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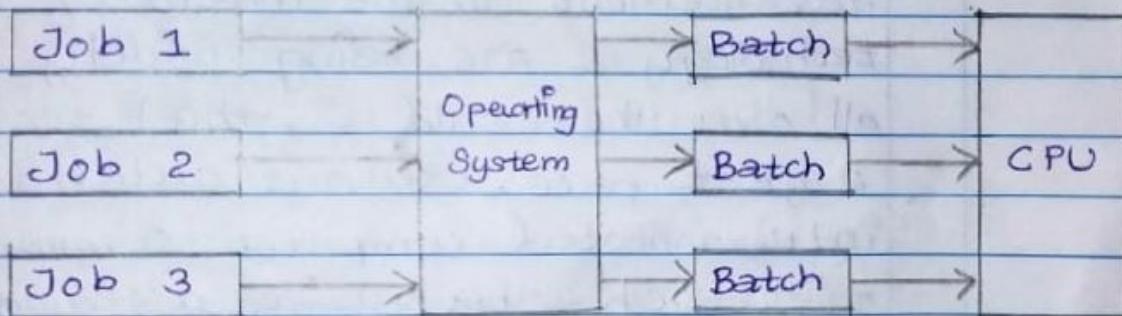
OPERATING SYSTEM

1] Define the types of Operating System?

= Types of Operating System: Some widely used operating systems are as follows-

1] Batch Operating System:-

This type of Operating System does not interact with the computer directly. There is an operator which takes similar jobs having the same requirement & group them into batches. It is the responsibility of the operator to sort jobs with similar needs.



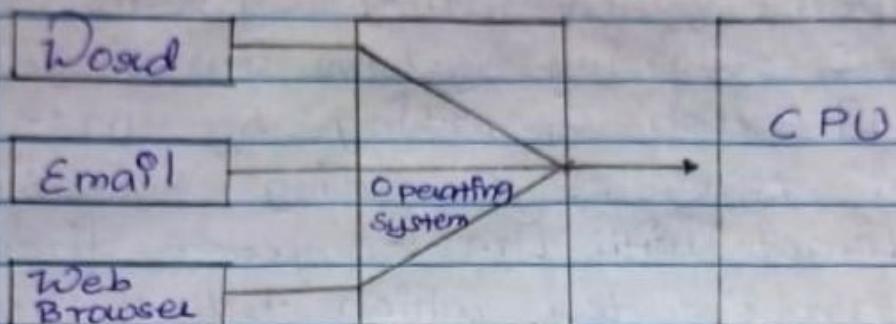
2] Time-Sharing Operating System -

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. These systems are also known as Multi-tasking Systems. The tasks can be from a single user or different users also. The time that each task gets to execute is called quantum. After

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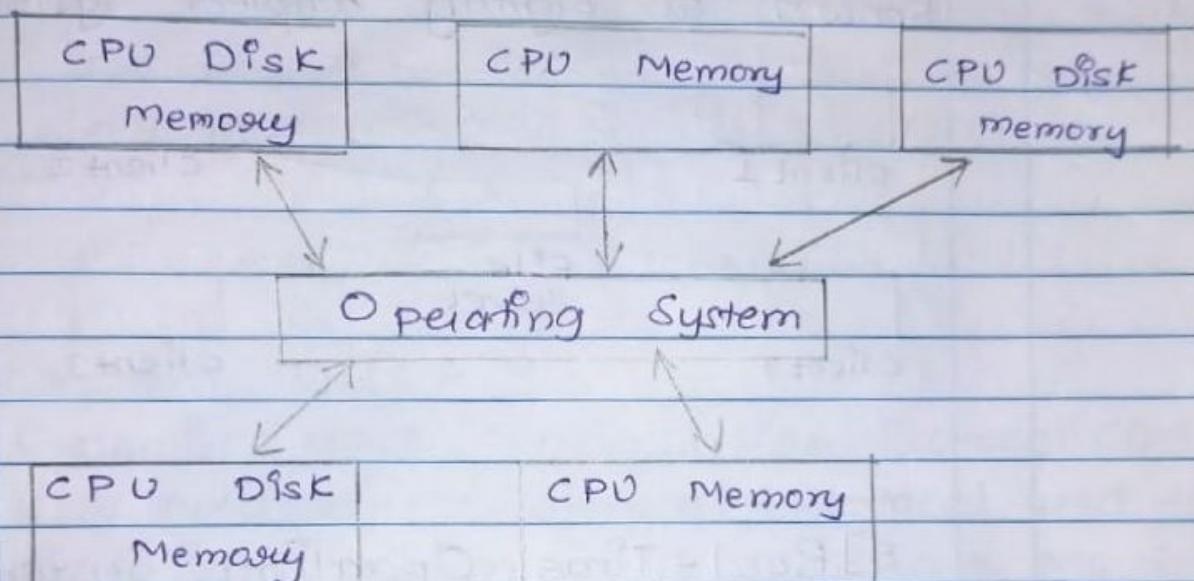
the time interval is over OS switches over to the next task.



3] Distributed Operating System -

These types of the OS is a recent advancement in the world of Comp" technology & are being widely accepted all over the world &, that too, with a great pace. Various autonomous interconnected computer communicate with each other using a shared com" network. Independent systems possess their own memory unit & CPU. These are referred to as loosely coupled system or distributed systems. These system's processes differ in size & funct" The major benefit of working with these types of OS is that it is always possible that one user can access the files or software which are not actually present on his system & that is always possible that one user can access the files or software

which are not actually present on his system but some other system connected within this network i.e., remote access is enabled within the device connected in that network.

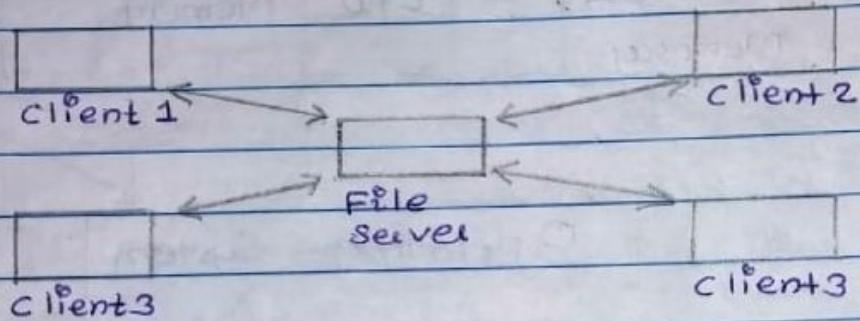


4] Network Operating System:-

These system run on a server & provide the capability to manage data, user, groups, security, applications, & other networking function. These types of OS allow shared access of files, printers, security, applications, & other networking. These types of OS allow shared access of files, printers, security, appl'n, & the networking function over a small private network. One more important aspect of Networking OS is that all the user are well aware of the

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underlying configuration, of all other users within the networks, their individual connections, etc. & that's why these computers are popularly known as tightly coupled systems.



5] Real - Time Operating System -

These types of OS serve real-time system. The time interval required to process & respond to inputs is very small. The time interval is called response time. Real time systems are used when there are time requirements that are very strict like missile system, air traffic control systems, robots, etc.

- Hard Real - Time Systems:-

- Soft Real - Time Systems:-

Applications



RTOS - Kernel

BSP

Custom Hardware

2] Explain DHCP ?

= Dynamic Host Configuration Protocol (DHCP) is a network management protocol used to dynamically assign an IP address to any device, or node, on a network so they can communicate using IP (Internet Protocol). DHCP automates & centrally manages these configurations. There is no need to manually assign IP addresses to new devices. Therefore, there is no requirement for any user configuration to connect to a DHCP based network.

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3] Explain DNS?

= An application layer protocol defines how the application processes running on different system, pass the message to each other.

- DNS stands for Domain Name System
- DNS is a directory service that provides a mapping betⁿ the name of a host on the network & its numerical address.
- DNS is required for the functioning of the Internet
- Each node in a tree has a domain name, & a full domain name is sequence of symbols specified by dots.
- Ex:- FTP site at EduSoft has an IP address of 132.147.165.50.

4] Explain paging?

= Paging is a storage mechanism that allows OS to retrieve processes from the secondary storage into the main memory in the form of pages. In the Paging method, the main memory is divided into small fixed-size blocks of physical memory, which is called frames. The size of a frame should be kept the same as that of a page to have minimum utilization of the main memory & to avoid external fragmentation. Paging is used for faster access to data, and it's a logical concept.

5) Explain segmentation?

- In operating systems, segmentation is a memory management technique in which the memory is divided into the variable size parts. Each part is known as a segment which can be allocated to process. The details about each segment are stored in a table called a segment table.

6) Explain memory management?

- Memory management is a functionality of an operating system which handles or manages primary memory and moves processes back and forth between main memory and disk during execution. Memory management keeps tracks of each and every memory location, regardless of either it is allocated to some process or it is free.

7) Explain the function of OS.

→ An operating system is a program that acts as a user-computer GUI (Graphical user interface). It controls the execution of all types of applications.

The operating system performs the following functions in a device.

① Instruction: The operating system establishes a mutual understanding between the various instructions given by the user.

② Input / output management

③ Memory management

④ File management

⑤ Processor management

⑥ Job Priority

⑦ special control program

⑧ security

8) Explain Kernel. Its architecture and working.

→ The kernel is a core of operating system. It is software responsible for running programs and providing secure access to the machine's hardware. Since there are many programs and resources are limited, the kernel also decides when and how long a program should run. This is called Scheduling.

Q) Explain a Shell Script?

A shell ~~script~~ is a text file that contains a sequence of commands for a UNIX-based operating system. It is called a shell script bcoz it combines a sequence of commands, that would otherwise have to be typed into the keyboard one at a time, into a single 'script'. The shell is the operating system's CLI - cf interpreter for the set of command that are used to communicate with the system.

A shell script is usually created for command sequences in which a user has a need to use repeatedly in order to save time. Like other programs, the shell script can contain parameters, comments & subcommands that the shell must follow. User initiate the sequence of commands in the shell script by simply entering the file name on command line.

10) Explain Page Fault?

→ Page fault dominates more like an error.

It mainly occurs when any program tries to access ~~space~~ the data or code that is in the address space of the program, but that data is not currently located in the RAM of the system.

- So basically when the page referenced by the CPU is not found in the main memory then the situation is termed as Page fault.

- Whenever any page fault occurs, then the reqd. page has to be fetched from the secondary memory into the main memory.

In case if the reqd page is not loaded into the memory, then a page fault trap arises.

The page fault mainly generates an exception, which is used to notify the operating system that it must have to retrieve the "pages" from the virtual memory in order to continue the execution.

Once all the data is moved into the physical memory the program continues its execution normally. The page fault process takes place in the background & thus goes unnoticed by the user.

- The hardware of the computer tracks to the Kernel & the program counter (Pc) is generally saved on the stack. CPU registers store the information of the current state of instruction
- An assembly program is started that usually saves the general registers & also saves the other ~~volatile~~ information to prevent the OS from destroying it.

17) Explain Deadlock.

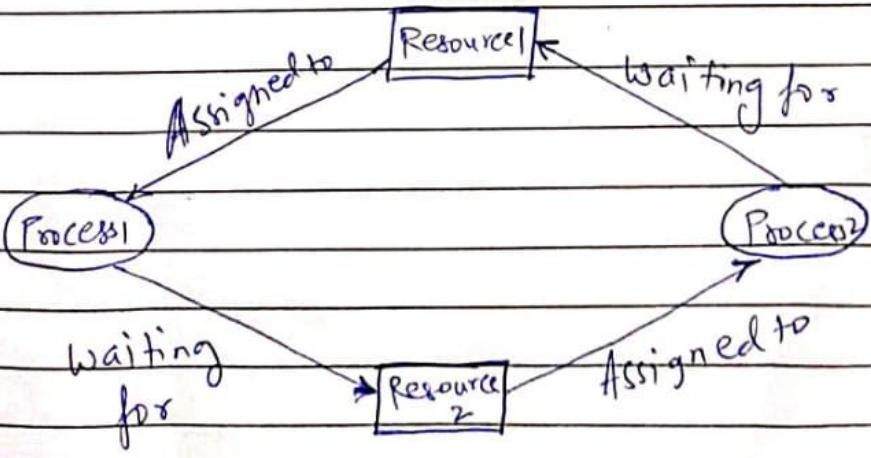
Deadlock :-

After A Process in operating system uses resources in the following way.

- 1) Request a resource.
- 2) Use the resource.
- 3) Release the resource.

Deadlock is a situation where a set of processes are blocked because each process is holding a certain resource & waiting for another resource acquired by some other process.

Consider an example when two trains are coming toward each other on the same track & there is only one track, none of the trains can move once they are in front of each other. A similar situation occurs in operating systems. When there are two or more processes that hold some resources & wait for resources held by other(s). For example in the below diagram, Process 1 is holding resource 1 & waiting for resource 2 which is acquired by process 2, & process 2 is waiting for resource 1.



Q) What are the necessary conditions for Deadlock
→ Deadlock can arise if the following four conditions hold simultaneously.

1) Mutual Exclusion:-

One or more than one resource are non-shareable (only one process can use at a time).

2) Hold & wait :-

A process is holding at least one resource & waiting for resource.

3) No Preemption :-

A resource cannot be taken from a process unless the process releases the resources.

4) Circular Wait :-

A set of processes are waiting for each other in circular form

Q.13] Explain a Semaphore.

- i) "Semaphore is simply a variable that is non-negative and shared between threads." a semaphore is a signaling mechanism and a thread is waiting on a semaphore which is waiting can be signalled by another thread. it uses two atomic operations 1) wait and 2) signal for the process of synchronization.

Characteristics of Semaphore:

- it provides a mechanism that can be used to provide synchronization of tasks.
- it is a low level synchronization mechanism.
- it always holds non-negative integer value.
- it can be implemented using test operations and interrupts.

Types of Semaphores - i) counting Semaphore
ii) binary Semaphore.

Q.14] Explain a mutex.

- i) "A mutex is a binary variable whose purpose is to provide locking mechanism".
- ii) it is used to provide mutual exclusion to a section of code, means only one process can work on a particular code section at a time.
- iii) Mutual exclusion reduces latency and busy-waits using queuing and context switches. Mutex can be enforced at both the hardware and software levels.
- iv) Disabling interrupts for the smallest number of instructions is the best way to enforce mutex at the kernel level and prevent the corruption of shared data structures.

Q.15] Difference among Kernel space & user space.

Kernel space	User space
i) Kernel space is where the kernel runs & provides its services.	i) User space is a portion of system memory in which user processes run.
ii) User is not allowed to interfere.	ii) User can interfere.
iii) Kernel space is strictly reserved for running the kernel, kernel extensions & most device drivers.	iii) User space is the memory area where all user mode app's work & memory can be swapped when necessary.
iv) Linux Kernel space gives full access to the hardware.	iv) User space cannot access memory of other processes.
v) If user space making frequent system calls then, it might be slower than user space drivers.	v) User space drivers are known to be faster as they avoid user-kernel context switches.
vi) Kernel code has ability to block interruptions.	vi) User code does not have ability to block interruptions.

Q.16] Write in brief the ping command

- i) "PING - (Packet internet groper) command is used to check the network connectivity between host and server/host.
- ii) This command takes IP address as input and sends a data packet to the specified address with the message 'PING' and get a response from the server host this time is recorded , which is called latency.
- iii) fast ping low latency means faster connection
- iv) PING uses ICMP[internet control message protocol] to send an ICMP echo message to the specified host . if that host is available then it sends ICMP reply message.
- v) PING is generally measured in millisecond
- vi) here are some commands
 - To get ping version ⇒ sudo ping -v
 - To stop ping ⇒ ctrl +c
 - To control the size of packets ⇒ ping -s
 - To control the number of pings ⇒ ping -c
 - To change the time interval ⇒ ping -i
 - To timeout ping ⇒ ping -w .

Q 17 What is Unix?

→ Unix is an operating system which was first developed in the 1960's. By operating system, we mean the suite of programs which make the computer work. It is stable, multi user, multi-tasking system for servers, desktop & laptop.

Unix System also have a graphical user interface [GUI] similar to Microsoft Windows which provides an easy to use environment.

- Type of Unix.

- The most popular varieties of Unix are
- Sun Solaris, - GNU/Linux, & macOS X.
-
- The Unix operating system is made up of three parts; the kernel, the shell, & the program.

The Kernel :-

The kernel of UNIX is the hub of operating system:- It allocates time and memory to program and handles the filestore, and communication in response to system calls.

The Shell :-

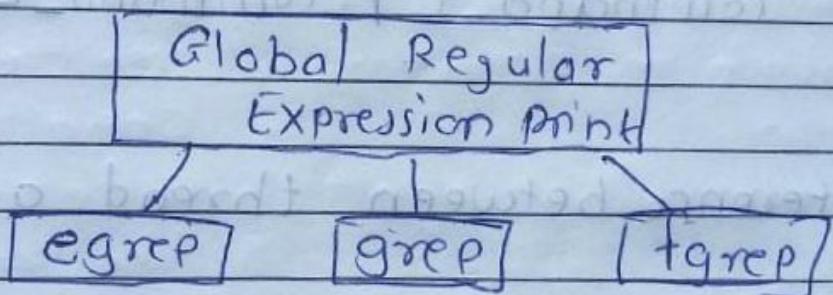
The shell acts as an interface between the user and the kernel. When a user logs in the login program checks the username and password and then starts another program called the shell. The shell is a command line interpreter (CLI).

files and process of

- Everything in UNIX is either a file or a process
- A process is an executing program identified by unique PID
- A file is a collection of data. They are created by user text editors, running compiler, etc.

Q18 What is GREP?

In Simplest term, grep [global regular expression print] is a small family of command that search input files for searching string and print the line that match it.



Ex -
grep "boot" a_file

Q19 What is piping?

A pipe is a form of redirection [transfer of standard output to some other destination] that is used in Linux and Unix-like operating systems to send the output of one command / program / process to another command to be connected to / program / process for further processing. The Unix / Linux system allows

The process can have following state like new, ready, running, waiting, terminated, suspended.

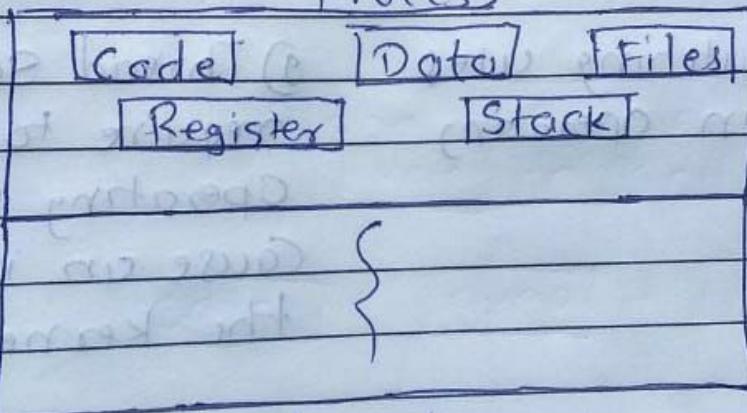
Threads :-

Thread is the segment of process means a process can have multiple threads and these multiple threads are contained within a process. A thread have 3 states.

Running, ready, and blocked.

Thread takes less time to terminated as compared to processes and like process threads do not isolate.

Process



Thread

Process

Thread

- i) process means any program is in execution
- ii) Thread means segment of process
- iii) Process take more time to terminate
- iv) Thread takes less time to terminate.
- v) It takes more time for creation
- vi) It takes less time for creation.

- 2) It also takes more time for context switching 4) It takes less time for context switching
- 5) Process is less efficient in term of communication 6) Thread is more efficient in term of communication
- 7) Process consume more resources 8) Thread consume less resources
- 9) Process is Isolated 10) Thread share memory
- 11) Process is called heavy weight process 12) Thread is called light weight process
- 13) Process switching uses interface in operating system 14) Thread switching doesn't require to call a Operating System and cause an interrupt to the kernel
- 15) If one process is blocked then it will not effect the execution of other process 16) Second thread is the same task couldn't run, while one server thread is blocked
- 17) Process has its own PCB, Stack & address Space 18) Thread has parent's PCB, its own Thread control block and stack and common address Space.

[1] Explain a scheduling algo?

Scheduling: When a process starts its execution if a new process starts its execution there is ready queue where process starts its execution.

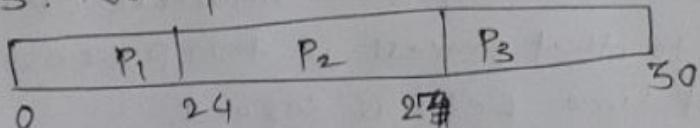
We are switching processes from ready to running for that certain things are required and on the basis of that which process needs to switch & which process needs to go in CPU this is done by scheduling of that's called process scheduling & for that we use algo and that are nothing but scheduling algo.

Scheduling Criteria: CPU utilization, throughput, turnaround time, waiting time, response time

Scheduling algo: pre-emptive, non pre-emptive.
FCFS, SJF, RR, PS.

process	BURST time	Arrival time.
P ₁	24	0
P ₂	3	2
P ₃	3	4

★ FCFS: Non pre-emptive.



Average turn around time:

Turn around time = waiting time + burst time

$$P_1 = 0 + 24 = 24$$

$$P_2 = 24 + 3 = 27$$

$$P_3 = 27 + 3 = 30$$

$$\text{Avg} = \frac{24+27+30}{3} = \frac{81}{3} = 27$$

Average response time:

Response time = first Response - Arrived time.

$$P_1 = 0$$

$$P_2 = 24 - 2 = 22$$

$$P_3 = 27 - 4 = 23$$

$$\text{Avg} = \frac{23+22+23}{3} = \frac{68}{3} = 22.67$$

(22) Explain pre-emptive & non-preemptive scheduling?

Non-preemptive: CPU is assigned to one process. CPU does not release until the completion of that process. The CPU will assign to some other process only after the previous process has finished. ex. FCFS, SJF, LTF

Pre-emptive: CPU can release the process even in the middle of the execution. CPU receives a signal from process P₂ as compares the priorities of P₁, P₂. If P₁ has greater priority than P₂, CPU continues the execution of P₁. If P₁ has less priority than P₂, then P₂ starts execution. ex. SRTF, LRFT, Round Robin, Priority based

(23) Define the different Scheduling Algo.

CPU scheduling algo:

① First come first served algo (FCFS)
The process that request the CPU first is holds the CPU first. If a process, if a process request the CPU then it is loaded into the ready queue. Connect CPU to that process.

② Shortest job first scheduling (SJF)

which process having the smallest CPU burst time CPU is assigned to that process. If two processes having the same CPU burst time FCFS is served.

③ Shortest Remaining Time First (SRTF), (Pre-emptive)

Short term scheduler always chooses the process that had the shortest remaining time. When a new process joins the ready queue short term scheduler compares the remaining time of executing process and new process. If the new process has the least CPU burst time the scheduler selects that job & connects to CPU otherwise continues the old process.

④ Round Robin:

It is designed especially for time sharing system. Here CPU switches bet. the processes when the time quantum expired the CPU switched to another job.

A small unit of time called a time quantum or time slice. A time quantum is generally from 10 to 100 ms. The time quantum is generally depending on OS. There ready queue is a circular queue. CPU scheduler picks the first process from ready queue. Sets timer to interrupt after one time quantum & dispatches the process.

Q5) Priority Scheduling:

In this algo algo is chosen which algo having highest priority.

Q6) Explain booting process?

Booting: Booting is a process of starting the computer. Operating system starts the computer to work. It checks the computer & makes it ready to work.

25) Explain Bias ?.

→ The basic input output system, or BIOS is a very small piece of code contained on a chip on your system board. When you start your computer, BIOS is the first software that runs. It identifies your computer's hardware, configures it, tests it and connects it to the operating system for further instruction. This is called the boot process.

Entering the bias setup utility allows you to change the boot process orders as well as wide variety of hardware settings. It is not recommended for an inexperienced user to change setting in the bios BIOS unless they are being instructed to do so by a trusted source.

Ques-26 Explain the difference among static memory allocation and dynamic memory allocation?

Ans Static Memory allocation

- 1) In this variable get allocated permanently , till the program executes or function call finishes.
- 2) It is done before program execution.
- 3) It uses stack for managing the static allocation of memory.
- 4) It is less efficient.
- 5) There is no memory reusability.
- 6) In this ~~memory~~ allocated memory remains from start to end of the program.

eg:- It is generally used for array.

Dynamic Memory allocation

- 1) In this variable get allocated only if the program unit gets active.
- 2) It is done during program execution.
- 3) It uses heap for managing the dynamic allocation of memory.
- 4) It is more efficient.
- 5) There is memory reusability and memory can be freed when not required.
- 6) In this allocated memory can be released at any time during the program.

eg:- generally used for linked list

Ques-27 UNIX commands like touch , sed, grep .

Ans touch :- It is used to create a file without any content.
It is used when the user does not have data to store at the time of file creation.

Syntax :-

touch file1-name file2-name file3-name

Sed :- It can perform function on file like , searching , find and replace , insertion or deletion . It is commonly used for substitution or for find and replace . By using sed we can edit files even without opening it

Syntax :- `sed OPTIONS ... [SCRIPT] [INPUTFILE...]`

grep :- It filter searches a file for a particular pattern of characters , and displays all lines that contain that pattern.

Syntax :- `grep[options] pattern[files]`

- Options
- c : prints only a count of the line that match pattern
 - i : ignores , case for matching
 - l : - display list of filenames only
 - n : - display the matched line and their line number.

Ques 28 Explain a process and process table ? Define different states of a process ?

Ans Processes :- A program / command when executed , a special instance is provided by the system to the process . This instance consist of all the services / resources that may be utilized by the process under execution . States of processes are :-

① Initializing a process :- Process can be run in two ways :-

i) foreground Process :- When process is running in the foreground and is taking a lot of time , no other processes can be run or started due unavailability of prompt .

ii) Background process :- It runs in the background without keyboard input and waits till keyboard input is required .

Process Table:- It is simply a data structure in the ~~RAM~~ RAM of a computer. It holds information about the processes that are currently handled by the OS.

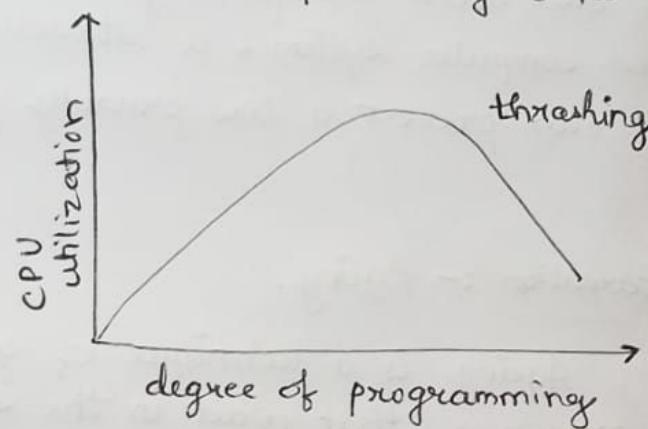
The information include:-

- Process id
- process owner
- process priority
- environment variable for each process
- the parent process
- pointers to the executable machine code of a process.

- ⑨ Benefits of Multithreading Programming?
- ① Better communication
 - ② Improved throughput.
 - ③ Simultaneous and fully symmetric use of multiple processes for computation and I/O.
 - ④ Superior application responsiveness.
 - ⑤ Improved server responsiveness.

- ⑩ What is thrashing?

Thrashing is a condition or situation when the system is spending a major portion of its time in servicing the page faults, but the actual processing done is very negligible.



The basic concept involved is that if process is allocated too new frames, then there will be too many and too frequent page faults.

As a result, no useful work would be done by the CPU and the CPU utilizing would fall drastically. The long term scheduler would then try to improve the CPU utilization by loading some more processes into the memory thereby increasing the degree of multiprogramming. This will further result in CPU utilization triggering in chained reaction of higher page faults followed by an increase in the degree of multiprogramming, called thrashing.

③ Belady's anomaly ?

⇒ It is a name given to phenomenon where increasing the number of page frames results in an increasing in the number of page faults for a given memory access pattern.

This phenomenon is commonly explained in the following page replacement algorithms :-

- ① First in first out (fifo)
- ② Second chance algorithm
- ③ Random page replacement algorithm.



Explain Starvation and ageing ?

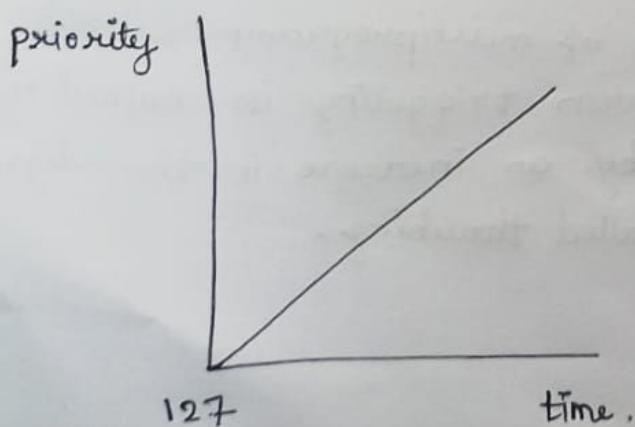
⇒ Starvation or indefinite blocking is phenomenon associated with the priority scheduling algorithms, in which a process is ready to run for CPU can wait indefinitely because of low priority.

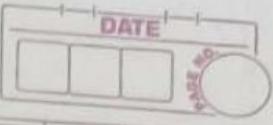
In heavily loaded computer system, a steady stream of higher priority processes can prevent a low priority process from ever getting the CPU.

Solution to Starvation :- Ageing.

Ageing is a technique of gradually increasing the priority of processes that wait in the system for a long time.

E.g. If priority ranges from 127 (low) to 0 (high), we could increase the priority of a waiting process by 1 every 15 min. Eventually even a process with an initial priority of 127 would take no more than 32 hours for priority 127 process to age to a priority - 0 process.





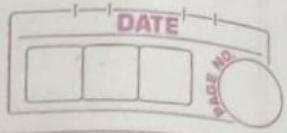
Q.33) Explain a trap and a trapdoor.

- Ans33) Trap :- ① Any language feature, API or system that may cause programmer to waste a lot of time on the use of development tools instead of on development of the final software can be called as a trap.
② A trap is a software interrupt, usually the result of an error condition.

Trapdoor :- Trapdoor is a secret undocumented entry point into a program used to grant access authentication.

Q.34) Explain a Daemon.

- Ans34) ① Daemon is a program that continuously runs as a background process rather than being under the direct control of an interactive user.
② It exists for the purpose of handling periodic service requests that a computer system expects to receive.
③ The file name of a software, daemon usually ends with a letter 'd'.



Q.35) Which application softwares are executed on OS?

- Ans.35)
- ① Application Software is one of the type of software which runs or executes as per user request.
 - ② High level languages such as Java, C, C++ etc are used to develop the application software.
 - ③ Without an Operating System application software cannot be installed.

* Following Application Softwares are executed on OS

- 1) Photoshop
- 2) VLC Media Player
- 3) Mozilla Firefox
- 4) Opera
- 5) Google Chrome
- 6) Google Maps, Etc.

Q.36) Define daemon objects and thread objects

Ans.36) (I) Daemon & Thread

- ① Daemon thread is a low priority thread that runs in background to perform tasks such as garbage collection.
- ② They cannot prevent JVM from exiting when all user threads finish their execution.
- ③ JVM terminates itself when all the threads finish their execution.
- ④ If JVM finds running daemon thread, it terminates the thread and after that shutdown itself.
- ⑤ It is an utmost low priority thread.

(II) Thread class

- ① Thread class is the main class on which Java Multithreading system is based.
- ② It provides constructors and methods to support multithreading.
- ③ It extends object class and implements Runnable Interface.

Q.36) Define daemon objects and thread objects.

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Ques? How to edit, rename and move file in Linux?

Ans Unix does not have a command specially for renaming file. Instead, the mv command is used both to change the name of the file into a different directory. (where thirdfile & file3 are sample file names)

→ (mv thirdfile file3)

This command results in the complete removal of thirdfile but a new file called file3 contains the previous contents of thirdfile. Like cp, the mv command also overwrites existing files. For example, if you have two files, fourthfile & secondfile and you type the command

→ (mv fourthfile Secondfile)

mv will remove the originally contents of secondfile and replace them with the contents of fourthfile. As a result, fourthfile is renamed secondfile, but in the process secondfile is deleted.

Moving :- The mv and cp commands are used to put files into a directory. Assume that you want to place some files from your current directory into a newly created directory called project1. The command mv bibliography project1 will move the file bibliography into the directory project1. The command cp chapter1 project1 will place a copy of the file chapter1 in directory project1

Edit :- Open the file in vim with command "Vim"

for example:

→ # vim /etc/fisca1 instscam.ini

b. Type "/" and then the name of the value you would like to edit and press Enter to search the value in the file

c. Type 'i' to insert mode

d. modify the value that you would like to change using the arrow key on your keyboard.

Ques Give 5 commands in Linux with explanation?

Ans 1) pwd Command

The pwd command is used to display the location of the current working directory.

Syntax— pwd

2) mkdir Command

The mkdir command is used to create a new directory under any directory.

Syntax— mkdir <directory name>

3) rmdir Command

The rmdir command is used to delete a directory.

Syntax— rmdir <directory name>

4) ls Command

The ls command is used to display a list of content of a directory.

Syntax— ls

5) cd Command

The cd command is used to change the current directory.

Syntax— cd <directory name>

Ques Which are deadlock handling situations?

Ans Following are four conditions that must hold simultaneously for a deadlock to occur.

- 1) Mutual Exclusion
- 2) Hold and Wait
- 3) No-preemption
- 4) Circular wait

Methods handling deadlocks!

- 1) Deadlock prevention
- 2) Deadlock avoidance
- 3) Deadlock detection

Ques Give Commands for finding process ID?

Ans There are 6 commands! →

- 1) pidof : find the process ID of a running program
- 2) pgrep : look up or signal process based on
- 3) ps : report a snapshot of the current processes
- 4) ss : ss is used to dump a tree of process
- 5) lsof : list open files
- 6) fuser : list process IDs of all processes that have one or more files open.