

IDHAYA COLLEGE FOR WOMEN

KUMBAKONAM – 612 001



DEPARTMENT OF PHYSICS

SEMESTER : II

CLASS : I M.Sc., PHYSICS

SUBJECT- INCHARGE : Ms. A. BHARATHI

**SUBJECT NAME : MICROPROCESSOR &
MICROCONTROLLER**

SUBJECT CODE : P16PYE1

**TOPIC : UNIT - I to V
2 Marks(Q&A)**

UNIT:1 MICROPROCESSOR ARCHITECTURE AND INTERFACING

1.what is the function performed by SIM instruction?

SIM-Set Interrupt Mask

Interrupts are enabled using instructions SIM, The execution of SIM enable/disable interrupt according to the bit pattern of the accumulator.

Bit 0-5=programming the restart interrupt masks.

Bit 6-7=masking serial output on SOD line.

The instruction SIM also used for serial data transmission.

2.what is the function performed by RIM?

RIM-Read Interrupt Mask.

When the instruction is executed,The accumulator is loaded with pending interrupt, The restart interrupt masks and the contents of SID.

When more than one interrupt occur simultaneously,The interrupt which have lower priority is remaining pending.it is called pending interrupt.

The instruction RIM is used to know about the current status of pending interrupt or maskable interrupts.

Bit 0-2=Interrupt mask

1=masked

3=interrupt enable flag

4-6=pending interrupt

7=serial input data

3. Define fetch and execution cycle fetch?

FETCH:

The content of program counter,which is the address of memory location where op-code is available is sent to the memory it is called fetch cycle. ie,fetching the op-code into the corresponding memory location.

EXECUTION:

After op-code fetched goes to the data register and then to instruction register. From the Instruction Register it goes to the decoder circuitry which decodes the instruction. After the instruction is decoded. The execution begins it is called execution cycle.

4. What is memory mapped I/O?

Memory mapped I/O schemes only one address space. Address space is defined as the set of all possible address that microprocessor can generate some address are assigned memory and some address are assigned to memories.

The address for I/O devices are different from the addresses which have been assigned to memories. it is called memory mapped I/O schemes.

5. Which technique is known as multiplexing?

The Intel 8085 requires 16 bit wide address bus as the memory address of 16 bit. The 8 bit most significant bit of the address are transmitted by the address bus.A-bus (pin A8 to A15).

The 8 bit least significant bit of address are transmitted by address/data bus transmits data and address at different moments. thus address data bus operator in time shared mode. thus technique is known as multiplexing.

6. What is the program counter?

It is a 16 bit special function register. it is used to hold the memory address of the next instruction to be executed .it keeps the track of memory addresses of the instruction is a program while they are being executed.

7. What is mean by stack?

It is a 16 bit special function register. The stack is a sequence of memory location set aside by a programmer to store/retrieve to the content of accumulator, flags, program counter and general purpose register. During the execution the program, the stacks works on LIFO(last in first out) principle.

8. List out the flags of intel 8085:

- Carry flag
- Parity flag
- Auxiliary flag
- Zero flag
- Sign flag

9. Addressing modes of 8085?

- ❖ Direct Addressing
- ❖ Register Addressing
- ❖ Register indirect Addressing

- ❖ Immediate Addressing
- ❖ Implicit Addressing

10. What is meant by Assembly language program?

Programs return using mnemonics form of instruction as known as assembly language program. Assembly language can be divided into two parts,

- (i) Operation code
- (ii) Operands

11. Define operation code and operand?

Each instruction contains two parts, operation code (or) op-code and operand.

The first part of an instruction which specifies the task to be performed by the computer is called op-code.

The second part of the instruction is the data to be operated on and it is called operand. The operand may be 8 bit or 16 bit address internal register or memory location.

12. What is meant by Machine language program?

Some instruction required only one byte but they are instruction 8085 which required two or three bytes and they are stored in two or three successive memory location. The binary form of program is known as machine language. The binary code is known as machine code.

13. What is meant by hardware & software interrupts?

Hardware interrupt:

Interrupts caused by I/O devices are called hardware interrupts.

Software interrupts:

The normal operations of a microprocessor can also be interrupted by normal internal conditions or special instructions. Such an interrupt is called a software interrupt.

Ex: RST n Instruction.

14: Define: vectored interrupt

An interrupt for which hardware automatically transfers the program to a specific memory location is known as vectored interrupt.

UNIT-2

ASSEMBLY LANGUAGE PROGRAMME 8085

1. What are the advantages of high level language?

1. Instructions are very clear
2. Program in high level language portable they can run on any computer or microprocessor having standard compiler for that language,

3.Easier documentation

4.Standard syntax.

2. Write the disadvantage of high-level language.

1. One has to learn the special rules for writing programs in a particular high-level language.

2. Low efficiency of memory utilization a program in a high-level language occupies a larger part of the memory.

3. Extension hardware and software supports are required.

4. A compiler has to be provided to convert a high level language program into machine language program the compiler is costly.

3. Write the application of machine language.

1. For small and simple programs.

2. Simple control applications where less computation is required.

3. Application where prototypes is the final product

4. Write the application of Assembly language.

1. Small to moderate size of program.

2. Real time control application .

3. Small volume of data are to be processed.

4. Where cost of the memory is consideration.

5. Where less computation are required in training kits.

6. While developing a program for microprocessor based system-Industrial control, Instrumentation etc.

7. For industrial application.

5. What is mean by program?

A computer can only do what the programmer asks to do. To perform a particular tasks the programmer prepares a sequence of instruction called a program. A set of program written for a particular computer is known as software for that computer. The program is stored in RAM.

6. Write the demerits of machine language program.

- It is very difficult to understand or debug a program.
- Since the each bit has to be entered individually the entry of a program is very slow.
- Program are long.
- Program written is difficult.
- Chances of careless errors is writing the program.

UNIT-3 PERIPHERAL DEVICES AND MICROPROCESSOR APPLICATIONS

1. WHAT IS PPI ?

A Programmable peripheral interface is a multiport device . The ports may be programmed in a variety of ways as required by the programmer. The device is a very useful for interfacing peripheral devices . The term PIA peripheral interface adapter is also used by some manufactures.

2. write the modified signals for memory and i/o port?

Intel 8085 issues control signals using RD/WR operation of memory and I/o devices
modified control signals for memory : IO/M goes low

MEMR-Memory read

MEMW-Memory write

To get these signals

MEMR-Use IO/M v RD

MEMW-Use IO/M v WR

Modified control signals for IO devices: IO/M goes high

IOR-I/O Read

IOW-I/O Write

To get these signals

IOR Using inverted IO/M v RD

IOW Using inverted IO/M v WR

3. Define control word ?

According to the requirement a port can be programmed to act either as an input port or an output port control word is required . For programming the ports of 8255 a control word is formed.

For example if all the ports are output pins the control word is 80

4.what is full scale adjustment ?

ADC 0800 gives complementary digital output . The digital output to 5v input is 00000000. If the output not zero an adjustment of reference is made (V_{ref}). This is called Full scale adjustment.

5. what is zero scale adjustment ?

When the input is zero, The digital output is 01111111

If the digital output corresponding to zero volt input is not equal to 01111111.It is adjust 1 kilo ohm variable resistor which is connected to pin 5 of ADC 0800 . This is called zero scale adjustment.

$$V_{ref}=[1/2 b_7+1/4 b_6+1/250b_0]-5v$$

6 .Define stepper motor ?

A stepper motor rotates in steps in response to digital pulse input. The shaft of the motor rotates in equal increments when a train of input pulses is applied .To control the direction and number of steps appropriate pulses are applied to the stator winding of the motor. There are two most common types of stepper motors,

- Permanent magnet type
- Variable reluctance type.

7 .operating modes of 8255A:

The Intel 8255 has the following three modes of operation which are selected by software:

MODE 0 – Simple input/output

MODE 1 – Strobed input/output

MODE 2 – Bidirectional port

- In mode 0 operation each of the four ports of 8255 can be programmed to be either an input or output port.
- In mode 1 operation port A and Port B both are designed to operate.
- In mode 2 operation is only for port A

8.what is meant by cascading?

One 8259 IC can entertain 8 I/O devices to transfer

Data using interrupt technique.If there are more than 8 I/O

Devices to transfer data using interrupt,two 8259 ICs can be connected in series.such a connection is called cascading.

9.what is the role of isr in 8259?

ISR-In service register

Which interrupt is currently being serviced ;thisInformation is stored in the ISR.the priority resolver determines the priority of the bits set in the IRR. The bit corresponding to the interrupt of the highest priority is selected. On the receipt of INTA signal from the CPU, the highest priority ISR bit is set and the corresponding IRR bit is reset.

10. what is the role of IRR ?

IRR-Interrupt request register. It stores the interrupt request. It keeps information about the Interrupt inputs which have requested for interrupt service . When an interrupt request is received , the corresponding bit in IRR is set.

11. What is the role of IMR ?

IMR- Interrupt mask register. It contains a specific bit for each interrupt line . It is used to Mask (disable) or enable (unmask) individual interrupt input

An interrupt input can be masked by setting the Corresponding bit to 1 in IMR . An interrupt which is masked By software (by programming IMR) is not recognised and Serviced even if the corresponding bit is set in the IRR .

12.operating modes of 8253?

- Mode0-Interrupt on Terminal count
- Mode1-Programmable one-shot
- Mode2-Rate Generator
- Mode3-Square wave Generators
- Mode4-Software Triggered strobe
- Mode5-Hardware Triggered strobe

UNIT – 4

8051 MICROCONTROLLER

1. What are the registers used in microcontroller 8051 ?

The 8051 is an accumulator based microcontroller. Its registers are:

- Register A

- Register B
- PSW : Pulse Width Modulator
- 8-bit Stack Pointer
- 16-bit Data Pointer
- Program Counter
- Program Address Register
- 16-bit timer register for timer/counter
- Instruction Register
- Control Register
- RAM address register
- Serial Data buffer
- Control Register and
- Special Function Register.

2. Write the function of given instruction in 8051 ?

XTAL 2 : It is the output of inverting amplifier which is a part of the onchip oscillator. When external clock is used, it is left unconnected.

XTAL 8 : It is input to the inverting amplifier which is a part of the on-chip oscillator circuit. When external clock is used. It is connected to the external oscillator signal.

3. Write down the I/O Lines of 8051 Microcontroller ?

8051 microcontroller contain four 8-bit parallel ports : P0, P1, P2, P3. All ports in 8051 are Bidirectional. The I/o lines of 8051 are not simply I/o lines, rather they are multifunction lines. Each port of Intel 8051 consists of a latch (SER P0-P3), an output driver and an input buffer.

4. What are the interrupts on 8051 Microcontroller ?

- The 8051 microcontroller have 4-level priority interrupts. The number of interrupts source differs from version to version. Its varies from 5 to 15. The important interrupts source are :
- One from serial port, Two from timers, Two from external interrupts INTO and INT1

5. What is meant by vectored interrupts ?

An interrupt for which microcontrollers hardware automatically transfers the program execution to a specific memory location is known as Vector interrupts.

The 8051 microcontroller has 5 vector interrupts source,

- 1.External interrupts 0 through the input pin INT0
- 2.External interrupts 1 through the input pin INT1
- 3.Timer/counter 0 interrupt
- 4.Timer/counter 1 interrupt
- 5.Serial port interrupt

6.Define Memory Organisation of Intel 8051 ?

- 2/4/8/32KB on – chip program memory in the form of ROM/EPROM/Flash memory.
- upto 64KB of program memory external to the microcontroller chip can be addressed.
- 128,256,512,1024 bytes of on-chip data memory are available.The capacity differs from version to version.
- 64KB of data memory external to the microcontroller chip can be addressed.

7.Write down the Addressing modes of 8051 with memory space ?

ADDRESSING MODES MEMORY SPACE

Register Addressing - Acc,B,CY,DPTR

Direct Addressing- Lower 128 bytes of Internal RAM,Special Function Register

Register Indirect Addressing -Internal RAM(@R,),External data memory(@R,@R)

Immediate Addresssing -Program Memory

Base-Register Plus Index Register Indirect Addressing -Program Memory(@DPTR + A)

8.Define Serial Port of 8051 Microcontroller ?

The 8051 contains a high - speed full-duplex serial port. The term full-duplex means that it can transmit and receive simultaneously for transmission special function register SBUF to hold data is used.

9.Define Data Memory Address space ?

- Data memory address space consists of an external and internal data memory.
- External data memory is accessed using MOV X instruction.
- Internal data memory consists of upper part of internal data memory,lower part of internal data memory.
- upper part of internal data memory accessed using SFR.
- Lower part of internal data memory accessed using RAM.

10. What is meant by Microcontroller ?

A microcomputer built on a single semiconductor chip is called signal chip microcomputer. It is used for dedicated application such as, automatic control of Equipment, Machines and process in Industry instrumentation, commercial and consumer appliances. Since the single-chip microcomputers are generally used in control applications they are also called microcontroller.

UNIT-5

8051 INSTRUCTION SET AND PROGRAMMING

1. What is meant by Arithmetic Instructions?

The instruction which is used to perform addition, subtraction, multiplication, division, increment, decrement, comparison and decimal adjust is called Arithmetic Instructions.

EX: ADD, ADDC, SUBB, INC, DEC, MUL, DIV and DA

2. What are the classification of instructions?

DATA TRANSFER INSTRUCTIONS:

The instructions which transfer data from a specified source to a specified destination. The source of data may be a register, memory location, stack, port etc.,

EX : MOV, XCH(exchange), PUSH, POP etc.,

ARITHMETIC INSTRUCTIONS:

The instructions which are used to perform addition, subtraction, multiplication, division, increment, decrement, comparison and decimal adjust are called Arithmetic Instructions.

EX : ADD, ADDC, SUBB, INC, DEC, MUL, DIV and DA

LOGICAL INSTRUCTIONS :

The instructions of this group perform logical AND, OR, exclusive OR, clear, rotate, complement etc.,

EX : ANL(AND), ORL(OR), XLR(EX-OR), CLR, CPL, RL, RLC, RR, RRC etc.,

CONTROL TRANSFER INSTRUCTIONS :

The instructions of this group include call, return and jump instructions.

EX : ACALL,LCALL,RET,JZ,JNZ,JC,JNC,NOP etc.,

3. Write any two data transfer instructions ?

1. MOV A,Rn : [A] ← [Rn]

Move data from the specified working registers Rn to the Acc.

- n= 0,1,2,3,.....
- byte count : 01
- no flag affected
- type of addressing : register addressing
- machine cycle : 01
- oscillatory period : 12

ENCODING : 1111 1rrr (Where rrr=address of the register RN)

2. MOV A,@Ri : [A] ← [[Ri]]

Move the content of the internal RAM memory location whose address is in Ri

(Where i=0 or 1) to the Accumulator.

- byte count : 01
- flag affected none
- type of addressing : register indirect addressing
- machine cycle : 01
- oscillatory period : 12
- encoding : 1110 011i

4. What do you mean by Boolean Manipulation Instructions ?

Some Boolean variable manipulation instructions for MOV,ANI(LOGICAL AND),ORL(LOGICAL OR),CLR,CPL and

SETB C Set carry flag(i.e., the value is made = 1)

- No other flag affected
- Byte count : 01
- machine cycle : 01
- oscillatory period : 12
- encoding : 1101 0011

SETB BIT set the content of the specified bit address

- No flag affected
- byte count : 02
- machine cycle : 01

- oscillatory period : 12
- encoding : 11001 0010

5. Write any two Program Branching Instructions ?

1. NOP :

- NO OPERATION
- OSCILLATORY PERIOD : 12
- BYTE COUNT : 01
- MACHINE CYCLE : 01
- ENCODING : 0000 0000

2.LCALL addr16 :

- Long subroutine call. It call subroutine located at the specified address.Before the control is transferred to the subroutine.
- The address of the next instructions of the main program is saved in the stack.
- No flag affected
- machine cycle : 02
- oscillatory period : 24
- byte count : 03
- type of addressing : immediate addressing
- encoding : 0001 0010 (16 bit address)

6. What is the function of SWAP A , DAA, POP Direct, PUSH Direct?

SWAP A : SWAP nibbles within the Accumulator. it interchanges the low-order and high-order nibbles of the accumulator.

- No flag affected
- machine cycle : 01
- oscillatory period : 12
- encoding : 1100 0100

DAA □ It is decimal adjust Accumulator.after the execution of ADD or ADDC instruction,the result is in hexadecimal and placed in the Accumulator. The instruction operates on the result and give the final result in decimal system.

- MACHINE CYCLE : 01
- OSCILLATORY PERIOD : 12
- BYTE COUNT : 01
- ENCODING : 1101 0100

- DIV AB □ The instruction is used to multiply unsigned 8bit content(integer) of the accumulator by unsigned 8bit content(integer) of the register B. The quotient is placed in the accumulator and the remainder in the register B. The carry and overflow flag OV are cleared.

MACHINE CYCLE : 04

- OSCILLATORY PERIOD : 48
- BYTE COUNT : 01
- TYPE OF ADDRESSING : REGISTER ADDRESSING
- ENCODING : 1000 0100

MUL AB □ The instruction is used to multiply unsigned 8bit content(integer) of the accumulator by unsigned 8bit content(integer) of the register B. The low order byte of the 16 bit product is placed in the accumulator and the high order bytes in register B. when the product is greater than FFH, the overflow flag OV is set to 1, otherwise it is cleared. The carry flag is cleared i.e., It is 0.

- MACHINE CYCLE : 04
- OSCILLATORY PERIOD : 48
- BYTE COUNT : 01
- TYPE OF ADDRESSING : REGISTER ADDRESSING
- ENCODING : 1010 0100

PUSH direct. [SP] □ [SP]+1. [[SP]] □ [direct address]. When the data is to be placed on the stack, the content of the stack pointer is incremented by one before storing data on the stack. So that the stack grows up as data is stored. The content of specified direct address is then copied into the internal RAM location addressed by the stack pointer.

- MACHINE CYCLE : 02
- OSCILLATORY PERIOD : 24
- BYTE COUNT : 02
- TYPE OF ADDRESSING : DIRECT ADDRESSING
- ENCODING : 1100 0000

POP direct. [direct address] □ [[SP]]. [SP] [SP] -1. The content of the internal RAM location addressed by the stack pointer is read, and the stack pointer is decremented by one. The value read is stored in the destination address which is directly given in the instruction.

- MACHINE CYCLE : 02
- OSCILLATORY PERIOD : 24
- BYTE COUNT : 02

- TYPE OF ADDRESSING : DIRECT ADDRESSING
- ENCODING : 1101 0000