2019

1(a): Define structure and function of computers. Discuss the structural development among different generation of computers brief.

Ans: Structure is a way in which components related to each other. The Central Processing Unit (CPU), input devices, and output devices are the three components that make up the basic structure of a computer system.

Function is the operation of individual components as part of the structure. The main functions of a computer are data processing, information and data storage, output, controlling of devices and functions.

Generation in computer terminology is a change in technology a computer is being used. There are totally five computer generations known till date. Each generation has been discussed in detail along with their time period and characteristics.

Following are the main five generations of computers -

First generation of computers (1942-1955): The beginning of commercial computer age is from UNIVAC (Universal Automatic Computer). It was developed by two scientists Mauchly and Echert in 1947. In this generation of computers were based on vacuum tubes. The computers were very large in size and consumed a large amount of energy. Air conditioning was required for this generation.

Second generation of computers (1955-1964): The second generation computers used transistors. The size of the computers was decreased by replacing vacuum tubes with transistors. It is smaller in size as compared to the first generation computers. Cooling system was required for this generation computer.

~~Thired~~ Third Generation of Computers (1964-1975): The third generation computers used the ~~intre~~ integrated circuits (IC). The first IC was invented and used in 1961. The size of an IC is about ¼ square inch. A single IC chip may contain thousands of transistors. Third Generation

of computers are smaller in size as compared to previous generations.

Fourth Generation Computers (1975-Present): The fourth generation computers started with the invention of Microprocessor. The microprocessor contains thousands of ICs. The technology of ICs improved rapidly. The LSI and VLSI circuits ~~improved rapidly~~ was designed. It greatly reduced the size of computer.

Fifth Generation of computers (Present & Beyond): Scientists are working hard on the 5th generation computers with quite a few breakthroughs. It is based on the technique of Artificial Intelligence (AI). Mainly it is based on VLSI Microprocessor.

1(b): Distinguish between RISC and CISC machines.

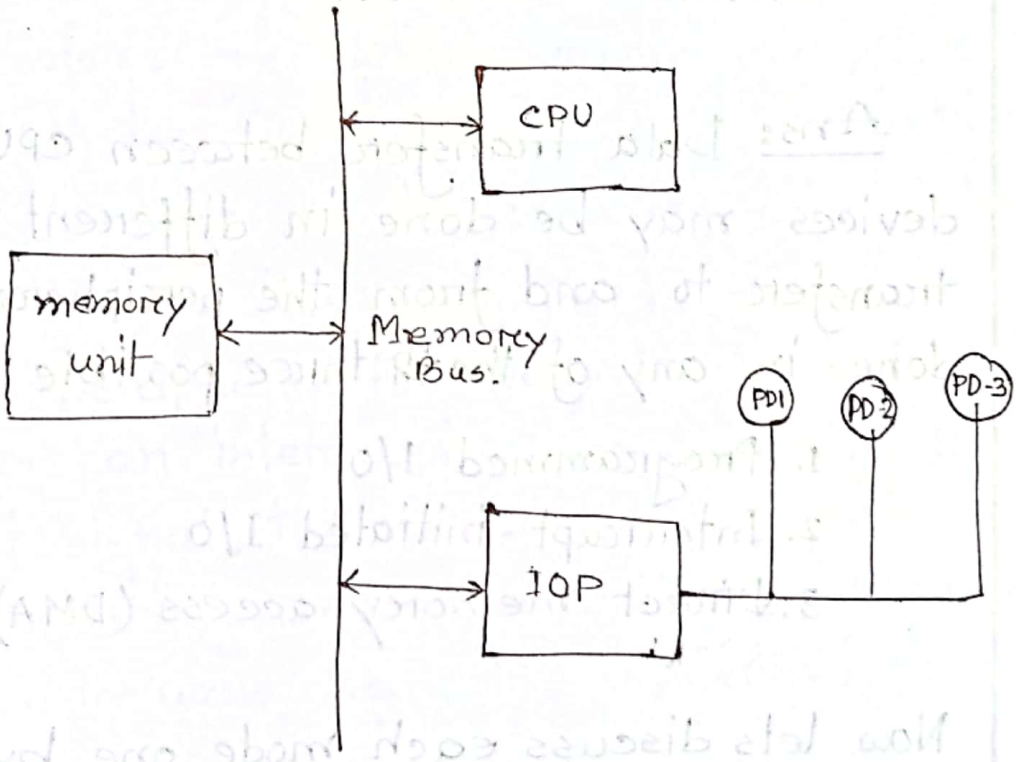
Ans: The major difference between RISC and CISC is that RISC and CISC are the computer instruction sets which is a part of computer architecture.

RISC	CISC
① RISC stand for Reduced Instruction Set Computer.	① CISC stands for Complex Instruction Set Computer.
② RISC requires more RAM	② CISC requires a minimum amount of RAM.
③ RISC does not supports array	③ CISC supports array.
④ Resisters are being used for procedure arguments and return addresses.	④ The stack is being used for procedure arguments and returns addresses.
⑤ It has fewere instructions	⑤ It has more instructions
⑥ Compound addressing mode.	⑥ Limited addressing mode.
⑦ Uses multiple registers	⑦ Uses a single register.

1(c): Draw and briefly discuss the structure of an I/O processor.

Ans: An input-output processor (IOP) is a processor with direct memory access capability. In this, the computer system is divided into a memory unit and number of processors.

Below is a block diagram of a computer along with various I/O processors. The memory unit occupies the central position and can communicate with each processor.



The IOP operates independent from CPU and transfer data between peripherals and memory. The communication between the IOP and the devices is similar to the program control method of transfer. And the communication with the memory is similar to the direct memory access method. The CPU can act as master and the IOP act as slave processor.

2(a): Specify the different I/O transfer machanisms available.

Ans: Data transfer between CPU and the I/O devices may be done in different modes. Data transfer to and from the peripherals may be done in any of the three possible ways.

1. Programmed I/O
2. Interrupt-initiated I/O
3. Direct memory access (DMA)

Now lets discuss each mode one by one.

1. Programmed I/O: Programmed I/O instructions are the result of I/O instructions written in computer program. Each data item transfer is initiated by the instruction in the program. Usually the program controls data transfer to and from CPU and peripheral. Transfering data under programmed I/O requires constant monitoring of all the peripherals by the CPU.

2. Interrupt initiated I/O: In the programmed I/O method the CPU stays in the program loop until the I/O unit indicates that it is ready for data transfer. This is time consuming process because it keeps the processor busy needlessly. This problem can be overcome by using interrupt initiated I/O. In this when the interface determines that the peripheral is ready for data transfer, it generates an interrupt. After receiving the interrupt signal, the CPU stops the task which it is processing and service the I/O transfer and then returns back to its previous processing task.

3. Direct Memory Access : Removing the CPU from the path and letting the peripheral device manage the memory buses directly would improve the speed of transfer. This technique is known as DMA.

. Many hardware systems use DMA such as disk drive controllers, graphic cards, network cards and sound cards e.t.c. It is also used for intra chip data transfer in multicore processors..

2(b): Drive and explain an algorithm fore adding and subtracting 2 floating point binary numbers.

Ans:

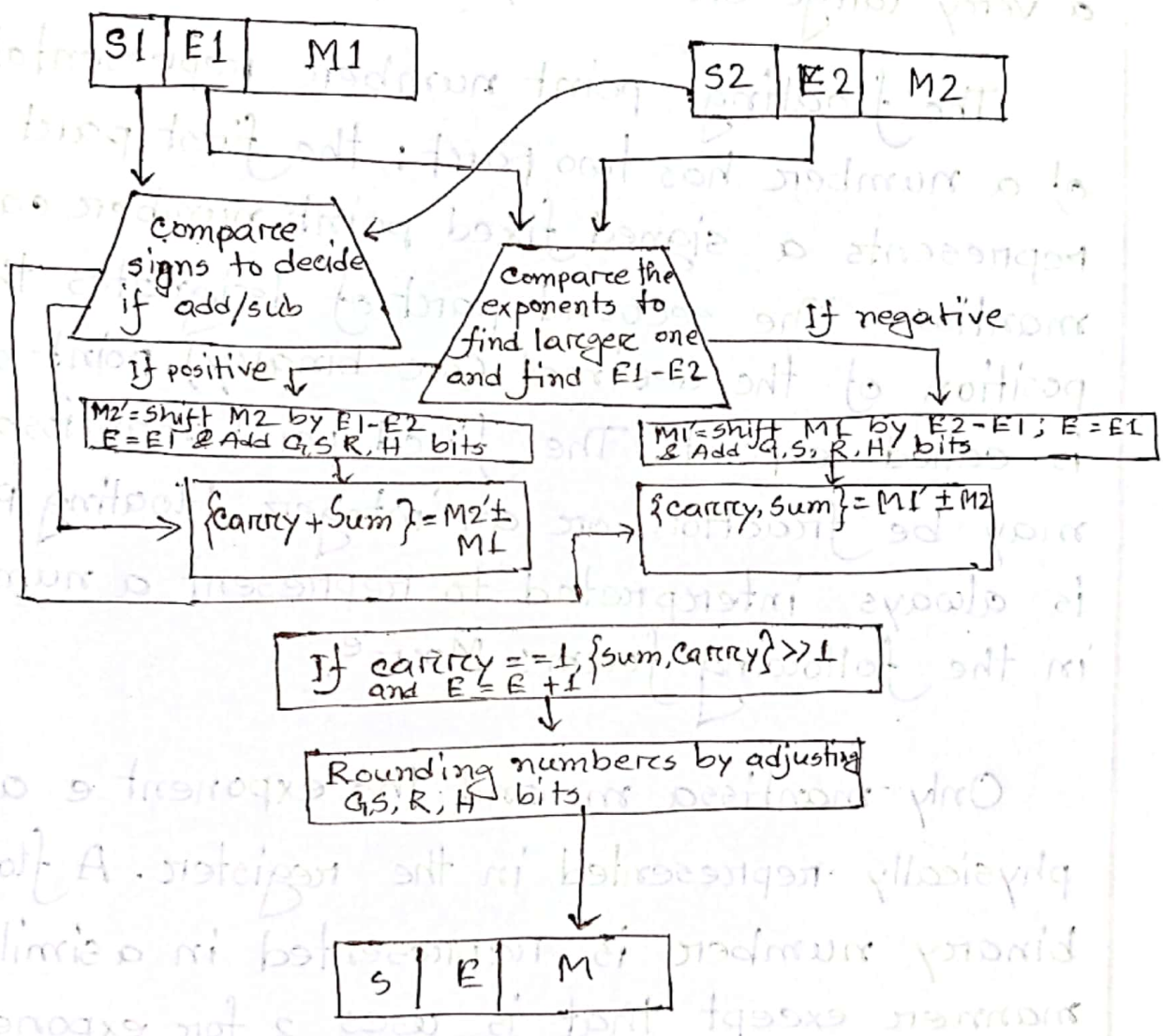


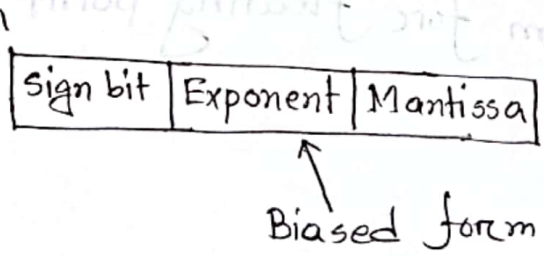
Fig: Algorithm fore floating point addition/subtraction.

2(c): Explain the representation of floating point numbers in detail.

Ans: A floating-point number can represent a very large or a very small value.

The floating point number representation of a number has two part: the first part represents a signed fixed point number called mantissa. The second part designates the position of the decimal (or binary) point and is called expoint. The fixed point mantissa may be fraction or an integer. Floating point is always interpreted to represent a number in the following form: $M \times r^e$.

Only mantissa m and the exponent e are physically represented in the register. A floating binary number is represented in a similar manner except that is uses 2 for exponent.



Section A — (2018)

1(a) Distinguish Between Computer Architecture and Computer Organization.

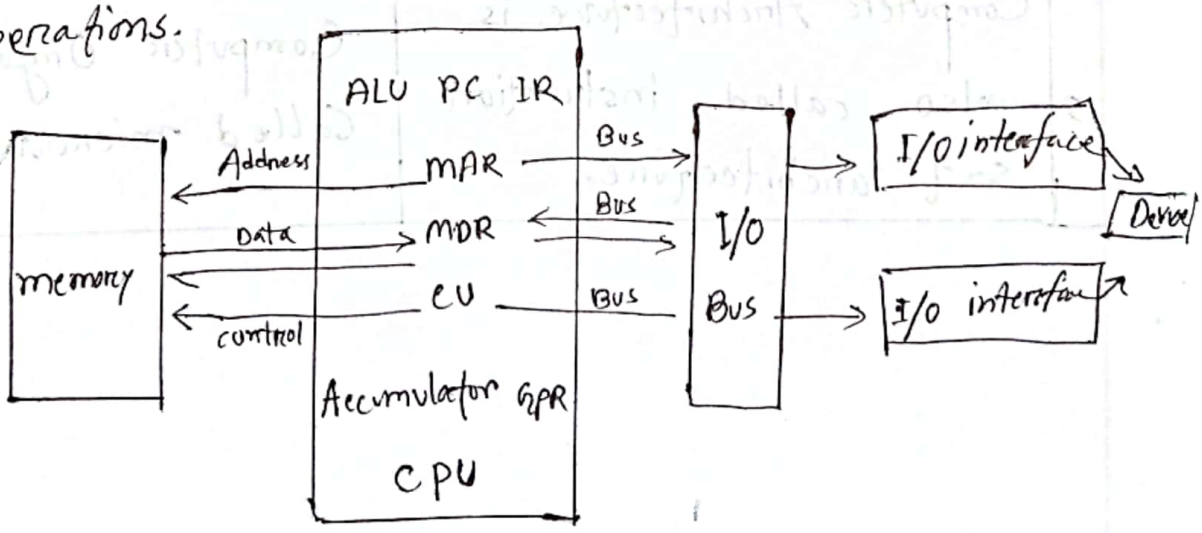
	Computer Architecture	Computer Organization
1	Computer Architecture describes what the computer does.	Computer Organization describes how to does it.
2	Computer architecture deals with the functional behavior of computer system.	Computer Organization deals with a structural relationship.
3	Computer Architecture indicates it's hardware.	Computer Organization indicates it's performance.
4	Architecture coordinates between the hardware and software of the system	Computer Organization handles the segment of network in a System.
5	Computer Architecture is also called instruction set architecture.	Computer Organization frequently Called microarchitecture.

(b) IAS computer the model for a class of computing machines designed by John Von Neumann. The IAS machine was started at Princeton in 1946 and was completed in 1951. This machine used electrostatic storage device - cathode-ray-tube as the main memory. Those tubes could each store 1024 bits.

Organization of CPU:

A control unit (CU) handals all processore control signals. It directs all input and output flow, fetches code for instructions and controls how data moves around the system.

Arithmetic logic unit is the part of CPU that handles all calculations the CPU may need. It also performs: logical, Bit shifting and Arithmetic operations.



Main memory of IAS computer: (Resisters)

1. Accumulator: stores the results of calculation of ALU.

2. Program Counter: keeps track of the memory location of the next instructions to be dealt with. The PC then passes this next address to memory address to memory Address resister.

3. Memory Address Resister: it stores the memory locations of instructions fetched from memory.

4. Memory Data Resister: it stores instructions fached from memory or data that is to be transferred and stored in memory.

5. Current Instruction Register: It stores the most recently fetched instruction while it's waiting and executed.

6. Instruction Buffer Register: The instruction that is not to be executed immediately is placed in IBR.

© Some important features of third generation computers. (1965–1971)

1. Use of Integrated Circuits (IC) insted of transistor.
2. Use of semi-conductor memory.
3. Uses of magnetic storage device.
4. Improved faster Operations and more dependable output.
5. Use of monitors and printers.
6. Use of high level programming language.
7. Less expensive than 2nd generation computers.
8. Less expensive maintence cost.
9. Examples: IBM 360, IBM 370, PDP-11 etc.