ASSIGNMENT
OF
OPERATING
SYSTEM

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ROLL NO.-53

Ques1-What are the main functions of an operating system?

Ans1-The main goal of Operating System is to provide the Interface between the user and the hardware.The various functions those are performed by the Operating System are:

Booting ->Booting is a process of starting the computer operating system starts the computer to work.It checks the computer and makes it ready to work.

Memory Management -> It is also an important function of OS.The memory cannot be managed without OS.Different programs and data execute in memory at one time.If there is no operating system,the programs may mix with each other.The system will not work properly.

Loading and Execution -> A program is loaded in the memory before it can be executed.OS provides the facility to load programs in memory easily and then execute it.

Data Management -> Operating System manages the disk space.It manages the stored files and folders in a proper way.

Process Management -> CPU can perform one task at one time.if there are many tasks,operating system decides which task should get the CPU.

Device Controlling -> Operating System also controls all devices attached to computer.The hardware devices are controlled with the help of small software called device drivers.

Printing Controlling -> OS also controls printing function.If a user issues two print commands at a time,it does not mix data of these files and prints them separately.

Ques2-What does the CPU do when it has no program to execute?

Ans2-Tasks may vary between architecture ,but generally these are the tasks prformed by idle threads:

->Enable interrupts to allow pending interrupts be delieverd.

->Disable interrupts

->On the DEBUG builds,query if a kernel debugger is attached and allow breakpoints if been requested.

->Handle deferred procedure calls.

->Check if there are any runnable threads ready forc execution.If there is one,update the idle processor control block with a pointer to the thread.

->Check the queues of other processors,if possible schedule thread awaiting execution on the idle processor.

->Call a power management routine,which may halt a process or downgrade CPU tick rate and do other similar power saving activities.

Ques3-

```
int main()
{int i,int j;
scanf("%d", &i);
for(j=0; j<i; j++)
{
sum= j+i;}
printf("%d", sum);
exit(0);}
```

In the above problem, differentiate each and every line of code as CPU execution or I/O execution.

Ans3-

STEP 1- FETCH INSTRUCTION

Execution cycle starts with fetching instruction from main memory.The instruction at the current program counter(PC) will be fetched and will be stored in instruction register(IR).

STEP 2-DECODE INSTRUCTION

During this cycle the encoded instruction present in the IR(instruction register) is interpreted by the decoder.

STEP 3-PERFORM ALU OPERATION

It takes two values and output one,the result of the operation.

STEP 4-ACCESS MEMORY

There are only two kind of instruction that access memory:LOAD and STORE. LOAD copies a value from memory to a register and STORE copies a register value to memory.

STEP 5-UPDATE REGISTER FILE

The output result of the ALU is written back to the register file to update the register file.

STEP 6-UPDATE THE PC

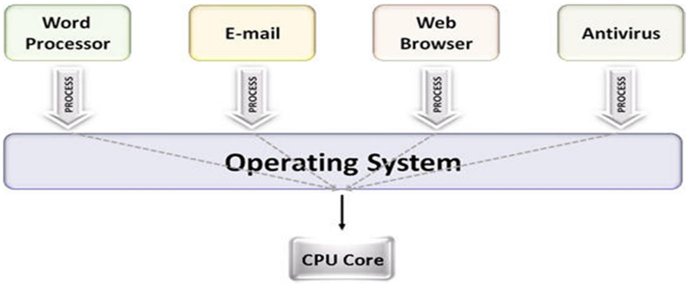
Update the PC to the address of the next instruction,so that we can go back to step1.

Ques4- Difference between Multi-programming, Multi-tasking and Multi-processing?

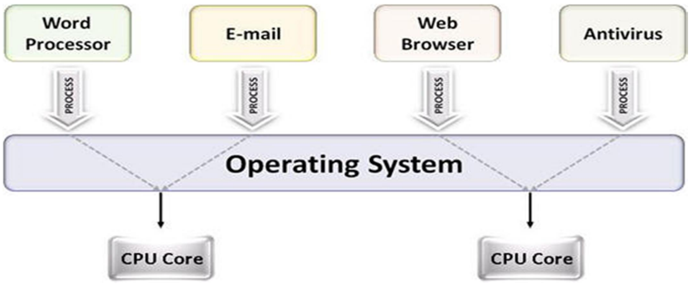
Ans4- MULTIPROGRAMMING->Multiprogramming is also the ability of an operating system to execute more than one program on a single processor machine.More than one task/program/job/process can reside into the main memory at one point of time.A computer running excel and firefox browser simultaneously is an example of multiprogramming.

Operating System
Job1
Job2
: :
Job n
Empty Space

MULTITASKING->Multitasking is the ability of an operating system to execute more than one task simultaneously on a single processor machine.Though we say so but in reality no two tasks on a single processor machine can be executed at the same time.Actually CPU switches from one task to the next task so quickly that appears as if all the tasks are executing at the same time.More than one task/program/job/process can reside into the same CPU at one point of time.



MULTIPROCESSING->Multiprocessing is the ability of an operating system to execute more than one process simultaneously on a multi processor machine.In this a computer uses more than one CPU at a time.



Ques5-Difference between a program and a process?

Ans5-

A **program** is a set of instructions that are to perform a designed task,where as the process is an operation which takes the given instructions and perform the manipulations as per the code,called ‘execution of instructions.A process is entirely dependent of a ‘program’.

A **process** is a module that executes modules concurrently.They are separate loadable modules.Where as the program perform the tasks directly relating to an operation of a user like word processing,executing presentation software etc.

Ques6- Categorize the following state: NEW, READY, RUN, BLOCK, TERMINATE, SUSPEND READY, SUSPEND WAIT as main memory or secondary memory.

Ans6-

NEW-Contains the process which are newly coming for execution.

READY-Contains the process which are in main memory and available for execution.

RUNNING-Contains the process which is running or executing.

TERMINATE-Contains the process which are completely executed.

SUSPEND READY-Contains the processes which are in secondary memory available for execution as soon as it is loaded into main memory.

SUSPEND WAIT-In systems that support virtual memory,a process may be swapped out,that is,removed from main memory and placed on external storage by the schedularFrom here the process may be swapped back into the waiting state.

Ques7-Define the term context switch with a appropriate example.

Ans7-Context Switch is the process of storing and restoring the state of a process or thread so that execution can be resumed from the same point at a later time.This enables multiple processes to share a single CPU and is an essential feature of a multitasking operating system.

Context switching perform the following activities with regard to processes on the CPU:

1-Suspending the progression of one process and storing the CPU's stste for that process somewhere in memory.

2-Retrieving the context of the next process from memory and restroing it in the CPU's registers.

3-Returning to the location indicated by the program counter in order to resume the process.

Ques8-Consider a system with ‘n’ CPU processors and ‘m’ processes, then answer the following queries regarding minimum and maximum number of processes:

	Minimum	Maximum
Ready	?	?
Running	?	?
Block	?	?

Ans8-

	Minimum	Maximum
Ready	0	M
Running	0	N
Block	0	M

Ques9-Define the responsibilities of: Short term scheduler, Middle term scheduler and Long term scheduler.

Ans9-Schedulers are special system software which handle process scheduling in various ways. Their main task is to select the jobs to be submitted into the system and to decide which process to run. Schedulers are of three types –

1-Long-Term Scheduler

2-Short-Term Scheduler

3-Medium-Term Scheduler

LONG TERM SCHEDULAR->It is also called a job scheduler. A long-term scheduler determines which programs are admitted to the system for processing. It selects processes from the queue and loads them into memory for execution. Process loads into the memory for CPU scheduling.

SHORT TERM SCHEDULAR-> It is also called as CPU scheduler. Its main objective is to increase system performance in accordance with the chosen set of criteria. It is the change of ready state to running state of the process. CPU scheduler selects a process among the processes that are ready to execute and allocates CPU to one of them.Short-term schedulers, also known as dispatchers, make the decision of which process to execute next. Short-term schedulers are faster than long-term schedulers.

MEDIUM TERM SCHEDULAR->Medium-term scheduling is a part of swapping. It removes the processes from the memory. It reduces the degree of multiprogramming. The medium-term scheduler is in-charge of handling the swapped out-processes.A running process may become suspended if it makes an I/O request. A suspended processes cannot make any progress towards completion. In this condition, to remove the process from memory and make space for other processes, the suspended process is moved to the secondary storage. This process is called swapping, and the process is said to be swapped out or rolled out. Swapping may be necessary to improve the process mix.

IN SHORT- LONG TERM SCHEDULER decide the number of process going to execute. The work of **SHORT TERM SCHEDULER** is to improve the performance of the CPU by minimizing/remove the indolence of the CPU by processing as many process it can so it load as many process it can. then it comes **MIDDLE TERM SCHEDULER** ,as short term scheduler load many process so it may cause CPU overloading so here Middle Term Scheduler comes in to picture by removing process (It is doing the opposite work of Short Term Scheduler) So,the processor can run the processes smoothly.

Ques10-State some principles of giving a better user interactivity.

Ans10-

CLARITY-Clarity is the first and most important job of any interface.To be effective using an interface you,ve designed,people must be able to recognize what it is.

KEEP USERS IN CONTROL-Keep users in control by regularly surfacing system status by describing causation and by giving insight into what to expect at every turn.

DIRECT MANIPULATION IS BEST-Strive for that original goal of direct manipulation design an interface with as little a footprint as possible natural human gestures.Ideally,the interface is so slight that the user has a feeling of direct manipulationwith the object of their focus.

ONE PRIMARY ACTION PER SCREEN-Every screen we design should support a single action of real value to the person using it.This makes it easier to learn,easier to add to or build on when necessary.Screen that support two or more primary actions become confusing quickly.

CONSISTENCY MATTERS-Elements that behave the same should look the same.But it is just as important for unlike elements to appear consistent.

Ques11- Why can’t a virus just take hold of the system and keep running? Think and try to answer.

Ans11-The code that is running at any moment in time has control of the computer while it is running. But other programs may be able to wrest control away from the running program so that they themselves can run. Operating systems do this all the time so that they can control the programs they run. The operating system is able to do this because it is loaded before any user programs and can arrange things so that it can always regain control.

Any malware that wants to be able to use your computer must somehow arrange to be run by the operating system. There are several ways to do this, but in the end, for the initial infection, the end-user must be tricked into allowing a program to be run, which will actually infect his/her computer. This means arranging that some unwanted software will be automatically run by the operating system, often using some autostart mechanism. This unwanted software can then actually do anything the current user is able to do on the computer.

Sometimes the virus will arrange be run even before the operating system is loaded, which means it can control the operating system. These are known as boot-viruses. The first code to run has complete control of the machine until it gives that up. On PC's this is generally the BIOS. But the BIOS does, as far as we know, is initialize the machine somewhat and then give control to a bootloader on a disc or stick somewhere. This is often where a boot-virus will insert it's self. It will then arrange to retain control of the machine while loading the operating system.

Ques12-What is the responsibility of dispatcher?

Ans12- The dispatcher is the module that gives control of the CPU to the process selected by the short-time scheduler(selects from among the processes that are ready to execute).

The function involves : Swithching context Switching to user mode Jumping to the proper location in the user program to restart that program.

Ques13- What are the applications of real time operating system?

Ans13-Applications of Real time operating system are-

1.Deterministic- they execute functions in fixed amount of time.

2.Correctness- time at which result produced .

3.Predictability- all constrints related to timing meet.

Ques14-What do understand by the term system call?

Ans14- A system call is the programmatic way in which a computer program requests a service from the kernel of the operating system it is executed on. This may include hardware-related services (for example, accessing a hard disk drive), creation and execution of new processes, and communication with integral kernel services such as process scheduling. System calls provide an essential interface between a process and the operating system.

In most systems, system calls can only be made from userspace processes, while in some systems, OS/360 and successors for example, privileged system code also issues system calls.

Ques15- What is the use of Fork and Exec system call?

Ans15-

Fork

At this point, the operating system will create a new process that is exactly the same as the parent process. This means all the state that was talked about previously is copied, including open files, register state and all memory allocations, which includes the program code.

The return value from the system call is the only way the process can determine if it was the existing process or a new one. The return value to the parent process will be the Process ID (PID) of the child, whilst the child will get a return value of 0.

At this point, we say the process has forked and we have the parent-child relationship as described above.

Exec

Forking provides a way for an existing process to start a new one, but what about the case where the new process is not part of the same program as parent process? This is the case in the shell; when a user starts a command it needs to run in a new process, but it is unrelated to the shell.

This is where the exec system call comes into play. exec will replace the contents of the currently running process with the information from a program binary.

Thus the process the shell follows when launching a new program is to firstly fork, creating a new process, and then exec (i.e. load into memory and execute) the program binary it is supposed to run.