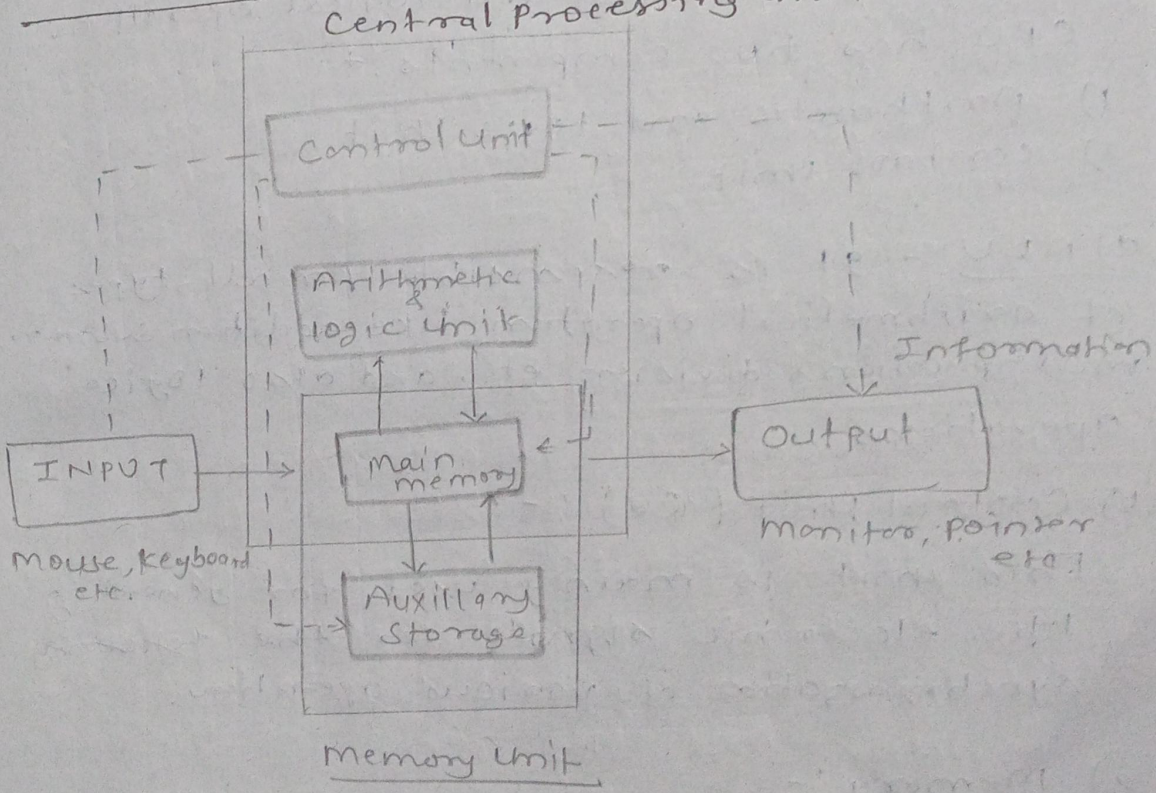
Unit-3 Assignment- 03

Q.1 :- Draw and Explain the basic block diagram of a digital computer system.

Ans :- A Digital computer is a programmable machine which read the binary instruction and process the data which are present in binary form.
Digital Computer are different from analog computers in the context that analog computer process the analog data. The term analog represents continuous data.

Block Diagram :-



1) Central Processing Unit (CPU)
2) Memory
3) Input / Output
4) Auxillary memory

① Central Processing Unit :-

CPU is the brain of computer where all kind of processing is done. This unit takes input data from input devices and process it according to set of instruction called program.

Major function of CPU is to store the data temporarily in the registers and perform arithmetical and logical operation.

CPU has two components :-

1) Arithmetic and logic unit
2) control unit

a) ALU :- It is responsible for all types of arithmetical operation like addition, subtraction, multiplication & division etc. and also logical operations.

b) Control unit (CU) :-

This unit is mainly used for generating the electronic signals for the following synchronization of various operation.

2) Memory :-

Memory in a computer is analogous to a notebook where we may note down various things for future reference.

memory can be classified into following categories :-

a) primary memory

b) Auxillary memory

a) primary memory :-

main memory is fastest memory in a digital computer system. The memory is primarily used to store the data and program, temporarily during the execution of a program.

~~b) Input/output~~

b) Auxillary memory :-

secondary memory is auxillary memory which is used to store the ~~data~~ operating system, compiler, assembler, application, programs, data, files etc, that are not read by cpu directly.

Ques. 2 :- Compare RISC and CISC Processors

CISC	RISC
i) Complex instruction set complex	i) Reduced instruction set complex.
ii) large no. of instruction	ii) less no. of Instruction.
iii) Variable length transaction format	iii) fixed length inst. format.
iv) large no. of addressing mode	iv) few no. of addressing mode.
v) Cost is high	v) less cost
vi) more powerfull	vi) less powerfull

vii) Several cycle instruction	vii) Single cycle instruction
viii) manipulation directly in main memory	viii) Only in registers.
ix) Requires more RAM	ix) Requires less RAM.

Ques. 3:- Explain the use of following registers of processors.

a) Program counter:-

Program counter holds the address of next instruction to read from memory. The register goes through a step by step counting sequence and cause the computer to make successive instructions, previously stored in memory.

b) Accumulator register:

An accumulator is a register for short term, intermediate storage of arithmetic and logic data in a computer's CPU. In an arithmetic operation involving two operands, one operand has to be in this register. And the result of the arithmetic operation will be stored or accumulated in this register.

c) Instruction Register:-

Instruction register holds operation-code bits of the current instruction, This register has only four bit since the operation code of instruction is four bit long. The operation code bits are transferred to the I register from B-register while address part of instruction is left in B.

d) Stack pointer:-

A stack pointer is a small register that stores the memory address of the last data element added to the stack. The stack pointer also referred to as the extended stack pointer (ESP) ensures that the program always adds data to the right location in the stack.

e) Scratch register:-

It is used to hold an intermediate value during a calculation. If we call function, the values in scratch registers may have been changed after the function call. The caller of the function must therefore ensure that these values are saved if they are still needed. They are also called safe registers, These are saved by the call function.

f) Status information Register:-

The status register also known as flag register. It stores the information about the state of the processor. Individual bits are implicitly or explicitly read and/or written by the machine code instruction executing on the processor. The status register lets an instruction take action contingent on the outcome of previous instruction.

g) Buffer registers:-

Buffer registers are a type of registers used to store a binary word. These can be constructed using a series of flip-flops as each flip-flop can store a single bit. This means that in order to store a n-bit binary word one should design an array of n-flip-flops.

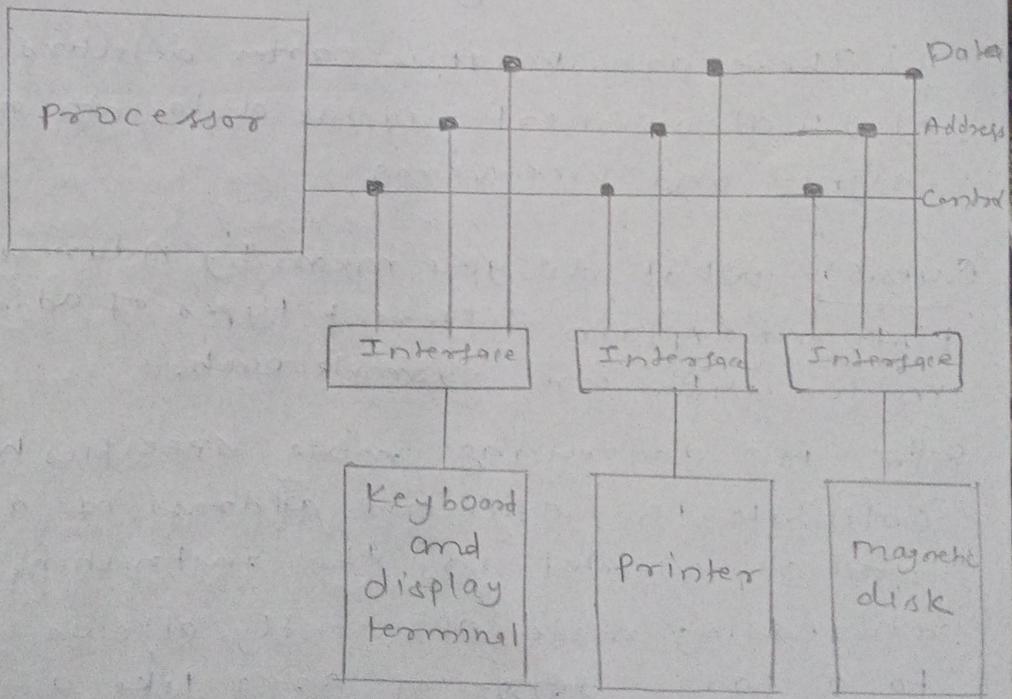
Ques. 4:- Explain about Arithmetic and Logic Unit.

Ans:- ALU is a main component of central processing unit, also known as integer unit. It does all processes related to arithmetic and logic operations that need to be done on instruction words. In some microprocessor architecture, the ALU is divided into the arithmetic unit and logic unit.

The calculations needed by the CPU are handled by ALU; most of the operations are logical in nature. If the CPU is made more powerful, which is made on the basis of ALU is designed. Then it creates more heat and take more power or energy. Therefore it must be moderation between how complex and powerful ALU. is and not be more costly. This is the main reason the faster CPU's are more costly, hence they take much power and destroy more heat. Arithmetic and logical operations are the main operations that are performed by ALU; it also perform bit shifting operation.

Ques. 5 :- Describe the Input/Output subsystem organization and interfacing.

Sol:



Bus is a communication system that transfers the data between components inside a computer, i.e. memory and peripheral device. A peripheral device is that which provide input and output for the computer. it is also called input-output devices. on micro computer bus system, the only purpose of peripheral devices is just to provide special communication links for the interfacing them with CPU.

functions of Input-Output Interface:-

a) It is used to synchronize the operating speed of CPU with respect to input-output devices.

b) It selects the input-output devices which is appropriate for the interpretation of the input-output device.

c) It is capable of providing signals like control and timing signals.

d) There are various error detecters.

e) It also convert digital data into analog signal and vice-versa.

Ques.6:- What do you mean by Addressing mode? List and explain different types of addressing modes with one example each.

Sol:- An addressing mode specifies how to calculate the effective address of a operand represented in the instruction. Some addressing mode efficiently allows referring to a large range of area like a linear

array of address and list of addresses.
Addressing mode describes a flexible and efficient way to define complex effective address.

Types of Addressing Modes:-

a) Implied mode
b) Immediate mode
c) Register mode
d) Register Indirect mode
e) Autoincrement or Autodecrement mode
f) Direct address mode
g) Indirect address mode
h) Indexed addressing mode.

a) Implied mode:-

In this mode, operands are specified implicitly in the definition of the instruction. All register reference instructions that use an accumulator are implied mode instructions.

b) Immediate mode:-

In this mode, operand is specified in the instruction itself. In other words, an immediate mode instruction has an operand field instead of an address field.

c) Register mode:-

In this mode operands are in registers that reside within the CPU. The specific register is selected from a register field in the instruction.

d) Register Indirect mode):-
In this mode the instruction defines a register in the CPU whose contents provide the address of the operand in memory. In other words, the selected register includes the address of the operand rather than the operand itself.

e) Autoincrement/Autodecrement mode:- This is similar to register indirect mode except that the register is incremented or ~~decrement~~ decremented. after (or before) its value is used to access memory.

f) Direct Address mode:-
In this mode, the effective address is equal to the address part of the instruction. The operand resides in memory and its address is given directly by the address field of the instruction.

g) Indirect address mode:-
In this mode, the address field of the instruction gives the address where the effective address is stored in memory. control fetches the instruction from memory and uses its address part to access memory again to read the effective address.

h) Indexed Addressing mode:-
In this mode, the content of an index register is added to the address part of instruction to obtain the effective address. The index register is a special CPU register that contains index value.

Ques.7:- Explain in detail about fetch, decode, and execute cycle in computer organisation.

sol:- This is the methodology, which compiler processors use for executing a given instruction many times processors can be compared to combustion engines. Every processor shows a three-step instruction cycle.

a) Fetch b) Decode c) Execute

a) Fetch:-

first step is to capture or fetch the instruction from the RAM. The fetched data is copied into instruction register. As the first instruction is fetched, the system is at the end of fetch stage of cycle. the program counter (PC) is incremented by 1. so the system is ready to read the next instruction when the next fetch cycle starts.

b) Decode:- Now the instruction fetched needs to be decoded. It is sent via the data bus to the control unit, where it is split into two parts. ~~is the~~ A decoder is responsible for taking in the instruction and decoding it to assign the respective execution unit to complete the execution instruction cycle.

c) Execute :-

The last stage of the execute instruction definition is to execute. It involves executing the given instruction that was fetched at the first stage. Once the instruction has been completed, the result is written to a specific memory address and the next one is executed.

Ques. 8:- What are the different types of instruction formats? Explain them in detail?

Sol:-