UNIT I
ARCHITECTURE OF 8086 MICROPROCESSOR

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

A microprocessor is a program controlled semiconductor device (IC), which fetches, decode and executes instructions. It 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 of 8085 is +5v and clock frequency in 3MHZ.

2. What is Software and Hardware?

The Software is a set of instructions or commands needed for performing a specific task by a programmable device or a computing machine. The Hardware refers to the components or devices used to form computing machine in which the software can be run and tested. Without software the Hardware is an idle machine.

3. What happens to the 8085 processor when it is resetted?

When the 8085 processor is resetted it execute the first instruction at the OOOOH location. The 8085 resets (clears) instruction register, interrupt mask bits and other registers.

4. What is a bus?

Bus is a group of conducting lines that carries data, address and control signals.

5. List the allowed register pairs of 8085.

B-C register pair   D-C 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 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.

8. What is an opcode ?

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

9. What are the operations performed by ALU of 8085?

The operations performed by ALU of 8085 are Addition, Subtraction, Logical AND, OR, Exclusive OR, Compare Complement, Increment, Decrement and Left I Right shift

10. List the 16 – bit registers of 8085 microprossor.

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

11. List the allowed register pairs of 8085.

B-C register pair D-C register pair H-L register pair.

12. What is a flag?

Flag is a flip flop used to store the information about the status of the processor and the status of the instruction executed most recently.

13. 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

14. 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 the 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.

15. Why data bus is bi-directional?

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

16. Why address bus is unidirectional?

The address is an identification number used by the microprocessor to identify or access a memory location or I / O device. It is an output signal from the processor. Hence the address bus is unidirectional.

17. 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.

18. Basic concepts in the 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,

1. Be able to select the chip 2. Identify the register 3.Enable the appropriate buffer

19. What is the need for system clock and how it is generated in 8085?

The system clock is necessary for synchronizing various internal operations or devices in the microprocessor and to synchronize the microprocessor with other peripherals in the system.

20. What is a port?

The port is a buffered I/O, which is used to hold the data transmitted from the microprocessor to I/O device or vice-versa.

21. What is the need for Port?

The I/O devices are generally slow devices and their timing characteristics do not match with processor timings. Hence the I/O devices are connected to system bus through the ports.

22. What are the Processor control instructions?

Machine control instructions are used to control the operation of processor. EI, DI, NOP, HLT, SIM, RIM are the Processor control instructions.

23. What is the signal classification of 8085?

All the signals of 8085 can be classified into 6 groups: 1. Address bus   2. Data bus   3. Control and status signals   4. Power supply and frequency signals 5. Externally initiated signals   6. Serial I/O ports

24. What is processor cycle (Machine cycle)?

The processor cycle or machine cycle is the basic operation performed by the processor. To execute an instruction, the processor will run one or more machine cycles in a particular order.

25. What is Instruction cycle?

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

26. What is fetch and execute cycle?

In general, the instruction cycle of an instruction can be divided into fetch and execute cycles. The fetch cycle is executed to fetch the opcode from memory. The execute cycle is executed to decode the instruction and to perform the work instructed by the instruction.

27. 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.

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 cycle is defined as one subdivision of the operation performed in one clock period.

29. Why status signals are provided in microprocessor?

The status signals can be used by the system designer to track the internal operations of the processor. Also, it can be used for memory expansion (by providing separate memory banks for program & data and selecting the bank using status signals).

30. How many machine cycles does 8085 have, mention them?

The 8085 have seven machine cycles they are : 1. Opcode fetch   2. Memory read 3. Memory write 4. I/O read 5. I/O write   6. Interrupt acknowledge 7. Bus idle

31. Steps involved to fetch a byte in 8085?

HOLD indicates that a peripheral such a 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 accept or send data.

SID is used to accept serial data bit by bit.

32. Define flags?

The flags are used to reflect the data conditions in the accumulator. The 8085 flags are

SIGN FLAG, ZERO FLAG, AUXILIARY FLAG, PARITY FLAG, CARRY FLAG

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

33. 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.

34. What is memory mapping?

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

35. What is I/O mapping?

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

36. Difference between memory mapped I/O and peripheral I/O?

MEMORY MAPPEED I/O	PERIPHERAL I/O
16-bit device address	8-bit device address
The data transfer between any general-purpose register and I/O port	The data transfer only between accumulator and I/O port
The memory map(64kb)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
More hardware is required to decode 16-bit address	Less hardware is required to decode 8-bit address

37. Define pipelining?

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 then the instruction is executed, the n+1 the instruction is fetched and thus the processing speed is increased.

38. Discuss the function of instruction queue ?

A 6-byte instruction queue is presented at the Bus Interface Unit (BIU). It is used to pre- fetch 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.

39. What are the basic units of microprocessor?

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

40. 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 flagto0. 8086 will not respond to INTR.

41 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.

42. Explain the function of ALE in the 8085 architecture? (or) How address and data lines are demultiplexed?

The ALE signal goes high at the beginning of each machine cycle indicating the availability of the address on the address bus, and the signal is used to latch the low-order address bus(A0-A7) by demultiplexing the address/data bus(AD0-AD7),which are multiplexed.

43. What is the function of HOLD and HLDA?

HOLD- It indicates when another device is requesting the use of address and data bus(like DMA controller). HLDA(Hold Acknowledge)- It indicates that HOLD request has been received. After the removal of HOLD request the HLDA goes low.

44. What is the purpose of READY and TRAP pins in 8085 Microprocessor?

READY- It is used to interface slow speed peripherals with microprocessor. TRAP- Vectored and non-maskable hardware interrupt.

45. If a 6Mhz crystal is connected with 8085, how much is the time taken by 8085 to complete opcode fetch cycle and memory read cycle?

Clock frequency = crystal frequency / 2 = 6 Mhz/2 =3Mhz One T-state = 1/ clock freq =1/(3X106) = 0.333µsec

Time for opcode fetch cycle = 4 Xµs 0.33= 1.332 µsec Time for memory read cycle= 43X 0.33=0.999 µsec.

46. Specify the five control signals commonly used by the 8085 MPU.

1. RD-Read signal
2. WR- Write signal
3. READY- Ready signal
4. ALE- Address Latch Enable
5. CLK OUT –Clock Out Signal

47. What is the difference between Opcode and Operand?

Opcode is the part of an instruction that identifies a specific operation.

Operand is a part of an instruction that represents a value on which the instruction acts.

Example: MVI A ,18H

MVI A is Opcode and 18 H is Operand.

48. Why data bus is bi-directional?

The microprocessor has to fetch (read) the date from memory or input device for processing and after processing, it has to store (Write) the data to memory or output device. Hence the data bus is bi-directional. i.e. data flow from the MPU (microprocessor unit)to peripherals or peripherals to MPU.

49. What is the need for timing diagram?

The timing diagram provides information regarding the status of various signals, when a machine cycle is executed. The knowledge of timing diagram is essential for system designer to select matched peripheral devices like memories, latches, ports, etc., to form a microprocessor system.

50. How many machine cycles constitute one instruction cycle in 8085?

Each instruction of the 8085 processor consists of one to five machine cycles.

51. Define (a) Instruction Cycle (b) M/C Cycle (c) T-state

Instruction cycle : Time required to complete the execution of an instruction. One instruction cycle consists of 3 to 6 machine cycles.

Machine cycle: Time required to complete one operation of accessing memory or I/O device. One machine cycle consists of 3 to 6 T-states.

T-State: The portion of the operation performed in one clock period.

52. What is an interrupt?

Interrupt is a signal send by an external device to the processor so as to request the processor to perform a particular task or work.

53. What is Software interrupts?

The Software interrupts are program instructions. These instructions are inserted at desired locations in a program. While running a program, if software interrupt instruction is encountered then the processor executes an interrupt service routine.

54. What is Hardware interrupt?

If an interrupt is initiated in a processor by an appropriate signal at the interrupt pin, then the interrupt is called Hardware interrupt.

55. What is Vectored and Non- Vectored interrupt?

When an interrupt is accepted, if the processor control branches to a specific address defined by the manufacturer then the interrupt is called vectored interrupt. In Non-vectored interrupt there is no specific address for storing the interrupt service routine. Hence the interrupted device should give the address of the interrupt service routine.

56. What is masking and why it is required?

Masking is preventing the interrupt from disturbing the current program execution. When the processor is performing an important job (process) and if the process should not be interrupted then all the interrupts should be masked or disabled. In processor with multiple 'interrupts, the lower priority interrupt can be masked so as to prevent it from interrupting, the execution of interrupt service routine of higher priority interrupt.

57. What is interrupt acknowledge cycle?

The interrupt acknowledge cycle is a machine cycle executed by 8085 processor to get the address of the interrupt service routine in-order to service the interrupt device.

58. 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 RST7.5, RST6.5, RST5.5. The priority of interrupts in 8085 is shown below.

Interrupts	Priority
TRAP	1
RST7.5	2
RST6.5	3
RST5.5	4
INTR	5

UNIT II
PERIPHERAL INTERFACING

PART A

1. What is an instruction?

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

2. How many operations are there in the instruction set of 8085 microprocessor?

There are 74 operations in the 8085 microprocessor

3. List out the five categories of the 8085 instructions. Give example of the instructions for each group?

1. Data transfer group   –   MOV,MVI,LXI
2. Arithmetic group   –   ADD,SUB,INR.
3. Logical group   -   ANA,XRA,CMP.
4. Branch group   –   JMP,JNZ,CALL.
5. Stack I/O and machine control group – PUSH,POP,IN,HLT.

4. 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.

5. Explain the purpose of the I/O instructions IN and OUT

The IN instruction is used to move data from an I/O port in to the accumulator.

The OUT instruction is used to move data from the accumulator to an I/O port.

The IN and OUT instructions are used only on microprocessor, which use a separate address space for interfacing.

6. 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.

7. 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)

8. Mention the similarity and difference between compare and Subtract instructions.

COMPARE: This instruction compares the given numbers by subtracting it and gives the result if the number is greater than, lesser than or equal to the status of sign and carry flag will be affected.

SUBTRACT: This instruction subtracts the two given numbers and the flag registers will not be affected.

9. Explain LDA,STA AND DAA instructions

LDA copies the data byte in to the 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 content of the accumulator from binary to 4-bit BCD digits.

10. Explain the different instruction formats with ex?

The instruction set is grouped in to the following formats
One byte instruction   MOV C,A
Two byte instruction   MVI A,39H
Three byte instruction   JMP 2345H

11. What is the use of addressing modes, mention the different types?

The various formats of specifying the operands are called as addressing modes, it is used to access the operands or data. The different types are as follows
1. Immediate addressing
2. Register addressing
3. Direct addressing
4. Indirect addressing
5. Implicit addressing

12. What is meant by register addressing mode?

The register addressing mode specifies the source operand, destination operand, or both to be contained in an 8085 registers. This results in faster execution, since it is not necessary to access memory locations for operand. Eg : MOV A, B

13. What is meant by direct addressing mode?

The direct addressing mode specifies the 16 bit address of the operand within the instruction itself.

The 2nd and 3rd bytes of the instruction contain this 16 bit address. Eg: LDA 2050 H

14. Define stack and 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 and POP.

15. 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

16. State the purpose and importance of NOP instruction.

NOP – No operation This instruction does not perform any operation. It can also be used to make the clock signals to go in wait state that is delay time can be increased.

17. Why do we need look up table?

To store the complex parameters in the program memory. It reduces computational complexity. Eg: SIN table.

18. What is indexing?

Indexing allows the programmer to point or refer the data stored in sequential memory locations one by one.

19. What happens when the RET instruction at the end of the subroutine is executed?

This instruction pops the return address (address of the instruction next to the CALL instruction in the main program) from the stack and loads program counter with this return address. Thus transfers program control to the instruction next to Call in the main program.

20. What are the instructions associated with the subroutine.

CALL 16 bit address: The program sequence is transferred to the address specified by the operand. Before the transfer, the address of the next instruction to CALL(the contents of the program counter) is pushed to the stack.

RET - RETURN: The program sequence is transferred from the subroutine to the calling program. The two bytes from the top of the stack are copied into the program counter and the program execution begins at the new address. The instruction is equivalent to POP program counter.

21. 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 program 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

22. How does the microprocessor differentiate b/w 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 ex 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 and the byte after the "data "will be treated as the next instruction.

23. Compare RET and POP

RET	POP
RET transfers the content of the top two locations of the stack to the PC	Pop transfers the content of the top two locations of the stack to the specified register pair.
When RET is executed the SP is incremented by two and it has 8 conditional RETURN instructions.	When POP is executed the SP is incremented by two and no conditional POP instructions.

24. What are subroutine?

Procedures are group of instructions stored as a separate program in memory and it is called from the main 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.

25. What is a 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.

26. How to access subroutine with in the main program procedure?
i) Accessed by CALL & RET instruction
ii) Machine code of instruction is put only once in the memory
iii) With procedures less memory is required
iv) Parameters can be passed in registers, memory location or stack

27. Define stack.

Stack is a sequence of RAM memory locations defined by the programmer.

28. What is the function of stack?

Stack is s portion of Read /Write memory location set aside by the user for the purpose of storing the information temporarily. When the information is written on the stack the operation is PUSH and when the information is read from the stack it is POP. The type of operation performed in stack is LIFO(last in first out)

29. How the microprocessor is synchronized with peripherals?

The timing and control unit synchronizes all the microprocessor operations with clock and generates control signals necessary for communication between the microprocessor and peripherals.

30. What is the minimum s/m and how it is formed in 8085?

A minimum s/m is one which is formed using minimum number of IC chips. The 8085 based minimum s/m is formed using 8155, 8355 & 8755.

31. State the function of given 8085 instruction: JP, JPE, JPO, JNZ.

JP – 16 bit Address – Jump on Plus JPE – 16 bit Address – Jump on Even Parity

JPO – 16 bit address – Jump on Odd Parity JNZ – 16 bit address – Jump on No Zero

32. How is PUSH B instruction executed? Find the status after execution.

This instruction decrements SP by one and copies the higher byte of the register pair into the memory location pointed by SP. Then decrements the SP again by one and copies the lower byte of the register pair into the memory location pointed by SP.

Ex: SP=2000H, DE=1050H

UNIT III
EMBEDDED SYSTEM CONCEPTS AND PROCESSORS

PART A

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. What are the advantages of microcontroller over microprocessor?

The overall system cost is low , as the peripherals are integrated in a single chip.
The size is very small
The system is easy to troubleshoot and maintain.
If required additional RAM , ROM and I/O ports may be interfaced.
The system is more reliable.

3. List the features of 8051 microcontroller?

Single supply +5 volt operation using HMOS technology.
4096 bytes program memory on chip (not on 8031)
128 data register banks
Four register 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.

4. List the on-chip peripherals of 8051 microcontroller.

4KB on chip RAM
128 B RAM
2 Timers
32 I/O pins
1 serial port
6 Interrupt sources

5. Explain DJNZ instruction 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.

6. 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

      Bank 0

      Bank 1

      Bank 2

      Bank 3

7. Give the alternate functions for the port pins of port3?

P3.0	-	RXD
P3.1	-	TXD
P3.2	-	INT0
P3.3	-	INT1
P3.4	-	T0
P3.5	-	T1
P3.6	-	WR
P3.7	-	RD

RD – Read data control output

WR – Write data control output

T1 – Timer / counter 1 external input or test pin T0 – Timer / counter 0 external input or test pin

INT 1 – 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

8. 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.

9. 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 address 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.

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

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 registers. It serves as a base register in indirect jumps, lookup table instructions and external data transfer.

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-chip RAM. The stack pointer is initialised to 07H after a reset. This causes the stack to begin at location. 08H.

11. What is the importance of special function registers (SPF) in 8051?

The 8051 operations that do not use the internal 128 byte RAM address from 00 H to 7F H are done by a group of special internal registers called SPFs (Special Function Registers) which have address between 80 H and FF H.

12. 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.

13. 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.

14. What is the function of SM2 bit present in SCON register in 8051?

SM2 enables the multiprocessor communication feature in modes 2 and 3. If SM2 = 1, RI will not be activated if the received 9th data bit (RB8) is 0.

In mode 1, if SM2 = 1, RI will not be activated if a valid stop bit was not received.

In mode 0, SM2 should be 0.

15. Define baud rate.

Baud rate is used to indicate the rate at which data is being transferred. Baud rate = 1/Time for a bit cell.

16. If a 12 Mhz crystal is connected with 8051, how much is the time taken for the count in timer 0 to get incremented by one?

Baud rate = oscillator frequency/12 = (12 X 106) / 12 =1 X 106 Hz T = 1/f = 1 /(1 X 106) = 1 μ sec

17. Name the interrupts of 8051 microcontroller.

External interrupt-0 , External interrupt-1,Timer-0 interrupt, Timer-1 interrupt, and serial port interrupt.

18. What is the job of the TMOD register?

To select the operating mode and the timer/counter operation of the timers we use TMOD register. Timer 0 and timer 1 are 2 timer registers in 8051. Both of these registers use the same register called TMOD to set various timer operation modes. TMOD is dedicated to the two timers (Timer0 and Timer1) and can be considered to be two duplicate 4 bit registers, each of which controls the action of one of the timers.

MSB							LSB
GATE	C/T	M1	M0	GATE	C/T	M1	M0
Timer1				Timer2			

19. What are the external hardware interrupts in 8051?

INT0 - External hardware Interrupt 0

INT1 - External hardware interrupt 1

20. Compare Microprocessor and Microcontroller.

Microprocessor	Microcontroller
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.
It has many instructions to move data between memory and CPU.	It has one or two instructions to move data between memory and CPU.
It has one or two bit handling instructions.	It has many bit handling instructions.
It has one or two bit handling instructions.	Less access times for built-in memory and I/O devices.
Microprocessor based system requires more hardware.	Microcontroller based system requires less hardware reducing PCB size and increasing the reliability.

21. Name the five interrupt sources of 8051?

Vector	**Address**
External interrupt 0:	IE0: 0003H
Timers interrupt 0:	TF0: 000BH
External interrupt 1:	IE1: 0013H
Timers interrupt 1:	TF1:001BH
Serial interrupt	
Receive interrupt: RI:	0023H
Transmit interrupt: TI:	0023H

22. Write a program to subtract the contents of RI of Bank0 from the contents of R0 0f Bank2.

```
MOV PSW, #10
MOV A, R0
MOV PSW, #00
SUBB A, R1
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23. How the RS-232 serial bus is interrupt to 1TL logic device?

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

24. List some of the features of 8096 microcontroller.

a. The 8096 is a 16-bit microcontroller.

b. the 8096 is designed to use in application which require high speed calculations and fast I/O operation.

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 timer and counter 6-output programmable events Generator.

d. It has 100 instructions, which can operate on bit, byte, word and double words.

e. The bit operation is possible and these can be performed on any bit in the register file or in the special function register.

25. Explain the operating mode 0 of 8051 serial ports?

In this mode serial enters & exits through RXD, TXD outputs the shift clock 8 bits are transmitted/received: 8 data bits (LSB first). The baud rate is fixed at 1/12 the oscillator frequency.

26. Explain the operating mode 2 of 8051 ports?

In this mode 11 bits are transmitted (through TXD) or received (through RXD): a start bit (0), 8 data bits (LSB first) a, programmable 9th data bit, & a stop bit (1).ON transmit the 9th data bit (TB* in SCON) can be assigned the value of 0 or 1.

For eg: the parity bit (P, in the PSW) could be moved into TB8. On receive the 9th data bit go in to the RS8 in Special Function Register SCON, while the stop bit is ignored. The baud rate is programmable to either 1/32, or 1/64 the oscillator frequency.

27. Explain the mode 3 of 8051 serial ports?

In this mode 11 bits are transmitted (through TXD) or received (through RXD): a start bit (0), 8 data bits (LSB first) a, programmable 9th data bit, & a stop bit (1). In fact, Mode 3 is the same as Mode 2 in all respect except the baud rate. The baud rate in Mode 3 is variable.

In all the four modes, transmission is initiated by any instruction that uses SBUF as a destination register. Reception is initiated in Mode 0 by the condition RI=0 & REN=1. Reception is initiated in other modes by the incoming start bit if REn=1.

28. What are the addressing modes of 8051 microcontroller?

Direct addressing
Register addressing
Register indirect addressing
Implicit addressing
Immediate addressing
Index addressing
Bit addressing

29. What are the applications of 8051 microcontroller?

Industrial control (process control)

Motor speed control (stepper motor control)

Peripheral devices (printer)

Standalone devices (colour Xerox machine)

Automobile applications (power steering)

Home applications (washing machine)

UNIT II

PERIPHERAL INTERFACING

PART A

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

The data transmission between points involves unidirectional or bi-directional transmission of meaningful digital data through a medium. There are basically there 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 transreceivers in both directions simultaneously.

In half duplex mode, on the other hand, data transmission may take place in either direction, but at a time may be transmitted only in one direction. For example, a computer may communication 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. computer is receiver). However, it is not possible to transmit data from the computer to terminal and from terminal to the computer simultaneously.

2. What is the various programmed data transfer method?

i) Synchronous data transfer

ii) Asynchronous data transfer

iii) Interrupt driven data transfer

3. What is synchronous data transfer?

It is a data method which is used when the I/O device and the microprocessor match in speed. The 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.

4. What is asynchronous data transfer?

It is a data transfer method which is used when the speed of I/O device does not match with the speed of the microprocessor. Asynchronous data transfer is also called as Handshaking.

5. 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.

6. 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.

7. List the major components of the Keyboard/ Display interface.

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

8. What is Key bouncing?

Mechanical switch are used as keys in most of the keyboard. 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.

9. What is TXD?

TXD- Transmitter Data Output. This output pin carries serial of the transmitted data bits along with other information like start bit, stop bits and priority bit.

10. Define HRQ?

The hold request output request 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.

11. What are the internal devices of a typical DAC?

The internal devices of a DAC are R/2R resistive network, an internal latch and current to voltage converting amplifier.

12. What is setting or conversion time in DAC?

The time taken by the DAC to convert a given digital data to corresponding analog signal is called conversion time.

13. What are the different types of ADC?

The different types of ADC are successive approximation ADC, counter type ADC, flash type ADC, integrator converters and voltage to frequency converters.

14. What is the purpose for scan section in Keyboard interface?

The scan section has a scan counter and four scan lines. These scan line scan be decoded using a 4-to-16 decoder to generate 16 lines for scanning

15. What are the tasks involved in keyboard interfacing?

The task involved in keyboard interfacing are sensing a keyboard interfacing are sensing a key actuation, de bouncing the key and generating key codes(decoding the key).these task are performed software if the keyboard is interfaced through ports and they are performed by hardware if the keyboard is interfaced through 8279.

16. How a keyboard matrix is formed in keyboard interface?

The return lines RL0 to RL7 of 8279 are used to form the columns of keyboard matrix.in decoded scan the scan lines SLO to SL3 of 8279 are used to form the rows of keyboard matrix. In encoded scan mode, the output lines of external decoder are used as rows of keyboard matrix.

17. What is scanning in keyboard and what is scan time?

The process of sending a zero to each row of a keyboard matrix and reading the columns for key actuation is called scanning. The scan time is the time taken by the processor to scan all the rows one by one starting from first row and coming back to the first row.

18. What is scanning in display and what is the scan time?

In display devices the process of sending display codes to 7-segment LED'S to display the led's one by one is called scanning. The scan time is the time taken to display all the 7- segment LED'S one by one, starting from first LED and coming back to the first LED again.

19. Define simplex transmission.

In simplex transmission, data are transmitted in only one direction. Example: transmission from a microcomputer to a printer.

20. 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 D7 of the control word determines either the I/O functions of the BSR function.

21. What is the size of ports in 8255?

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

22. What is the purpose for the 8255 PPI?

The 8255A is a widely used, programmable, parallel I/O device. It can be programmed to transfer data under various conditions, from simple I/O to interrupt I/O.

23. 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-Strobe I/O mode
Mode 2- Strobe bi-direction I/O

24. 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- it 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.

25. What are the features used mode 1 in 8255?

Two groups A and group B are available for strobe data transfer. Each group contains one 8-bit data I/O port and one 4-bit control/data port. The 8-bit data port can be either used as input or output port. The inputs and outputs both are latched. 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 inputs PC6, PC7 may be used as independent data lines.

10. What are the signals used in input control signal and output control signals?

Input control signals : STB (Strobe input),   IBF (Input buffer full) , INTR (Interrupt request)

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

26. What are the features used mode 2 in8255?

The signals 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 output 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.

27. Specify the bit of a control word for the 8255, which differentiates between the I/O mode and the BSR mode?

BSR mode D7= 0, and I/O mode D5 = 1

28. Write down the output control signals used in 8255A PPI?

OBF output Buffer Full, ACK Acknowledge, INTR Interrupt request and INTE Interrupt Enable

29. What are the modes of operation 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)

30. List the operation modes of 8255?

a) I/O Mode
       i. Mode 0- Simple Input/Output.
       ii. Mode 1- Strobe Input/Output (handshake mode)
       iii. Mode 2- Strobe bi-directional mode
b) Bit Set/Reset Mode.

31. 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)

32. Give the operation modes of 8259A?

(a) Fully Nest Mode   (b) End of Interrupt (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

33. Give the various modes of 8254 timer?

Mode 0: interrupt or terminal count
Mode 1: Rate generator
Mode 3: square wave generator
Mode 4: software triggered strobe
Mode 5: hardware triggered strobe

34. What is read back command in 8254 timer?

The Read- Back Command in 8254 allows the user to read the count and the status of the counter

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

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

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/receiver, error reset and modem control.

36. What is the use of 8251A 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.

37. 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.

38. What is the use of 8251 chip?

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

39. List the major components of 8251A programmable communication interface?

Read/Write control logic, Three buffer registers, Data register, Control register transmission receiver, Data bus buffer and Modem control.

40. What is RXD?

RXD- Receive Data Input. This input pin of 8251A receives a composite stream of the data to be received by 8251A.

41. What is the output modes used in 8279?

8279 provides two output modes for selecting the display options, Display and scan. In display mode, 8279 provides 8 or 16 character- multiplexed displays those can be organized as dual 4-bit or single 8-bit display units. 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.

42. The 8279 is a programmable------------------interface.

Keyboard/ Display

43. 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. Scanned Matrix Mode.

44. 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.

45. List the major components of 8279 keyboard /display interface?

Keyboard section, Scan section, Display section and MPU interface.

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

There are two types write operation 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 initialize
>   (a) Initializing the operating modes (mode 0- mode 4)
>   (b) Selection of counters (counter 0- counter 2)
>   (c) Choose 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.

47. 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 bit and provides a decoded 1 out of 4 scan on SL3-SL 3. The keyboard and display both are in the same mode at a time.