

UNIT I THE 8085 AND 8086 MICROPROCESSORS

PART A (2 MARKS)

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 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.

8. 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.

9. 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.

10. 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.

11. 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.

12. 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)

13. 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

14. 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

15. 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

16. What are the interrupts of 8085 ?

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

17. What is an instruction?

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

18. 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.

19. 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

20. 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

UNIT II

8086 SOFTWARE ASPECTS

PART A (2 MARKS)

1. 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

2. 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

3. 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.

4. 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.

5. State the significance of 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 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.

6. 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

7. 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.

8. 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.

9. 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 s 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.

10. What is a recursive procedure?

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 $N=0$.

11. 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
```

12. 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

13. 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

14. 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.

15. 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.

16. 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 points out here 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 registers 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.

17. Define pipelining?

In 8086, to speedup the execution of program, the instructions fetching and execution of instructions are overlapped each other. This technique is known as pipelining. In pipelining, when the nth instruction is executed, the n+1th instruction is fetched and thus the processing speed is increased.

18. 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.

19. What are the conditional and control flags available in status register of 8086?

Conditional Flags:

CF - Carry Flag

PF - Parity Flag

AF - Auxiliary Carry Flag

ZF - Zero Flag SF - Sign Flag

OF - Overflow Flag

Control Flags:

TF – Single step Trap Flag

IF – Interrupt Enable Flag

DF – String Direction Flag

20. 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

UNIT III

MULTIPROCESSOR CONFIGURATIONS

PART A (2 MARKS)

1. What are the advantages of multiprocessor system?

- High level performance can be attained when parallel processing.
- Robustness can be improved by isolating system functions.

2. What are the problems occurred in multiprocessor system?

1. Bus contention
2. Interprocess communication
3. Resource sharing

3. What is Coprocessor?

The coprocessor is a processor which specially designed for processor to work under the control of the processor and support special processing capabilities. Example : 8087 which has numeric processing capability and works under 8086.

4. What are the basic multiprocessor configurations?

1. Coprocessor configuration
2. Closely Coupled configuration

3. Loosely coupled configuration

5. Compare closely coupled and loosely coupled configurations.

Closely coupled

1. Single CPU is used
2. It has local bus only
3. No system memory or IO
4. No bus arbitration logic required

Loosely coupled

1. Multiple CPU modules are used
2. It has local as well system bus
3. It has system memory and IO, shared among CPU modules
4. Bus arbitration logic required

6. What is mean by loosely coupled multiprocessor system?

In loosely coupled multiprocessor system, each processor has a set of Input/output devices and a large memory, where it accesses most of the instructions and data.

7. 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.

8. 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

9. What are the advantages of daisy chaining method?

1. It requires less number of control lines.
2. It is simple and cheap.

10. What are the disadvantages of daisy chaining method?

1. Propagation delay
2. The priority of master is fixed by its physical location.

11. 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.

12. What are the features of 8087?

It can operate on the data of integer, decimal and real types with lengths ranging from 2 to 10 bytes.

It is high performance numeric data processor. It can multiply two 16-bit real numbers in about 27us and calculate square root in about 36us.

It is multi-bus compatible.

13. What are the three memory reference options in 8087 instruction?

- 1. Not reference memory.
- 2. Load an operand word from memory into 8087.
- 3. Store an operand word from 8087 to memory.

14. What are the status bits of 8087.

S2 S1 S0

15. Write a short note on data register in 8087.

- 1. It has 8 data register.
- 2. Each register is 8 bit and accessed as a stack
- 3. A PUSH operation decrements the TOP of the stack by one and loads the value on the top register.
- 4. A POP register stores the value from the current TOP register and increments TOP by one.

16. Write a short note on status register in 8087.

- 1. Status register is 16 bit register.
- 2. It indicates various errors, stores condition code for certain instruction and indicates the BUSY status.

17. List the data types of 8087.

- Word integer
- Short integer
- Long integer
- Packed BCD
- Short real
- Long real
- Temporary real

18. List the instruction of 8087.

- Data transfer instructions
- Arithmetic instructions
- Compare instructions
- Transcendental instructions

- Load constant instructions
- Processor control instructions

19. What are the features of 8089 I/O processor?

- An IOP can fetch and execute its own instruction.
- IOP can transfer data from an 8 bit source to 16 bit destination and vice versa.
- Communication between IOP and CPU is through memory based control blocks.
- CPU defines tasks in the control blocks to locate a program sequence, called a channel program.

20. What is the main advantage of polling method?

The priority can be dynamically changed by altering the polling sequence stored in the controller.

UNIT IV

I/O INTERFACING

PART A (2 MARKS)

1. What are the basic modes of operation of 8255?

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

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

2. 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.

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

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)

4. 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)

5. 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.

6. 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)

7. 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

8. 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.

9. 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.

10. 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.

11. 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.

12. 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.

13. 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.

14. 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

15. What are the various programmed data transfer methods?

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

16. 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.

17. 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.

18. Give the register organization of 8257?

The 8257 performs 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.

19. 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.

20. 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.

21. What is memory mapping?

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

22. What is I/O mapping?

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

23. 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.

24. 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.

UNIT V

MICROCONTROLLERS

PART A (2 MARKS)

1. 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.

2. 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.

3. What are the addressing modes supported by 8051?

- Register addressing
- Direct byte addressing
- Register indirect
- Immediate
- Register specific
- index

4. State the function of RS1 and RS0 bits in the flag register of Intel 8051 microcontroller?

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

5. Explain the function of the PSEN pin 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.

6. Explain the function of the EA pin of 8051.

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.

7. Explain the 16-bit registers DPTR 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.

8. Explain the function of the SP of 8051.

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.

9. 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.

10. Explain the register IE format of 8051.

EA	—	ET2	ES	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.

11. 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: