3rd semester, CSE

Sub: computer system Architecture

1(a) RAM which stands for Random access memory. It is volatile memory that temporarily stores the files you are working on which means that the information temporarily stored in the module is erased when you restart or shut down your computer.

(b) It is a conceptual model that describes the structure and behavior of multiple components and subsystems like multiple software applications, network devices, hardware and even other machinery of a system.

(C) Arithmetic logic unit (ALU) which is capable of performing logical operations (e.g AND, OR, EX-OR, Invert etc) in addition to the arithmetic operations (e.g Addition, Substraction e.t.c) ALU is the calculator portion of the computer. An arithmetic logic unit (ALU) is a major component of the central processing unit of a computer system.

(d) The SPEC rating is computed as follows

$$\text{SPEC rating} = \frac{\text{Running time on the reference computer}}{\text{Running time on the computer under test}}$$

If the SPEC rating = 50 means that the computer under test is 50 times as fast as the ultra Sparc 10.

2(a) The performance equation analyzes execution time as a product of three factors that are relatively independent of each other. The three factors are in order. Known as the instruction count (IC), clock per instruction (CPI) and clock time (CT).

Basic performance Equation

Let T = processor time required to executed a program.

N = Actual number of instruction executions

S = Average number of basic steps needed to execute one machine instructions.

R = clock rate in cycles per second

The program execution time is given by

$$T = \frac{N \times S}{R}$$

This equation is referred as the basic performance equation.

2(b)

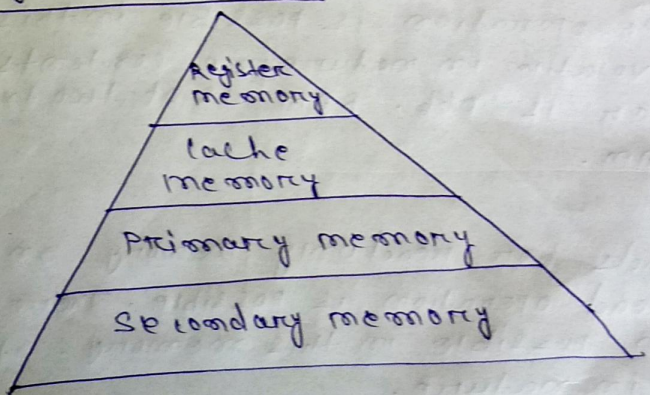
Primary memory	Secondary memory
* It is expensive	* It is relatively cheaper when compared to the main memory
* memory access time is small.	* memory access time is more.
* instruction and data are stored in the main memory only during execution of the program.	* programs are stored in the backup storage when it is not executing
* main memory is random access.	* magnetic tape is sequential access.

* processor interacts with the main memory during execution.	* processor never interacts with the secondary memory.
* ex of main memory are RAM, ROM	* Examples of secondary memory are magnetic disk and magnetic tape.
* storage capacity of main memory is less.	* secondary memory have high storage capacity.

2(i)

MAR	MDR
* it is connected to the address lines of the system bus. it specifies the address in memory for a read or write operations.	* it is connected to the datalines of the system bus. it contains the value to be stored in memory or the last value read from memory.
* it is located on the CPU	* it is an area of RAM.
* it is used to store and retrieve information from them.	* it is mostly used for input/output processes.
* it increase the accessing speed of CPU	* it doesn't increase accessing time.

2(a) memory classification :-



Register memory :-

This memory is inbuilt in the CPU. It consists of several electronic registers. CPU uses this to carry out its various operations. A register is nothing but a group of binnary cell each capable of holding one bit. size of the Register is called the word length. Number of registers in CPU vary from computer to computer. But there are some important registers which every CPU must have. They are: Accumulator, PC, MAR, MBR etc.

Cache memory :-

This is again very fast memory, but put outside the CPU. The size of the memory is also less. This is used for storing frequently used program and data. As the volume of main memory is relatively more the access speed is small.

main memory :-

This is the memory where the program is stored for execution by CPU. This memory directly communicates with CPU. Unless program and data are loaded into this memory, execution is not possible. After execution the result is stored in this memory. It is volatile in nature. This means that whenever power goes out, the content of this memory will be lost.

RAM :-

It stands for Random access memory. Both read and write operation is possible in this memory. This is volatile in nature i.e contents will be lost once power is off. RAM is of two types. SRAM and DRAM.

Rom

It stands for read only memory. In this memory only read operation is possible. There is no write operation possible in this memory. It is not volatile in nature.

PROM:

It stands for programmable read only memory. Here user can program the ROM but only once.

EPROM:

Erasable programmable read only memory. Erasing is possible by use of ultraviolet rays.

EEPROM:

Electrically Erasable programmable read only memory. Erasing is possible by applying high voltage electricity.

Secondary memory:

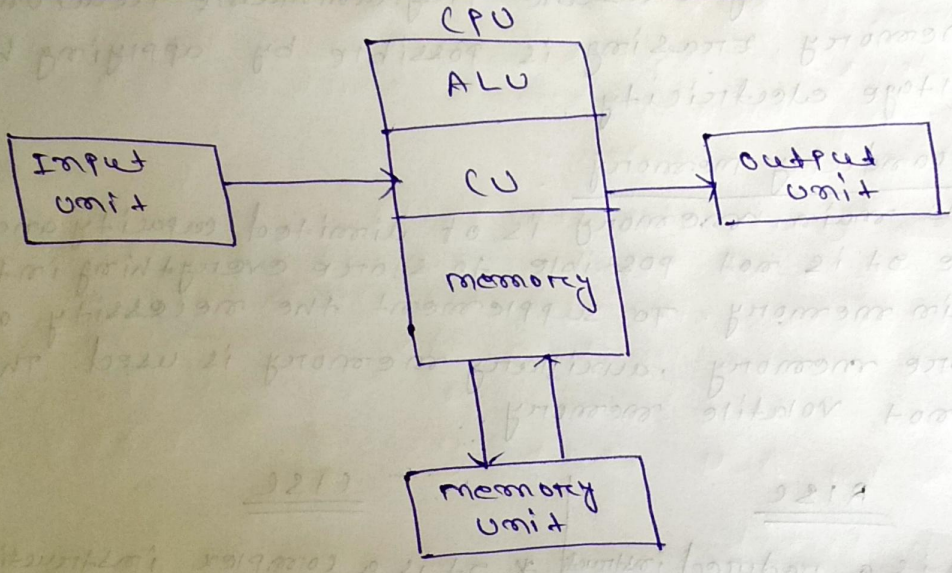
As main memory is of limited capacity and size it is not possible to store everything in the main memory. To supplement the necessity of more memory, auxiliary memory is used. This is not volatile memory.

3(c)

RISC	CISC
* It is a reduced instruction set computer.	* It is a complex instruction set computer.
* It emphasizes on software to optimize the instruction set.	* It emphasizes on hardware to optimize the instruction set.
* It is a hard wired unit of programming in the RISC processor.	* microprogramming unit in CISC processor.
* It requires multiple register sets to store the instruction.	* It requires a single register set to store the instruction

RISC	CISC
* RISC has simple decoding of instruction.	* CISC has complex decoding of instruction.
* Uses of the pipeline are simple in RISC.	* Uses of the pipeline are difficult in CISC.
* RISC has more transistors on memory registers.	* CISC has transistors to store complex instructions.
* The execution time of RISC is very short.	* The execution time of CISC is longer.

(b) Functional units of a computer :→



This architecture say that generally computer consists of 4 major functional units.

(1) Input unit
(2) output unit
(3) CPU
(4) memory unit

Input Unit :-

It is used for giving instruction and data to the computer. Usually the information entered into the computer is in high level language (i.e in a form understood by user)

Input unit converts this into a coded form to be understood by the computer. Input unit comprises of several input devices. Ex Keyboard, mouse, joystick, trackball

Output unit:

The function of output unit is to send the processed results to the outside world. output unit converts it into a form to be understood by the user and send it to the outside world.

Ex Printer, VDU, Plotter

CPU:

Central processing unit consists of ALU and control unit. Besides ALU and CU the CPU also contains of high speed storage elements called registers. Processors uses these registers for temporary storage of operands which are often used by the computer.

ALU: - (Arithmetic Logic unit)

It consists of electric circuit that performs the various arithmetic operations such as addition, substraction, division, multiplication and some logical operations. The control unit tells the ALU, which operation to perform

Control unit:

It coordinates all the activities of the various components of the computer. It sends out command and control signals and determines the sequence of the various instruction.

Memory: -

It refers to the memory available in the CPU itself. It is sometimes called as on chip memory or register memory. This memory is used by CPU for its own work.

Memory Unit

The function of the memory unit is to store program and data. It is also used to hold both the intermediate and final results as the computer proceed through the program. There are two classes of memory devices.

(1) Primary storage
(2) Secondary storage.