

## CS 1304-MICROPROCESSORS

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

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.

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?

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.

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

### 5. List the allowed register pairs of 8085.

- B-C register pair
- D-E 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 is an Opcode?

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?**

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?**

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?**

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.**

- 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.**

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.**

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?**

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?**

12 address lines.

**16. Control signals used for DMA operation are \_\_\_\_\_**

HOLD & HLDA.

**17. 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 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.**

- DI ( Disable Interrupts )
- EI ( Enable Interrupts )
- RIM ( Read Interrupt Masks )
- SIM ( Set Interrupt Masks )

**19. What is meant by polling?**

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

**20. What is meant by interrupt?**

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

**21. 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 RST 7.5, RST 6.5, RST 5.5. The priority of interrupts in 8085 is shown in the table.

Interrupts	Priority
TRAP	1
RST 7.5	2
RST 6.5	3
RST 5.5	4
INTR	5

**22. What is a microcomputer?**

A computer that is designed using a microprocessor as its CPU is called microcomputer.

**23. What is the signal classification of 8085**

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**

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**

- 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**

The 8085 has 5 interrupt signals; they are INTR, RST7.5, RST6.5, RST5.5 and TRAP

#### **27. Basic concepts in 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

- Be able to select the chip
- Identify the register
- Enable the appropriate buffer

#### **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. T-cycle is defined as one subdivision of the operation performed in one clock period

#### **29. What is an instruction?**

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

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

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

The instructions of 8085 can be categorized into the following five

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

### 34. Explain LDA, STA and DAA instructions

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

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**

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?**

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**

W(8) Temp. Reg	Z(8) Temp. Reg
B(8) Register	C(8) Register
D(8) Register	E(8) Register
H(8) Register	L(8) Register
Stack Pointer(16)	
Program Counter(16)	

**39. Define stack and explain stack related instructions**

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**

The XRA A instruction is used to clear the contents of the Accumulator and store the value 00H.

**41. Compare CALL and PUSH instructions**

CALL	PUSH
When CALL is executed the microprocessor automatically stores the 16-bit address of the instruction next to CALL on the stack	The programmer uses the instruction PUSH to save the contents of the register pair on the stack
When CALL is executed the stack pointer is decremented by two	When PUSH is executed the stack pointer register is decremented by two

#### 42. What is Microcontroller and Microcomputer

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

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, CY-Carry flag

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

#### 44. How does the microprocessor differentiate between data and instruction

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

RET	POP
RET transfers the contents of the top two locations of the stack to the PC	POP transfers the contents of the top two locations of the stack to the specified register pair
When RET is executed the SP is incremented by two	When POP is executed the SP is incremented by two
Has 8 conditional RETURN instructions	No conditional POP instructions

#### 46. 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.

#### 47. What is loader

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

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. Explain ALIGN & ASSUME

The ALIGN directive forces the assembler to align the next segment at an address divisible by specified divisor. The format is ALIGN number where number can be 2, 4, 8 or 16. Example ALIGN 8.

The ASSUME directive assigns a logical segment to a physical segment at any given time. It tells the assembler what address will be in the segment registers at execution time. Example ASSUME CS: code, DS: data, SS: stack

#### 50. Explain PTR & GROUP

A program may contain several segments of the same type. The GROUP directive collects them under a single name so they can reside in a single segment, usually a data segment. The format is Name GROUP Seg-name,.....Seg-name

PTR is used to assign a specific type to a variable or a label. It is also used to override the declared type of a variable.

#### 51. Explain about MODEL

This directive provides short cuts in defining segments. It initializes memory model before defining any segment. The memory model can be SMALL, MEDIUM, COMPACT or LARGE.

Model	Code segments	Data segments
Small	One	One
Medium	Multiple	One
Compact	One	Multiple
Large	Multiple	Multiple

#### 52. Explain PROC & ENDP

PROC directive defines the procedures in the program. The procedure name must be unique. After PROC the term NEAR or FAR are used to specify the type of procedure. Example FACT PROC FAR. ENDP is used along with PROC and defines the end of the procedure.

#### 53. Explain SEGMENT & ENDS

An assembly program in .EXE format consists of one or more segments. The starts of these segments are defined by SEGMENT and the end of the segment is indicated by ENDS directive. Format Name SEGMENT

Name ENDS

#### 54. Explain TITLE & TYPE

The TITLE directive helps to control the format of a listing of an assembled program. It causes a title for the program to print on line 2 of each page of the program listing. Maximum 60 characters are allowed. Format TITLE text.

TYPE operator tells the assembler to determine the type of specified variable in bytes. For bytes the assembler gives a value 1, for word 2 & double word 4.

#### 55. Define SOP

The segment override prefix allows the programmer to deviate from the default segment

Eg : MOV CS : [BX] , AL

### **56. Define variable**

A variable is an identifier that is associated with the first byte of data item. In assembly language statement: COUNT DB 20H, COUNT is the variable.

### **57. What are procedures**

Procedures are a group of instructions stored as a separate program in memory and it is called from the main program whenever required. The type of procedure depends on where the procedures are stored in memory. If it is in the same code segment as that of the main program then it is a near procedure otherwise it is a far procedure.

### **58. Explain the linking process**

A linker is a program used to join together several object files into one large object file. The linker produces a link file which contains the binary codes for all the combined modules. It also produces a link map which contains the address information about the link files. The linker does not assign absolute addresses but only relative address starting from zero, so the programs are relocatable & can be put anywhere in memory to be run.

### **59. Explain about passing parameters using registers with example**

Procedures process some data or address variable from the main program, for processing it is necessary to pass the address variables or data. This is called passing parameters to procedures. In passing parameters using registers the data to be passed is stored in registers & these registers are accessed in the procedure to process the data.

```
CODE SEGMENT
MOV AL, DATA
```

```
CALL PRO1
```

```
PRO1 PROC NEAR
MOV INPUT, AL
```

```
RET
PRO1 ENDP
CODE ENDS
```

### **60. What is recursive procedures**

A recursive procedure is a procedure, which calls itself. Recursive procedures are used to work with complex data structures called trees. If the procedure is called with N=3, then the N is decremented by 1 after each procedure CALL and the procedure is called until N=0.

### **61. What are libraries**

Library files are collection of procedures that can be used in other programs. These procedures are assembled and compiled into a library file by the LIB program. The library file is invoked when a program is linked with linker program. when a library file is linked only the required procedures are copied into the program. Use of library files increase s/w reusability & reduce s/w development time.

### **62. What are Macros**

Macro is a group of instruction. The macro assembler generates the code in the program each time where the macro is called. Macros are defined by MACRO & ENDM

directives. Creating macro is similar to creating new opcodes that can be used in the program

```
INIT MACRO
MOV AX, data
MOV DS
MOV ES, AX
ENDM
```

### 63. How do 8086 interrupts occur

An 8086 interrupt can come from any of the following three sources

- External signals
- Special instructions in the program
- Condition produced by instruction

### 64. What are the 8086 interrupt types

Dedicated interrupts

- Type 0: Divide by zero interrupt
- Type 1: Single step interrupt
- Type 2: Non maskable interrupt
- Type 3: Breakpoint
- Type 4: Overflow interrupt

Software interrupts

- Type 0-255

### 65. What is interrupt service routine

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.

### 66. Define BIOS

The IBM PC has in its ROM a collection of routines, each of which performs some specific function such as reading a character from keyboard, writing character to CRT. This collection of routines is referred to as Basic Input Output System or BIOS.

### 67. Explain PUBLIC

For large programs several small modules are linked together. In order that the modules link together correctly any variable name or label referred to in other modules must be declared public in the module where it is defined. The PUBLIC directive is used to tell the assembler that a specified name or label will be accessed from other modules. Format PUBLIC Symbol.

### 68. Explain DUP

The DUP directive can be used to initialize several locations & to assign values to these locations. Format Name Data\_Type Num DUP (value)

Example TABLE DW 10 DUP (0). Reserves an array of 10 words of memory and initializes all 10 words with 0. array name is TABLE.

### 69. Compare Procedure & Macro

Procedure	Macro
Accessed by CALL & RET instruction	Accessed during assembly with name given

during program execution	to macro when defined
Machine code for instruction is put only once in the memory	Machine code is generated for instruction each time when macro is called
With procedures less memory is required	With macro more memory is required
Parameters can be passed in registers, memory locations or stack	Parameters passed as part of statement which calls macro

**70. What is the purpose of segment registers in 8086?**

There are 4 segment registers present in 8086. They are

1. Code Segment (**CS**) register
2. Data Segment (**DS**) register
3. Stack Segment (**SS**) register
4. Extra Segment (**ES**) register

The **code segment** register gives the address of the current code segment. ie. It will point out where the instructions, to be executed, are stored in the memory.

The **data segment** register points out where the operands are stored in the memory.

The **stack segment** register points out the address of the current stack, which is used to store the temporary results.

If the amount of data used is more the **Extra segment** register points out where the large amount of data is stored in the memory.

**71. Define pipelining?**

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

In pipelining, when the  $n^{th}$  instruction is executed, the  $n+1^{th}$  instruction is fetched and thus the processing speed is increased.

**72. Discuss the function of instruction queue in 8086?**

In 8086, a 6-byte instruction queue is presented at the Bus Interface Unit (BIU). It is used to prefetch 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.

**73. What is the maximum memory size that can be addressed by 8086?**

In 8086, a memory location is addressed by 20 bit address and the address bus is 20 bit address and the address bus is 20 bits. So it can address up to one mega byte ( $2^{20}$ ) of memory space.

**74. What is the function of the signal in 8086? \_\_\_\_\_**

BHE signal means Bus High Enable signal. The BHE signal is made low when there is some read or write operation is carried out. ie. When ever the data bus of the system is busy i.e. whenever there is some data transfer then the BHE signal is made low.

**75. What are the predefined interrupts in 8086?**

The various predefined interrupts are,  
DIVISION BY ZERO (type 0) Interrupt.  
SINGLE STEP (type 1) Interrupt.  
NONMASKABLE (type 2) Interrupt.  
BREAK POINT (type 3) Interrupt.  
OVER FLOW (type 4) Interrupt.

**76. What are the different flags available in status register of 8086?**

There are 6 one bit flags are present. They are,  
AF - Auxiliary Carry Flag  
CF - Carry Flag  
OF - Overflow Flag  
SF - Sign Flag  
PF - Parity Flag  
ZF - Zero Flag

**77. List the various addressing modes present in 8086?**

There are 12 addressing modes present in 8086. They are,

- (a) Register and immediate addressing modes
  - Register addressing modes
  - Immediate addressing mode
- (b) Memory addressing modes.
  - Direct addressing modes
  - Register indirect addressing modes
  - Based addressing modes
  - Indexed addressing modes
  - Based Indexed addressing modes
  - String addressing modes
- (c) I/O addressing modes
  - Direct addressing mode
  - Indirect addressing mode
- (d) Relative addressing mode
- (e) Implied addressing mode

**78. How single stepping can be done in 8086?**

By setting the Trace Flag (TF) the 8086 goes to single-step mode. In this mode, after the execution of each instruction the 8086 generates an internal interrupt and by writing some interrupt service routine we can display the content of desired registers and memory locations. So it is useful for debugging the program.

**79. State the significance of  $\overline{\text{LOCK}}$  signal in 8086?**

If 8086 is working at maximum mode, there are multiprocessors are present. If the system bus is given to a processor then the  $\overline{\text{LOCK}}$  signal is made low. That means the system bus is busy and it cannot be given of any other

processors. After the use of the system bus again the LOCK signal is made high. That means it is ready to give the system bus to any processor.

**80. What are the functions of bus interface unit (BIU) in 8086?**

- (a) Fetch instructions from memory.
- (b) Fetch data from memory and I/O ports.
- (c) Write data to memory and I/O ports.
- (d) To communicate with outside world.
- (e) Provide external bus operations and bus control signals.

**81. What is the clock frequency of 8086?**

	<b>8086</b>	<b>8086-2</b>	<b>8086-4</b>
Internal clock Frequency	5 MHz	8MHz	4MHz
External Clock Frequency	15MHZ	24MHZ	12MHZ

**82. What are the two modes of operations present in 8086?**

- i. Minimum mode (or) Uniprocessor system
- ii. Maximum mode (or) Multiprocessor system

**84. 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 flag to 0. 8086 will not respond to INTR.

**85. Explain REPEAT-UNTIL statements**

REPEAT-UNTIL statements allow executing a series of instructions repeatedly until some condition occurs. The REPEAT defines the start of the loop & UNTIL the end of the loop. UNTIL has a condition when the condition is true the loop is terminated

**86. What is multiprogramming?**

If more than one process is carried out at the same time, then it is known as multiprogramming. Another definition is the interleaving of CPU and I/O operations among several programs is called multiprogramming.

To improve the utilization of CPU and I/O devices, we are designing to process a set of independent programs concurrently by a single CPU.

This technique is known as multiprogramming

**87. Differentiate between absolute and linear select decoding?**

<b>Absolute decoding</b>	<b>Linear decoding</b>
All higher address lines are defined to select the memory or I/O device	Few higher address lines are decoded to select the memory or I/O

	device
More h/w is required to design decoding logic	Hardware required to design decoding logic is less
Higher cost for decoding circuit	Less cost for decoding circuit
No multiple address	Has a disadvantage of multiple addressing
Used in large systems	Used in small systems

**88. What are the three classifications of 8086 interrupts?**

- (1) Predefined interrupts
- (2) User defined Hardware interrupts
- (3) User defined software interrupts.

**89. What are the functions of status pins in 8086?**

S2	S1	S0	
0	0	0	---- Interrupt acknowledge
0	0	1	---- Read I/O
0	1	0	---- Write I/O
0	1	1	---- Halt
1	0	0	---- Code access
1	0	1	---- Read memory
1	1	0	---- Write memory
1	1	1	---- inactive

S4	S3	
0	0	--I/O from extra segment
0	1	--I/O from Stack Segment
1	0	--I/O from Code segment
1	1	--I/O from Data segment

S5	--Status of interrupt enable flag
S6	--Hold acknowledge for system bus
S7	--Address transfer.

**90. What are the schemes for establishing priority in order to resolve bus arbitration problem?**

There are three basic bus access control and arbitration schemes

1. Daisy Chaining
2. Independent Request
3. Polling

**91. What is the use of 8251 chip?**

Intel's 8251A is a universal synchronous asynchronous receiver and transmitter compatible with Intel's Processors. This may be programmed to operate in any of the serial communication modes built into it. This chip converts the

parallel data into a serial stream of bits suitable for serial transmission. It is also able to receive a serial stream of bits and converts it into parallel data bytes to be read by a microprocessor.

**92. What are the different types of methods used for data transmission?**

The data transmission between two points involves unidirectional or bi-directional transmission of meaningful digital data through a medium. There are basically three modes of data transmission

- (a) Simplex
- (b) Duplex
- (c) Half Duplex

In simplex mode, data is transmitted only in one direction over a single communication channel. For example, a computer (CPU) may transmit data for a CRT display unit in this mode.

In duplex mode, data may be transferred between two transceivers in both directions simultaneously.

In half duplex mode, on the other hand, data transmission may take place in either direction, but at a time data may be transmitted only in one direction. For example, a computer may communicate with a terminal in this mode. When the terminal sends data (i.e. terminal is sender). The message is received by the computer (i.e. the computer is receiver). However, it is not possible to transmit data from the computer to terminal and from terminal to the computer simultaneously.

**93. What are the various programmed data transfer methods?**

- ii) Synchronous data transfer
- iii) Asynchronous data transfer
- iv) Interrupt driven data transfer

**94. What is synchronous data transfer?**

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.

**95. What is asynchronous data transfer?**

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.

**96. What are the functional types used in control words of 8251a?**

The control words of 8251A are divided into two functional types.

- 1. Mode Instruction control word
- 2. Command Instruction control word

Mode Instruction control word :- This defines the general operational characteristics of 8251A.

Command Instruction control word :- The command instruction controls the actual operations of the selected format like enable transmit/receive, error reset and modem control.

**97. What are the basic modes of operation of 8255?**

There are two basic modes of operation of 8255, viz.

1. I/O mode.
3. 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 |

**98. Write the features of mode 0 in 8255?**

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.

**99. What are the features used mode 1 in 8255?**

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.

**100. What are the signals used in input control signal & output control signal?**

Input control signal

- $\overline{STB}$  (Strobe input)
- IBF (Input buffer full)
- INTR(Interrupt request)

Output control signal

- $\overline{OBF}$  (Output buffer full)
- ACK (Acknowledge input)
- INTR(Interrupt request)

**101. What are the features used mode 2 in 8255?**

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.

**102. What are the modes of operations used in 8253?**

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)

**103. What are the different types of write operations used in 8253?**

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.

**104. Give the different types of command words used in 8259a?**

The command words of 8259A are classified in two groups

1. Initialization command words (ICWs)
2. Operation command words (OCWs)

**105. Give the operating modes of 8259a?**

- (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

**106. Define scan counter?**

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 SL0-SL3. The keyboard and display both are in the same mode at a time.

**107. What is the output modes used in 8279?**

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.

**108. What are the modes used in keyboard modes?**

1. Scanned Keyboard mode with 2 Key Lockout.
2. Scanned Keyboard with N-key Rollover.
3. Scanned Keyboard special Error Mode.
4. Sensor Matrix Mode.

**109. What are the modes used in display modes?**

**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.

**110. What is the use of modem control unit in 8251?**

The modem control unit handles the modem handshake signals to coordinate the communication between the modem and the USART.

**111. Give the register organization of 8257?**

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 A<sub>0</sub>-A<sub>3</sub>.

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

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.

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

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.

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

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.

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

SL: NO	Memory Mapped I/O	Peripheral I/O
1	16-bit device address	8-bit device address
2	Data transfer between any general-purpose register and I/O port.	Data is transfer only between accumulator and I.O port
3	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
4	More hardware is required to decode 16-bit address	Less hardware is required to decode 8-bit address
5	Arithmetic or logic operation can be directly performed with I/O data	Arithmetic or logical operation cannot be directly performed with I/O data

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

- 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.

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

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

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

The control words written to control register specify an I/O function for each I.O port. The bit D<sub>7</sub> of the control word determines either the I/O function of the BSR function.

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

- Port-A : 8-bits
- Port-B : 8-bits
- Port-C<sub>U</sub> : 4-bits
- Port-C<sub>L</sub> : 4-bits

**120. 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.

**121. What is memory mapping?**

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

**122. What is I/O mapping?**

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

**123. What is an USART?**

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.

**123.What is the use of 8251 chip?**

8251 chip is mainly used as the asynchronous serial interface between the processor and the external equipment.

**125. The 8279 is a programmable \_\_\_\_\_ interface.**

Keyboard/Display

**126. List the major components of the keyboard/Display interface.**

- a. Keyboard section
- b. Scan section
- c. Display section
- d. CPU interface section

**127. What is Key bouncing?**

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.

**128. Define HRQ?**

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.

**129. What is the use of stepper motor?**

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.

**130. What is TXD?**

TXD- Transmitter Data Output

This output pin carries serial stream of the transmitted data bits along with other information like start bit, stop bits and priority bit.

**131. What is RXD?**

RXD- Receive Data Input

This input pin of 8251A receives a composite stream of the data to be received by 8251A.

**132. Draw the status word format for 8254.**

OUT	NULL COUNT	RW1	RW0	M2	M1	M0	BCD
-----	---------------	-----	-----	----	----	----	-----

**133. What is meant by key bouncing?**

Microprocessor must wait until the key reach to a steady state; this is known as Key bounce.

**134. Write the function of crossbar switch?**

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.

**135. What is a data amplifier?**

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.

**136. What are the different inter connection topologies?**

- Shared bus
- Multiport Memory
- Linked Input/Output
- Bus window
- Crossbar Switching.

**137. What are the configurations used for physical interconnections?**

- Star Configuration
- Loop configuration
- Complete interconnection
- Regular topologies
- Irregular topologies

**138. Give the instruction set of 8087?**

1. Data Transfer Instructions
2. Arithmetic Instructions
3. Comparison Instructions.
4. Transcendental Operations.
5. Constant Operations.
6. Coprocessor Control Operations.

**139. Write the advantages of loosely coupled system over tightly coupled systems?**

1. More number of CPUs can be added in a loosely coupled system to improve the system performance
2. The system structure is modular and hence easy to maintain and troubleshoot.
3. A fault in a single module does not lead to a complete system breakdown.

**140. What is the different clock frequencies used in 80286?**

Various versions of 80286 are available that run on 12.5MHz, 10MHz and 8MHz clock frequencies.

**141. Define swapping in?**

The portion of a program is required for execution by the CPU, it is fetched from the secondary memory and placed in the physical memory. This is called 'swapping in' of the program.

**142. What are the different operating modes used in 80286?**

The 80286 works in two operating modes

1. Real addressing mode
2. Protected virtual address mode.

**143. What are the CPU contents used in 80286?**

The 80286 CPU contains almost the same set of registers, as in 8086

- Eight 16-bit general purpose register
- Four 16-bit segment registers
- Status and control register
- Instruction pointer.

**144. What is status flag bit?**

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.

**145. What is a control flag?**

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.

**146. What is instruction pipelining?**

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.

**147. What is swapping?**

The procedure of fetching the chosen program segments or data from the secondary storage into the physical memory is called 'swapping'.

**148. What is mean by microcontroller?**

A device which contains the microprocessor with integrated peripherals like memory, serial ports, parallel ports, timer/counter, interrupt controller, data acquisition interfaces like ADC,DAC is called microcontroller.

**149. Explain DJNZ instructions of intel 8051 microcontroller?**

a) DJNZ Rn, rel

Decrement the content of the register Rn and jump if not zero.

b) DJNZ direct , rel

Decrement the content of direct 8-bit address and jump if not zero.

**150. State the function of RS1 and RS0 bits in the flag register of intel 8051 microcontroller?**

RS1 , RS0 – Register bank select bits

RS1	RS0	Bank Selection
0	0	Bank 0
0	1	Bank 1
1	0	Bank 2
1	1	Bank 3

**151. Write a program using 8051 assembly language to change the data 55H stored in the lower byte of the data pointer register to AAH using rotate instruction.**

```
MOV DPL,#55H
MOV A, DPL
RL A
Label :SJMP label
```

**152. Give the alternate functions for the port pins of port3?**

$\overline{\text{RD}}$	$\overline{\text{WR}}$	T1	T 0	$\overline{\text{INT1}}$	$\overline{\text{INT0}}$	TXD	RXD
------------------------	------------------------	----	--------	--------------------------	--------------------------	-----	-----

$\overline{RD}$  – Read data control output.  
 $\overline{WR}$  – Write data control output.  
T1 – Timer / Counter1 external input or test pin.  
T0 – Timer / Counter0 external input or test pin.  
 $\overline{INT1}$  - Interrupt 1 input pin.  
INT 0 – Interrupt 0 input pin.  
TXD – Transmit data pin for serial port in UART mode.  
RXD - Receive data pin for serial port in UART mode.

**153. Specify the single instruction, which clears the most significant bit of B register of 8051, without affecting the remaining bits.**

Single instruction, which clears the most significant bit of B register of 8051, without affecting the remaining bits is CLR B.7.

**154. Explain the function of the pins PSEN and EA of 8051.**

PSEN: PSEN stands for program store enable. In 8051 based system in which an external ROM holds the program code, this pin is connected to the OE pin of the ROM.

EA :EA stands for external access. When the EA pin is connected to Vcc, program fetched to addresses 0000H through 0FFFH are directed to the internal ROM and program fetches to addresses 1000H through FFFFH are directed to external ROM/EPROM. When the EA pin is grounded, all addresses fetched by program are directed to the external ROM/EPROM.

**155. Explain the 16-bit registers DPTR and SP of 8051.**

DPTR:

DPTR stands for data pointer. DPTR consists of a high byte (DPH) and a low byte (DPL). Its function is to hold a 16-bit address. It may be manipulated as a 16-bit data register or as two independent 8-bit registers. It serves as a base register in indirect jumps, lookup table instructions and external data transfer.

SP:

SP stands for stack pointer. SP is a 8- bit wide register. It is incremented before data is stored during PUSH and CALL instructions. The stack array can reside anywhere in on-chip RAM. The stack pointer is initialised to 07H after a reset. This causes the stack to begin at location 08H.

**156. Name the special functions registers available in 8051.**

- Accumulator
- B Register
- Program Status Word.
- Stack Pointer.
- Data Pointer.
- Port 0
- Port 1
- Port 2

- Port 3
- Interrupt priority control register.
- Interrupt enable control register.

**157.Explain the register IE format of 8051.**

E A	-	E T 2	E S	ET1	EX1	ET0	EX0
--------	---	-------------	--------	-----	-----	-----	-----

- EA- Enable all control bit.  
 ET2- Timer 2 interrupt enable bit.  
 ES – Enable serial port control bit.  
 ET1 – Enable Timer1 control bit.  
 EX1- Enable external interrupt1 control bit.  
 ET0 – Enable Timer0 control bit.  
 EX0- Enable external interrupt0 control bit.

**158. Compare Microprocessor and Microcontroller.**

Sl.No	Microprocessor	Microcontroller
1	Microprocessor contains ALU,general purpose registers,stack pointer, program counter, clock timing circuit and interrupt circuit.	Microcontroller contains the circuitry of microprocessor and in addition it has built- in ROM, RAM, I/O devices, timers and counters.
2	It has many instructions to move data between memory and CPU.	It has one or two instructions to move data between memory and CPU.
3	It has one or two bit handling instructions.	It has many bit handling instructions.
4	Access times for memory and I/O devices are more.	Less access times for built-in memory and I/O devices.
5	Microprocessor based system requires more hardware.	Microcontroller based system requires less hardware reducing PCB size and increasing the reliability.

**159.Name the five interrupt sources of 8051?.**

The interrupts are:

		Vector address
• External interrupt 0	: IE0	: 0003H
• Timer interrupt 0	: TF0	: 000BH
• External interrupt 1	: IE1	: 0013H
• Timer Interrupt 1	: TF1	: 001BH
• Serial Interrupt		
Receive interrupt : RI	:	0023H
Transmit interrupt: TI	:	0023H

**160. Explain the contents of the accumulator after the execution of the following program segments:**

```
MOV A,#3CH
MOV R4,#66H
ANL A,R4
```

A → 3C

R4 → 66

A → 24

**161. Write a program to load accumulator A, DPH and DPL with 30H.**

```
MOV A,#30
MOV DPH,A
MOV DPL,A
```

**162. Write a program to subtract the contents of R1 of Bank0 from the contents of R0 of Bank2.**

```
MOV PSW,#10
MOV A,R0
MOV PSW,#00
SUBB A,R1
```

**163. How the RS -232C serial bus is interfaced to TTL logic device?**

The RS-232C signal voltage levels are not compatible with TTL logic levels. Hence for interfacing TTL devices to RS-232C serial bus, level converters are used. The popularly used level converters are MC 1488 & MC 1489 or MAX 232.

**164. List some of the features of 8096 microcontroller.**

- a. The 8096 is a 16-bit microcontroller.
- b. The 8096 is designed to use in applications which require high speed calculations and fast I/O operations.
- c. The high speed I/O section of an 8096 includes a 16-bit timer, a 16-bit counter, a 4 input programmable edge detector, 4 software timers and a 6-output programmable event generator.
- d. It has 100 instructions, which can operate on bit, byte, word, and double words.
- e. The bit operations are possible and these can be performed on any bit in the register file or in the special function register.

**165. List the features of 8051 microcontroller?**

The features are

- \*single\_ supply +5 volt operation using HMOS technology.
- \*4096 bytes program memory on chip(not on 8031)
- \*128 data memory on chip.
- \*Four register banks.
- \*Two multiple mode,16-bit timer/counter.
- \*Extensive Boolean processing capabilities.
- \*64 KB external RAM size
- \*32 bi-directional individually addressable I/O lines.
- \*8 bit CPU optimized for control applications.

**166. What is the function of NEU?**

The numeric execution unit executes all the instructions including arithmetic, logical transcendental, and data transfer instructions.

The numeric execution unit executes all the numeric processor instructions while the control unit (CU) receives, decodes instructions, reads and writes memory operands and executes the 8087 control instructions.

**167. Give the disadvantages of bus window technique?**

The numeric execution unit executes all the instructions including arithmetic, logical transcendental, and data transfer instructions.

The numeric execution unit executes all the numeric processor instructions while the control unit (CU) receives, decodes instructions, reads and writes memory operands and executes the 8087 control instructions.

**168. What is swapping out?**

A portion of the program or important partial results required for further execution may e saved back on secondary storage to make the physical memory free for further execution of another required portion of the program. This is called ‘swapping out’ of the executable program.

# UNIT I

1. With neat sketch explain the architecture of 8085 Processor

- Block Diagram
- Registers Available
- Function Of Accumulator
- Explanation about all blocks in the block diagram

2. Draw the Pin Diagram of 8085 and explain the function of various signals.

- Pin Diagram
- Explanation about all signals

3. List the various Instructions available in 8085 processor.

- Data Transfer Instructions
- Arithmetic Instructions
- Logical Instructions
- Branch Instructions
- Machine Control Instructions

4. Write a program to sort the numbers in ascending and descending order.

- Program
- Result Verification

5. Draw the timing diagram of the following Instructions

- a) PUSH
- b) IN Port A
- c) STA 5000
- d) MVI A, 08

- Explain the machine cycles needed for every Instructions and draw the timing diagram

6. Draw and explain the interrupt structure of 8085 microprocessor. Show clearly priority, input triggering, masking, vector locations, enabling, disabling.

- Types of interrupt
- Interrupt structure
- Priority: TRAP, RST 7.5, RST 6.5, RST 5.5, and INTR
- Masking & Unmasking Interrupt: EI, DI, SIM
- Pending Interrupt: SIM
- Vector Address Table

## UNIT II

1. With neat sketch explain the architecture of 8086 processor.

- Block Diagram
- Explanation about all blocks in the block diagram

2. Draw the Pin Diagram of 8086 and explain the function of various signals.

- Pin Diagram
- Explanation about all signals

3. List the various Instructions available in 8086 processor.

- Data Transfer Instructions
- Arithmetic Instructions
- Bit Manipulation Instructions
- String Instructions
- Program Execution Transfer Instructions
- Processor Control Instructions

4. Write a program to find sum of numbers in the array.

- Program
- Result Verification

5. What are the sources of Interrupt in 8086?

- External signal
- Special instruction in the program
- Condition produced by instruction

### UNIT III

1. Sketch and explain a block diagram showing in Maximum mode and minimum mode configurations
  - Pin Diagram for minimum and maximum mode
  - Explanation about minimum and maximum mode pins
2. Draw the Pin Diagram of 8088 and explain the function of various signals.
  - Pin Diagram
  - Explanation about all signals
3. Draw and explain the Timing diagrams of 8086 maximum and minimum mode.
  - Draw the timing diagram for Minimum mode in Read and Write operation
  - Draw the timing diagram for Maximum mode in Read and Write operation
4. With neat sketch explain the architecture of NDP 8087
  - Block Diagram
  - Explanation about all blocks in the block diagram
5. With neat sketch explain the architecture of 8089
  - Block Diagram
  - Explanation about all blocks in the block diagram

## UNIT IV

1. With neat sketch explain the functions of 8255 PPI.

- Block Diagram
- Explanation about all the ports available.
- Explanation about the modes of transfer
- Explain the control Word Register

2. With neat sketch explain the functions of 8251.

- Block Diagram
- Types of data transfer
- Explanation about all the blocks.
- Explain the control Word Register, Status Register

3. With neat sketch explain the function of DMA controller.

- Block Diagram
- Explanation about all blocks in the block diagram

4. With neat sketch explain the function of Programmable Interrupt Controller.

- Block Diagram
- Explanation about all blocks in the block diagram

5. With neat sketch explain the function of Keyboard and display controller.

- Block Diagram
- Types of Display Available
- Types of keys available
- Explanation about all blocks in the block diagram

6. With neat sketch explain the function of Programmable Timer.

- Block Diagram
- Explanation about all blocks in the block diagram

# UNIT V

1. With neat sketch explain the architecture of 8051 processor.

- Block Diagram
- Explanation about all blocks in the block diagram

2. Draw the Pin Diagram of 8051 and explain the function of various signals.

- Pin Diagram
- Explanation about all signals

3. List the various Instructions available in 8051 processor.

- Data Transfer Instructions
- Arithmetic Instructions
- Logical Instructions
- Boolean variable Instructions
- Program and Machine Control Instructions

4. Explain the interrupt 8051.

- Reset
- Timer Interrupt
- External Interrupt
- Serial communication Interrupt

5. Explain about SFR?

- Timer/Counter 0 and 1
- Serial port
- Interrupt
- Power control