Q1.> What is an Operating System? Discuss Components of a computer system.

A1.> An operating system is an interface between a computer user and computer hardware. It is a software which performs all the basic tasks like file management, memory management, process management, handling I/O and controlling peripheral devices.

The components of a computer system are:

(i) **Hardware** : It comprises of the CPU, memory and I/O devices. and provides the basic computing resources for the system.

Central Processing Unit (CPU) - It processes the data from the user and produces results according to the instructions. It has 2 categories:

(a) **Arithmetic and Logic Unit (ALU)** - It performs arithmetic and logic operations like add, multiply etc.

(b) **Control Unit (CU)** - This part of CPU extracts instructions, perform execution and co-ordinates tasks between different parts of computer.

Memory: It stores information either temporarily or permanently in form of bits.

I/O devices: input devices provide input to the processor which process data and display results through output devices.

(ii) **Operating system :** It controls the hardware and coordinates its use among various application programs for various users.

(iii) **Application programs:** For eg: spreadsheets, compilers, web browsers etc. They define the ways in which these resources are used to solve user's computing problems.

USERS	1	2	3	●

SOFTWARE	System Software	Application Software

Operating System

HARDWARE	CPU	RAM	I/O

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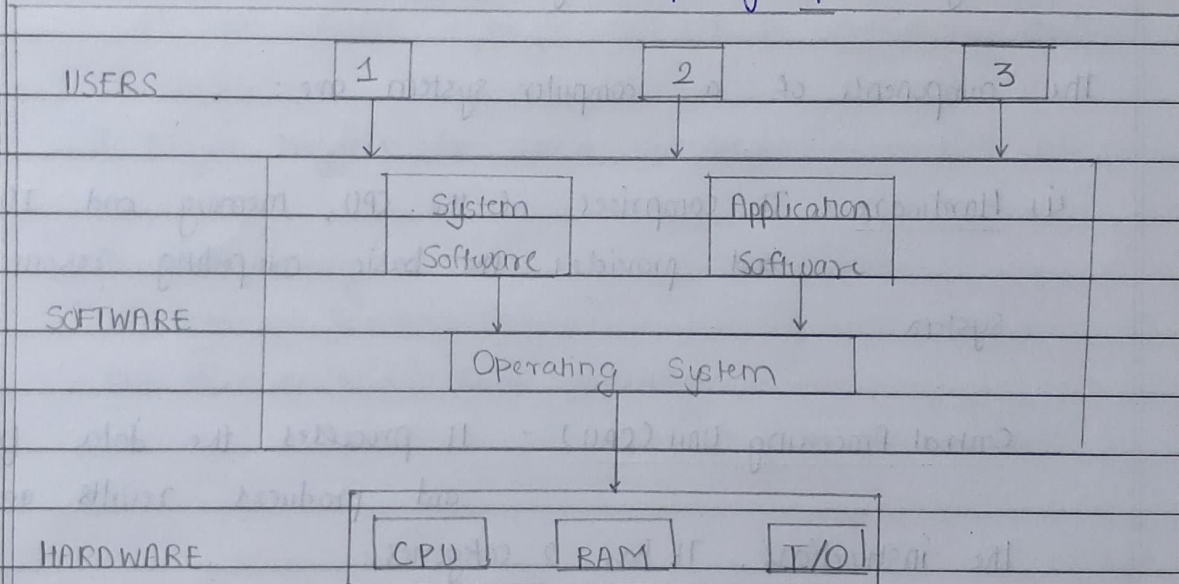
Abstract view of components of computer system

Q2.) Discuss user view and system view of OS.

Ans2) User View depends on the system interface that is used by the user. The OS interface hides the internal complex details and presents a virtual machine to the user to make it easier to use. Different user views experiences are :

(i) Personal computer - OS is designed to make interaction easy.

(ii) Mainframe /Mini computer - OS is largely concerned with resource utilization.

(iii) Workstation - OS needs to focus on both individual usage of resources and sharing throught the network.

(iv) Mobile Phones - OS handles device usability, battery & other operations.

System View : From computer's point of view, OS is the program mostly involved with hardware and acts as resource allocator. It handles different resources like CPU time, memory space, File storage, I/O devices and so on. It allocates them to be specific programs effeciently so that the computer can operate friendly fairly

Q3.7 Explain types of OS in detail.

A3.7 (i) Batch OS - This type of OS does not interact with computer directly. There is an operator which takes similar jobs having the same requirements and group them in batches. Operator is responsible to state jobs with similar needs. Eg: Parallel System, Bank System.

(ii) Time Sharing OS - Each task is given some time to execute so that all the tasks work smoothly. Each user gets the time of CPU as they use a single system, hence they are known as Multitasking (time sharing) Systems. Eg: Multics, Unix, etc.

(iii) Distributed OS - It uses multiple CPU's to serve multiple real time applications and multiple users. Data processing jobs are distributed among the processors accordingly. The processors communicate with one another through various communication lines. Eg: LOCUS

(iv) Network OS - It runs on a server and provides the server the capability to manage data, users, groups, security, applications and other networking functions. Its primary purpose is to allow shared file and printer access among multiple computers in a network. Eg: Linux, Mac OS X   (LAN)

VISION

(V) Real Time OS - These type of OS serve real time systems. The time interval required to process the response to inputs is very small. This time interval is called response time.

    (a) Hard Real time systems : Time constraints are very strict and virtual memory is rarely found in this system.

    (b) Soft Real time systems : Time constraints is less strict and have limited utility as compared to hard real time OS. Eg. multimedia, VR etc.

{Q4> → totrnal 1 }

Q5.> Discuss the process concepts and its different states.

Ans 5.> Process is an active program that is currently in execution. It is more than the program code as it includes program counter, process stack, registers, program code etc. The states of the process are :

(i) New: The process is about to be created but not yet created.

(ii) Ready: Process is loaded into main memory and is waiting to be assigned to the Processor.

(iii) Run : The process is chosen by the CPU for execution and the instructions within the process are executed.

(iv) Blocked : The process is in this state when it is waiting for some event to occur like access to I/O or needs input from user. It waits in Main Memory and does not require CPU.

(V) Terminated: Process is killed as well as PCB is deleted.

(vi) Suspend Ready: Process is in secondary memory. They were in main but lack of memory forced them to be suspended.

(vii) Suspend wait/Block: Similar to suspend ready, but uses the process

Ans ⑤

which was performing I/O operations and lack of main memory caused them to move to secondary memory. When work is finished, it may go to suspend ready.

Q4.> Explain difference between single user single tasking, Multitasking and Multiprogramming. → [Same question in Tutorial 1]

[D5)(↑) above]

Q6.> What is PCB?

Ans6.> A Process Control Block (PCB) is a data structure maintained by operating system for every Process. It contains information associated with a specific process. It stores many data items that are needed for efficient process or management.

(i) Process state : The state may be new, ready, running, haulted etc.

(ii) Process counter : It stores the address of the next instruction to be executed for this process.

(iii) CPU Registers : They include accumulators, stack pointers, general purpose registers. Along with PC, this state information must be saved afterwards when an interrupt occurs, to allow the process to continue correctly.

(iv) CPU scheduling information : This info includes a process priority, pointers to scheduling, queues and any other scheduling parameters.

(v) Memory Management info — It may include info such as value of base and limit registers, page tables or segment tables depending on memory system used by the OS.

(vi) Accounting Info — It includes CPU and real time used, time limits account numbers, job or process numbers.

(vii) I/O status info — It includes list of I/O devices allocated to the process, a list of open files, etc.

Q7.> What is Context Switch?

Ans 7.> The Context Switching is a technique that involves storing the context or state of a process, so that it can be be reloaded when required and execution can be resumed from the same point as earlier.

When context switch occurs, the kernel saves the context, of the old process in the PCB and loads the saved context of the process scheduled to run. This is the feature of a multitasking OS and allows a single CPU to be shared by multiple process.

3 Major Triggers for context switching:

(i) Multi tasking
(ii) Interrupt handling
(iii) User or kernel mode switching

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