

**VETRI VINAYAHA COLLEGE OF ENGINEERING AND TECHNOLOGY**  
**DEPARTMENT OF ECE**  
**EC6504 MICROPROCESSORS AND MICROCONTROLLERS**  
**QUESTION BANK(2013 Regulation)**

**UNIT I**  
**THE 8086 MICROPROCESSOR**

**1. Define microprocessors?**

A semiconductor device(integrated circuit) manufactured by using the LSI technique. It includes the ALU, register arrays, and control circuits on a single chip.

**2. Define microcomputer?**

A computer that is designed using a microprocessor as its CPU. It includes microprocessor, memory and I/O.

**3. Define ROM?**

A memory that stores binary information permanently. The information can be read from this memory but cannot be altered.

**4. What is an ALU?**

The group of circuit that provides timing and signals to all operation in the computer and controls data flow.

**5. What is Micro controller?**

A device that includes microprocessor, memory, and I/O signal lines on a single chip, fabricated using VLSI technology.

**6. What is an Assembler?**

A computer program that translate an assembly language program from mnemonics to the binary machine code of a computer.

**7. What are the four primary operations of a MPU?**

1. Memory read
2. Memory write
3. I/O read
4. I/O write

**8. What do you mean by address bus?**

A group of lines that are used to send a memory address or a device address from the MPU to the memory location or a peripheral. The 8085 microprocessor has 16 address lines.

**9. How many memory locations can be addressed by a microprocessor with 14 address lines?**

The 8085 MPU with its 14-bit address is capable of addressing 2

14

=16,384 (ie) 16K memory locations.

**10. Why is the data bus bi-directional?**

The data bus is bi-directional because the data flow in both directions between the MPU and memory and peripheral devices.

**11. What is the function of the accumulator?**

The accumulator is the register used to store the 8-bit data to perform the arithmetic and logical operations.

**12. Define control bus?**

This is single line that is generated by the MPU to provide timing of various operations.

**13. What is a flag?**

The data conditions, after arithmetic or logical operations, are indicated by setting or resetting the flip-flops called flags.

**14. Why are the program counter and the stack pointer 16-bit registers?**

Memory locations for the program counter and stack pointer have 16-bit address. So the PC and SP have 16-bit registers.

**15. Define memory word?**

The number of bits stored in a register is called a memory word.

**16. Specify the number of registers and memory cells required in a 128 x 4 memory chip?**

Number of registers=128

Memory cells required is  $128 \times 4=512$

**17. Explain the function of ALU and IO/M signals in the 8085 architecture?**

The ALU 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. The IO/M signal is a status signal indicating whether the machine cycle is I/O or memory operation.

The IO/M signal is combined with the RD and WR control signals to generate IOR, IOW, MEMW, MEMR.

**18. If the 8085 adds 87H and 79H, specify the contents of the accumulator and the status of the S, Z, and CY flag?**

The sum of 87H and 79H=100H. Therefore, the accumulator will have 00H, and the flags will be S=0, Z=1, CY=1.

**19. Write down the control and status signals?**

Two control signals and three status signals

Control signals: RD and WR

Status signals: IO/M, S1, S2

**20. Define machine cycle?**

Machine cycle is defined, as the time required completing one operation of

accessing memory, I/O, or acknowledging an external request.

**21. Define T-state?**

T-state is defined as one subdivision of the operation of performed in one clock period.

**22. What is a transparent latch? Why is it necessary to latch with output devices such as LED's?**

A transparent latch is a flip-flop; its output changes according to input when the clock signal is high, and it latches the input on the trailing edge of the clock. The latch is necessary for output devices to return the result; otherwise the result will disappear.

**23. Give the bit positions reserved for the flags?**

D7 D6 D5 D4 D3 D2 D1 D0

**24. Define instruction cycle?**

Instruction cycle is defined, as the time required completing the execution of the instruction.

**16 MARK**

1. (i) Explain the internal hardware architecture of 8086 microprocessor with neat diagram?  
(ii) Write short note about assembler directives?
  2. Explain the various addressing modes of 8086 microprocessor with examples?
  3. (i) Explain Data transfer, arithmetic and branch instructions ? (ii) Write an 8086 ALP to find the sum of numbers in the array of 10 elements?
  4. Explain modular programming in detail?
  5. Write a note about stack, procedures and macros?
  6. Define interrupt and their two classes? Write in detail about interrupt service routine?
  7. Explain byte and string manipulation with examples?
  8. Write in detail about instruction formats and instruction execution timing?
  9. Write an ALP to find the largest number and smallest number in the array?
  10. Write a short note about
    - (i) Loop, NOP and HLT instructions
    - (ii) Flag manipulation, logical and shift & rotate instructions?
-

## UNIT-II

### 8086 SYSTEM BUS STRUCTURE

#### 1. What is an instruction set?

The entire group of instructions, determines what functions the microprocessor can perform is called instruction set.

#### 2. Give the functional categories of 8085 micro instructions?

A Z AC P CY

- o Data transfer operations
- o Arithmetic operations
- o Logical operations
- o Branching operations
- o Machine control operations

#### 3. Define Opcode and operand?

The operation to be performed is called Opcode. The data to be operated is called operand.

#### 4. Define the types of branching operations?

Jump: to test the conditions Call, Return, And Restart: Change the sequence of the program

#### 5. Define two-byte instruction with one example?

In a 2-byte instruction, the first byte specifies the Opcode; the second byte specifies the operand.

Example: Opcode operand

MVI A, Data

#### 6. Write instructions to load the hexadecimal numbers 65H in register C, and 92h in the accumulator A .Display the number 65H at PORT0 and 92H at PORT1?

```
MVI C, 65H
MVI A, 92H
OUT PORT1 ; DISPLAY 92H
MOV A, C ; COPY C INTO A FOR DISPLAY
OUT PORT0 ; DISPLAY 65H
HLT
```

#### 7. What operation can be performed by using the instruction ADD A?

The instruction ADD a will add the content of the accumulator to itself this is equivalent to multiplying by 2.

#### 8. What operation can be performed by using the instruction SUB A? Specify the status of Z and CY?

The instruction SUB a will clear the accumulator. The flag status will

be  $CY = 0$  and  $Z = 1$ . 9. Write instructions to

- a) load 00H to accumulator
- b) Decrement the accumulator
- c) Display the answer

```
MVI A, 00H (A = 0 0 0 0 0 0 0 0)
DCR A - 0 0 0 0 0 0 0 1
OUT PORT# 1 1 1 1 1 1 1 1 = FFH)
HLT
```

**9. What is the machine control operations used in 8085 microprocessor?**

HLT: Halt  
NOP: No Operation

**10. What is data transfer instructions?**

The data transfer instructions copy data from one source in to a destination without modifying the content of the source.

**11. Give the flow chart symbols?**

Rectangle: represents a process  
Arrow: indicates the direction  
Represents a predefined process  
Represents beginning or end  
Represents a decision making

**12. What are the notations used in the 8085 instructions?**

R = 8085 8-bit register  
M=memory register  
Rs = Register source  
Rd = register destination  
Rp = register pair

**13. What is JNC 16-bit address?**

It change the program sequence to the location specified by the 16-bit

**14. Give the instructions that perform the logical operations?**

- o AND, OR, Exclusive-OR
- o Rotate
- o Compare
- o Complement

**15. What is a three-byte instruction?**

In a three-byte instruction, the first byte specifies the Opcode, and the following two bytes specifies the 16- bit address.

**16. Define a program?**

A program is a sequence of instructions written to tell the computer to perform a specific function.

**17. Define ASCII code?**

ASCII code is a 7-bit code that represents both decimal numbers, alphabets. Extended ASCII is an 8-bit code.

**18. What is STA in data transfer instruction?**

Copy the data from the accumulator in the memory location specified by the 16-bit address

**19. What is an IN instruction?**

This is a 2-byte instruction. It accepts data from the input port specified in the second byte.

**20. What is an OUT instruction?**

This is a 2-byte instruction. It sends the content of the accumulator to the output port specified in the second byte.

**21. Give the difference between JZ and JNZ?**

JZ change the program sequence to the location specified by the 16-bit address if the zero flag is set

JNZ change the program sequence to the location specified by the 16-bit address if the zero flag is reset

**22. What is CMA?**

Complements the data in the accumulator.

**23. What is CALL instruction?**

CALL instruction change the sequence to the location of a subroutine.

**24. How is the instruction set classified?**

The instruction set is classified in three groups according to the word size:

- 1-byte instruction
- 2-byte instruction
- 3-byte instruction

**16 MARK**

1. Explain Minimum mode and maximum mode of operation in 8086 in detail.
2. Explain in detail about the system bus timing of 8086/8088.
3. Write notes on the following
  - (i) Programmed I/O
  - (ii) Interrupt I/O
4. Explain in detail about block transfers and DMA.
5. Explain in detail about closely coupled configurations.
6. Explain loosely coupled configurations in detail.
7. Explain the following in detail
  - (i) Process Management & iRMX86

- (ii) Memory Management
  - (iii) Virtual Memory
8. Explain Numeric data Processor in detail.
9. Explain in detail about I/O Processor.
10. Explain the following
- (i) Multiprocessor system(4)
  - (ii) Coprocessor(4)
  - (iii) Multiprogramming(4)
  - (iv) Semaphore(4)
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### UNIT III I/O INTERFACING

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

There are two basic modes of operation of 8255, They are:

1. I/O mode.
2. BSR mode.

In I/O mode, the 8255 ports work as programmable I/O ports, while In BSR mode only port C (PC0-PC7) can be used to set or reset its individual port bits. Under the IO mode of operation, further there are three modes of operation of 8255, So as to support different types of applications, viz. mode 0, mode 1 and mode 2.

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

#### **2. Write the features of mode 0 in 8255?**

- 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
- Any port can be used as an input or output port.
- Output ports are latched. Input ports are not latched.
- A maximum of four ports are available so that overall 16 I/O configurations are possible.

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

Two groups – group A and group B are available for strobed 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 lines PC6, PC7 may be used as independent data lines.

### **4. 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)

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

The single 8-bit port in-group A is available.

- The 8-bit port is bi-directional and additionally a 5-bit control port is available.
- Three I/O lines are available at port C, viz PC2-PC0.
- Inputs and outputs are both latched.
- The 5-bit control port C (PC3=PC7) is used for generating/accepting handshake signals for the 8-bit data transfer on port A

### **6. 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.

- Mode 0 (Interrupt on terminal count)
- Mode 1 (Programmable monoshot)
- Mode 2 (Rate generator)
- Mode 3 (Square wave generator)
- Mode 4 (Software triggered strobe)
- Mode 5 (Hardware triggered strobe)



## **7. 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.

## **8. 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)

9. Give the operating modes of 8259a?

- (a) Fully Nested Mode
- (b) End of Interrupt (EOI)

## **9. 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

## **10. 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.

### **11. 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.

### **12. 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.

### **13. 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.

### **14. 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.

### **15. 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 A0- A3.

### **16. 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.

**17. 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

**18. 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.

**19. 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.

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

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.

**21. 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.

**22. 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 function of the BSR function.

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

Port-A : 8-bits

Port-B : 8-bits

Port-CU : 4-bits

Port-CL : 4-bits

**24. What is memory mapping?**

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

**16MARK:**

1. Draw and explain the block diagram of 8254 programmable interval timer. Also explain the various modes of operation.
2. Explain 8279 keyboard /display controller with neat block diagram.

3. (i) Explain how to interface: (i) ADC and (ii) DAC (ii) Compare serial and parallel interface?
  4. With neat block diagram explain the 8251 and its operating modes.
  5. Draw the block diagram of I/O interface & explain in detail.
  6. Explain in detail about DMA controller.
  7. Explain the format of I/O mode set control and BSR control word of programmable peripheral interface. Explain in detail the operating modes of PPI?
  8. Draw and explain the block diagram of traffic light control system.
  9. Write short notes on LED display, LCD display, Keyboard display interface
  10. Draw and explain the block diagram of alarm controller.
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#### UNIT IV MICROCONTROLLER

##### **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

RS, RS0 – Register bank select bits

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

RD WR T1 T0 INT1 INT0 TXD RXD

RD – Read data control output.

WR – Write data control output.

T1 – Timer / Counter1 external input or test pin.

T0 – Timer / Counter0 external input or test pin.

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.

**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.[MAY/JUNE 2007]**

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 pin of 8051.[NOV/DEC-2011]**

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.[MAY/JUNE 2007]**

- 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. What is Microcontroller and Microcomputer?[APRIL/MAY 2011]**

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.

**11. 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.

Microprocessor And Microcontroller

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EX1- Enable external interrupt1 control bit.

ET0 – Enable Timer0 control bit.

EX0- Enable external interrupt0 control bit.

**12. Compare Microprocessor and Microcontroller.[NOV/DEC 2006,2011]**

1. 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 builtin 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.

4.It has many bit handling instructions.

5. Access times for memory and I/O devices are more.

6.Less access time for built-in memory and

7.I/O devices.

8.Microprocessor based system requires more hardware.

9. Microcontroller based system requires less hardware reducing PCB size and increasing the reliability.

**13. 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

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

MOV A, #3CH

MOV R4, #66H

**15. How is stack implemented in 8051?**

- The 8051 LIFO: Stack can reside anywhere in the internal RAM.
- It has 8 bit stack pointer to indicate the top of the stack using PUSH and POP instructions.
- During PUSH the SP is incremented by one and POP the SP is decremented by one.

**16. List the 8051 instructions that affect the overflow flag.**

ADD, ADDC, DIV, MUL, SUBB

**17. List the 8051 instructions that always clear the carry flag.**

CLR C, DIV, MUL

**18. List the 8051 instructions that affect all the flags.[NOV/DEC 2007]**

ADD, ADDC and SUBB

**19. What are the different types of ADC?[APR/MAY2008 NOV/DEC 2011]**

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

ANL A, R4

A = 3C

R4 = 66

**20. Name of the Serial Interrupt**

Receive interrupt: RI: 0023H

Transmit interrupt: TI: 0023H

**16 MARK**

1. Explain the architecture of 8051 with its diagram.
2. Explain the I/O pins ports and circuit details of 8051 with its diagram.

3. Write an 8051ALP to create a square wave 66% duty cycle on bit3 of port 1.
4. With example explain the arithmetic and logic instruction of 8051 microcontroller.
5. With example explain the different instruction set of 8051 microcontroller.
6. Write a program based on 8051 instruction set to pack array of unpacked BCD digits.
7. Explain the different addressing modes of 8051
8. Write a program to bring in data in serial form and send it out in parallel form using 805
9. Explain the data types and assembler directives of 8051
10. Explain about the register banks and special function register of 8051 in detail

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## UNIT V

### INTERFACING MICROCONTROLLER

#### 1. What is Microcontroller?

Microcontroller incorporates all the features that are found in microprocessor with the added features of in-built ROM, RAM, Parallel I/O, Serial I/O, counters and clock circuit to make a micro computer system on its own.

#### 2. What are the alternate functions of Port 3 in 8051 microcontroller?

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

#### 3. 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.



**4.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 X106Hz

$T = 1/f = 1 / (1 \times 106) = 1 \mu \text{ sec}$

**5.What is the advantage 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.

**6. What is the function of IP register in 8051?**

The IP register is used to set high priority to one or more interrupts in 8051. PS PT1 PX1 PT0 PX0 Setting a bit to 1 makes the corresponding interrupt to have high priority and setting a bit to 0 makes the corresponding interrupt to have low priority.

**7.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.

**8.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.

**9.Name the interrupts of 8051 microcontroller.**

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

**10.Name any 4 additional hardware features available in 8051 when compared to microprocessor.**

ROM ,RAM ,Parallel I/O , Serial I/O , Counters, and a clock circuit are available.

**11.What is the function of DPTR register?**

The data pointer register (DPTR) is the 16 bit address register that can be used to fetch any 8 bit data from the data memory space. When it is not being used for this purpose, it can be used as two eight bit registers , DPH and DPL.

**12.What are the features of 8051 microcontroller?**

- 8 bit CPU with registers A and B
- 16 bit PC and DPTR
- 8 bit PSW
- Internal ROM of 4KB

- Internal RAM of 128 bytes
- Two 16 bit timers and counters: T0 and T1
- Two external and three internal interrupts
- 32 input / output pins arranged as four 8 bit ports :Port0, port1, port2 and port3.
- Control registers are: TMOD, TCON, SCON ,PCON ,IP and IE.

### 13.What is the job of the TMOD register?

TMOD (timer mode) register is used to set the 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

### 14.List any applications of microcontroller

- Industrial control (process control)
- Motor speed control(stepper motor control)
- Peripheral devices(printer)
- Stand alone devices(colour Xerox machine)
- Automobile applications(power steering)
- Home applications (washing machine)

### 15.What are the bits available in TMOD register?

GATE C/T M1 M0 GATE C/T M1 M0

TIMER 1 TIMER 0

M1 M0 Mode

0 0 0 (13 bit Timer Mode)

0 1 1 (16 bit Timer Mode)

1 0 2 (8 bit auto reload)

1 1 3 (split Timer Mode)

GATE: Gating control when set

C/T : Timer or counter selection ; 1= counter , 0= Timer.

### 16.What are the timers available in 8051?

- Timer 0
- Timer 1

Each 16 bit timer is accessed as two separate 8 bit registers : Low byte register(TL) and High byte register (TH).

### 17.Explain the instruction : SWAP

SWAP instruction works only on the accumulator (SWAP A) . It swaps the lower nibble and higher nibble .The lower 4 bits are put into the higher 4 bits and the higher 4 bits are put into the lower 4 bits.

E.g.- SWAP A  
ACC

Before 1111 0000 execution :

After 0000 1111 execution :

**18. What are the external hardware interrupts in 8051?**

INT0 - External hardware  
interrupt 0 INT1 - External  
hardware interrupt 1

**19. 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.

**20. 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.

**16MARK**

1. Draw the diagram to interface a stepper motor with 8051 microcontroller and explain also write an 8051 ALP to run the stepper motor in both forward and reverse direction with delay.
  2. Explain how interrupts are handled in 8051.
  3. Write short notes on LCD interface.
  4. Write notes on 8051 serial port programming.
  5. Explain about external memory interfacing to 8051
  6. Write notes on 8051 timer and counter programming.
  7. Draw and explain the ADC interfacing using 8051.
  8. Draw and explain the DAC interfacing using 8051.
  9. Explain the keyboard interfacing using 8051
  10. Explain the sensor interfacing using 8051
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