate buffer

28. Define instruction cycle, machine cycle and T-state  
**Ans:**- 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. Tcycle is defined as one subdivision of the operation performed in one clock period

29. What is an instruction?  
**Ans:**- An instruction is a binary pattern entered through an input device to command the microprocessor to perform that specific function

30. What is the use of ALE  
**Ans:**- 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.

31. How many machine cycles does 8085 have, mention them  
**Ans:**- The 8085 have seven machine cycles. They are  
• Opcode fetch  
• Memory read  
• Memory write  
• I/O read  
• I/O write  
• Interrupt acknowledge  
• Bus idle

32. Explain the signals HOLD, READY and SID
HOLD indicates that a peripheral such as 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 send or accept data. SID is used to accept serial data bit by bit

33. Mention the categories of instruction and give two examples for each category.
Ans: The instructions of 8085 can be categorized into the following five categories

- Data transfer Instructions - MOV Rd,Rs STA 16-bit
- Arithmetic Instructions - ADD R DCR M
- Logical Instructions - XRI 8-bit RAR
- Branching Instructions - JNZ CALL 16-bit
- Machine control Instructions - HLT NOP

34. Explain LDA, STA and DAA instructions
Ans: LDA copies the data byte into accumulator from the memory location specified by the 16-bit address. STA copies the data byte from the accumulator in the memory location specified by 16-bit address. DAA changes the contents of the accumulator from binary to 4-bit BCD digits.

35. Explain the different instruction formats with examples
Ans: The instruction set is grouped into the following formats

- One byte instruction - MOV C,A
- Two byte instruction - MVI A,39H
- Three byte instruction - JMP 2345H

36. What is the use of addressing modes, mention the different types
Ans: The various formats of specifying the operands are called addressing modes, it is used to access the operands or data. The different types are as follows

- Immediate addressing
- Register addressing
- Direct addressing
- Indirect addressing
- Implicit addressing

37. What is the use of bi-directional buffers?
Ans: It is used to increase the driving capacity of the data bus. The data bus of a microcomputer system is bi-directional, so it requires a buffer that allows the data to flow in both directions.

38. Give the register organization of 8085
Ans:

<table>
<thead>
<tr>
<th>W(8)</th>
<th>Temp. Reg</th>
</tr>
</thead>
<tbody>
<tr>
<td>Z(8)</td>
<td>Temp.</td>
</tr>
</tbody>
</table>
39. Define stack and explain stack related instructions
Ans: The stack is a group of memory locations in the R/W memory that is used for the temporary storage of binary information during the execution of the program. The stack related instructions are PUSH & POP

40. Why do we use XRA A instruction
Ans: The XRA A instruction is used to clear the contents of the Accumulator and store the value 00H.

41. Compare CALL and PUSH instructions
Ans:

<table>
<thead>
<tr>
<th>CALL</th>
<th>PUSH</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. When CALL is executed the microprocessor automatically stores the 16-bit address of the instruction next to CALL on the stack.</td>
<td>1. PUSH The programmer uses the instruction to save the contents of the register pair on the stack.</td>
</tr>
<tr>
<td>2. When CALL is executed the stack pointer is decremented by two</td>
<td>2. When PUSH is executed the stack pointer is decremented by two</td>
</tr>
</tbody>
</table>

42. What is Microcontroller and Microcomputer
Ans: Microcontroller is a device that includes microprocessor; memory and I/O signal lines on a single chip, fabricated using VLSI technology. Microcomputer is a computer that is designed using microprocessor as its CPU. It includes microprocessor, memory and I/O.

43. Define Flags
Ans: The flags are used to reflect the data conditions in the accumulator. The 8085 flags are S-Sign flag, Z-Zero flag, AC-Auxiliary carry flag, P-Parity flag, CYCarry flag, D7 D6 D5 D4 D3 D2 D1 D0

44. How does the microprocessor differentiate between data and instruction?
Ans: When the first m/c code of an instruction is fetched and decoded in the instruction register, the microprocessor recognizes the number of bytes required to fetch the entire instruction. For
example MVI A, Data, the second byte is always considered as data. If the data byte is omitted by mistake whatever is in that memory location will be considered as data & the byte after the “data” will be treated as the next instruction.

45. Compare RET and POP

<table>
<thead>
<tr>
<th>RET</th>
<th>POP</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. RET transfers the contents of the top two locations of the stack to the PC</td>
<td>1. POP transfers the contents of the top two locations of the stack to the specified register pair</td>
</tr>
<tr>
<td>2. When RET is executed the SP is incremented by two</td>
<td>2. When POP is executed the SP is incremented by two</td>
</tr>
<tr>
<td>3. Has 8 conditional RETURN instructions</td>
<td>3. No conditional POP instructions</td>
</tr>
</tbody>
</table>

46. What is assembler?

Ans: 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.

47. What is loader?

Ans: The loader copies the program into the computer’s main memory at load time and begins the program execution at execution time.

48. What is linker?

Ans: A linker is a program used to join together several object files into one large object file. For large programs it is more efficient to divide the large program modules into smaller modules. Each module is individually written, tested & debugged. When all the modules work they are linked together to form a large functioning program.

49. What is interrupt service routine?

Ans: Interrupt means to break the sequence of operation. While the CPU is executing a program an interrupt breaks the normal sequence of execution of instructions & diverts its execution to some other program. This program to which the control is transferred is called the interrupt service routine.

50. What are the various programmed data transfer methods?

Ans: i) Synchronous data transfer ii) Asynchronous data transfer iii) Interrupt driven data transfer

51. What is synchronous data transfer?

Ans: It is a data method which is used when the I/O device and the microprocessor match in speed. To transfer a data to or from the device, the user program issues a suitable instruction addressing the device. The data transfer is completed at the end of the execution of this instruction.

52. What is asynchronous data transfer?

Ans: It is a data transfer method which is used when the speed of an I/O device does not match with the speed of the microprocessor. Asynchronous data transfer is also called as Handshaking.
53. What are the basic modes of operation of 8255?
Ans: There are two basic modes of operation of 8255, They are:
1. I/O mode. 2. BSR mode.
In I/O mode, the 8255 ports work as programmable I/O ports, while in BSR mode only port C (PC0-PC7) can be used to set or reset its individual port bits. Under the IO mode of operation, further there are three modes of operation of 8255, So as to support different types of applications, viz. mode 0, mode 1 and mode 2.

- Mode 0 - Basic I/O mode
- Mode 1 - Strobed I/O mode
- Mode 2 - Strobed bi-directional I/O.

54. Write the features of mode 0 in 8255?
Ans: 1. Two 8-bit ports (port A and port B) and two 4-bit ports (port C upper and lower) are available. The two 4-bit ports can be combined used as a third 8-bit port. 2. Any port can be used as an input or output port. 3. Output ports are latched. Input ports are not latched. 4. A maximum of four ports are available so that overall 16 I/O configurations are possible.

55. What are the features used mode 1 in 8255?
Ans: Two groups – group A and group B are available for strobed data transfer.
1. Each group contains one 8-bit data I/O port and one 4-bit control/data port. 2. The 8-bit data port can be either used as input or output port. The inputs and outputs both are latched. 3. Out of 8-bit port C, PC0-PC2 is used to generate control signals for port B and PC3=PC5 are used to generate control signals for port A. The lines PC6, PC7 may be used as independent data lines.

56. What are the signals used in input control signal & output control signal?
Ans: Input control signal
- STB (Strobe input)
- IBF (Input buffer full)
- INTR (Interrupt request)

Output control signal
- OBF (Output buffer full)
- ACK (Acknowledge input)
- INTR (Interrupt request)

57. What are the features used mode 2 in 8255?
Ans: The single 8-bit port in-group A is available.
1. The 8-bit port is bi-directional and additionally a 5-bit control port is available. 2. Three I/O lines are available at port C, viz PC2-PC0. 3. Inputs and outputs are both latched. 4. The 5-bit control port C (PC3=PC7) is used for generating/accepting handshake signals for the 8-bit data transfer on port A.

58. What are the modes of operations used in 8253?
Ans: Each of the three counters of 8253 can be operated in one of the following six modes of operation.
1. Mode 0 (Interrupt on terminal count) 2. Mode 1 (Programmable monoshot) 3. Mode 2 (Rate generator) 4. Mode 3 (Square wave generator) 5. Mode 4 (Software triggered strobe) 6. Mode 5 (Hardware triggered strobe)

59. What are the different types of write operations used in 8253?
Ans: There are two types of write operations in 8253
(1) Writing a control word register (2) Writing a count value into a count register
The control word register accepts data from the data buffer and initializes the counters, as required. The control word register contents are used for
(a) Initializing the operating modes (mode 0-mode4) (b) Selection of counters (counter 0-counter 2) (c) Choosing binary /BCD counters (d) Loading of the counter registers.
The mode control register is a write only register and the CPU cannot read its contents.

60. Give the different types of command words used in 8259a?
Ans: The command words of 8259A are classified in two groups
1. Initialization command words (ICWs) 2. Operation command words (OCWs)

61. Give the operating modes of 8259a?
Ans:
(a) Fully Nested Mode (b) End of Interrupt (EOI) (c) Automatic Rotation (d) Automatic EOI Mode (e) Specific Rotation (f) Special Mask Mode (g) Edge and level Triggered Mode (h) Reading 8259 Status (i) Poll command (j) Special Fully Nested Mode (k) Buffered mode (l) Cascade mode

62. Define scan counter?
Ans: The scan counter has two modes to scan the key matrix and refresh the display. In the encoded mode, the counter provides binary count that is to be externally decoded to provide the scan lines for keyboard and display. In the decoded scan mode, the counter internally decodes the least significant 2 bits and provides a decoded 1 out of 4 scan on SLO-SL3. The keyboard and display both are in the same mode at a time.

63. What is the output modes used in 8279?
Ans: 8279 provides two output modes for selecting the display options.
1. Display Scan
In this mode, 8279 provides 8 or 16 character-multiplexed displays those can be organized as dual 4-bit or single 8-bit display units.
2. Display Entry
8279 allows options for data entry on the displays. The display data is entered for display from the right side or from the left side.

64. What are the modes used in keyboard modes?

65. What are the modes used in display modes?
Ans: 1. Left Entry mode
In the left entry mode, the data is entered from the left side of the display unit.
2. Right Entry Mode.
In the right entry mode, the first entry to be displayed is entered on the rightmost display.

66. What is the use of modem control unit in 8251?
Ans: The modem control unit handles the modem handshake signals to coordinate the communication between the modem and the USART.

67. Give the register organization of 8257?
**Ans:** The 8257 perform the DMA operation over four independent DMA channels. Each of the four channels of 8257 has a pair of two 16-bit registers. DMA address register and terminal count register. Also, there are two common registers for all the channels; namely, mode set registers and status register. Thus there are a total of ten registers. The CPU selects one of these ten registers using address lines A0- A3.

**68. What is the function of DMA address register?**

**Ans:** Each DMA channel has one DMA address register. The function of this register is to store the address of the starting memory location, which will be accessed by the DMA channel. Thus the starting address of the memory block that will be accessed by the device is first loaded in the DMA address register of the channel. Naturally, the device that wants to transfer data over a DMA channel, will access the block of memory with the starting address stored in the DMA Address Register.

**69. What is the use of terminal count register?**

**Ans:** Each of the four DMA channels of 8257 has one terminal count register. This 16-bit register is used for ascertaining that the data transfer through a DMA channel ceases or stops after the required number of DMA cycles.

**70. What is the function of mode set register in 8257?**

**Ans:** The mode set register is used for programming the 8257 as per the requirements of the system. The function of the mode set register is to enable the DMA channels individually and also to set the various modes of operation.

**71. What is interfacing?**

**Ans:** 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.

**72. List the operation modes of 8255**

**Ans:** a) I.O Mode
   i. Mode 0-Simple Input/Output
   ii. Mode 1-Strobed Input/Output (Handshake mode)
   iii. Mode 2-Strobed bidirectional mode
   b) Bit Set/Reset Mode.

**73. What is a control word?**

**Ans:** It is a word stored in a register (control register) used to control the operation of a program digital device.

**74. What is the purpose of control word written to control register in 8255?**

**Ans:** The control words written to control register specify an I/O function for each I.O port. The bit D7 of the control word determines either the I/O function of the BSR function.

**75. What is the size of ports in 8255?**

**Ans:**

- Port-A : 8-bits
- Port-B : 8-bits
- Port-CU : 4-bits
- Port-CL : 4-bits

**76. Distinguish between the memories mapped I/O peripheral I/O?**

**Ans:**

<table>
<thead>
<tr>
<th>Memory Mapped I/O</th>
<th>Peripheral Mapped I/O</th>
</tr>
</thead>
<tbody>
<tr>
<td>16-bit device address</td>
<td>8-bit device address</td>
</tr>
</tbody>
</table>
Data transfer between any general-purpose register and I/O port.

Data transfer only between accumulator and I/O port.

The memory map (64K) 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 can be connected.

More hardware is required to decode 16-bit address

Less hardware is required to decode 8-bit address.

Arithmetic or logic operation can be directly performed with I/O data

Arithmetic or logical operation cannot be directly performed with I/O data.

### 77. What is memory mapping?
**Ans:** The assignment of memory addresses to various registers in a memory chip is called as memory mapping.

### 78. What is I/O mapping?
**Ans:** The assignment of addresses to various I/O devices in the memory chip is called as I/O mapping.

### 79. What is an USART?
**Ans:** USART stands for universal synchronous/Asynchronous Receiver/Transmitter. It is a programmable communication interface that can communicate by using either synchronous or asynchronous serial data.

### 80. What is the use of 8251 chip?
8251 chip is mainly used as the asynchronous serial interface between the processor and the external equipment.

### 81. What is 8279?
**Ans:** The 8279 is a programmable Keyboard/Display interface.

### 82. List the major components of the keyboard/Display interface.
- a. Keyboard section
- b. Scan section
- c. Display section
- d. CPU interface section

### 83. What is Key bouncing?
**Ans:** Mechanical switches are used as keys in most of the keyboards. When a key is pressed the contact bounce back and forth and settle down only after a small time delay (about 20ms). Even though a key is actuated once, it will appear to have been actuated several times. This problem is called Key Bouncing.

### 84. Define HRQ?
**Ans:** The hold request output requests the access of the system bus. In non-cascaded 8257 systems, this is connected with HOLD pin of CPU. In cascade mode, this pin of a slave is connected with a DRQ input line of the master 8257, while that of the master is connected with HOLD input of the CPU.

### 85. What is the use of stepper motor?
**Ans:** A stepper motor is a device used to obtain an accurate position control of rotating shafts. A stepper motor employs rotation of its shaft in terms of steps, rather than continuous rotation as in case of AC or DC motor.

### 86. What is TXD?
87. **What is RXD?**
**Ans:** RXD- Receive Data Input This input pin of 8251A receives a composite stream of the data to be received by 8251A.

88. **What is meant by key bouncing?**
**Ans:** Microprocessor must wait until the key reach to a steady state; this is known as Key bounce.

89. **What is swapping?**
The procedure of fetching the chosen program segments or data from the secondary storage into the physical memory is called ‘swapping’.

90. **Write the function of crossbar switch?**
**Ans:** The crossbar switch provides the inter connection paths between the memory module and the processor. Each node of the crossbar represents a bus switch. All these nodes may be controlled by one of these processors or by a separate one altogether.

91. **What is a data amplifier?**
**Ans:** Transceivers are the bi-directional buffers are some times they are called as data amplifiers. They are required to separate the valid data from the time multiplexed address data signal. They are controlled by 2 signals i.e. DEN & DT/R.

92. **What is status flag bit?**
**Ans:** The flag register reflects the results of logical and arithmetic instructions. The flag register digits D0, D2, D4, D6, D7 and D11 are modified according to the result of the execution of logical and arithmetic instruction. These are called as status flag bits.

93. **What is a control flag?**
**Ans:** The bits D8 and D9 namely, trap flag (TF) and interrupt flag (IF) bits, are used for controlling machine operation and thus they are called control flags.

94. **What is instruction pipelining?**
**Ans:** Major function of the bus unit is to fetch instruction bytes from the memory. In fact, the instructions are fetched in advance and stored in a queue to enable faster execution of the instructions. This concept is known as instruction pipelining.

95. **Compare Microprocessor and Microcontroller.**
**Ans:**

<table>
<thead>
<tr>
<th>Microprocessor</th>
<th>Microcontroller</th>
</tr>
</thead>
<tbody>
<tr>
<td>Microprocessor contains the circuitry of microprocessor and in addition it has built-in ROM, RAM, I/O devices, timers and counters.</td>
<td>Microcontroller contains ALU, general purpose registers, stack pointer, program counter, clock timing circuit and interrupt circuit.</td>
</tr>
<tr>
<td>It has many instructions to move data between memory and CPU.</td>
<td>It has one or two instructions to move data between memory and CPU.</td>
</tr>
<tr>
<td>It has one or two bit handling instructions.</td>
<td>It has many bit handling instructions.</td>
</tr>
<tr>
<td>Access times for memory and I/O devices are more.</td>
<td>Less access times for built-in memory and I/O devices.</td>
</tr>
<tr>
<td>----------------------------------------------------</td>
<td>---------------------------------------------------</td>
</tr>
<tr>
<td>Microprocessor based system requires more hardware.</td>
<td>Microcontroller based system requires less hardware reducing PCB size and increasing the reliability.</td>
</tr>
</tbody>
</table>