

## Q. I (A)

- 1 what is Thread?  
→ A thread is the smallest unit of execution within an operating system. It represents an independent path of execution with priority.
- 2 SJF stands for Shortest job first.
- 3 Queue or ticket window is example of a first comes first served type of scheduling algo.
- 4 When running process requires some input output then it goes to.

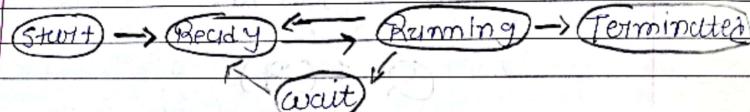
## Q. I (B)

- 1 Explain context switching?  
→ Context switching is the process of saving and restoring the state of a process or thread so that execution can be resumed from the same point later.
- In multitasking operating system, multiple processes or threads share the CPU and the OS must switch between them to provide the illusion of simultaneous execution.

- 2) what is OS? List out its features?
- > An operating system is a software program that acts as an intermediary between computer hardware and SW application.
  - > Features of OS: Process Management, memory management, file system management, device management, security, user interface, networking, I/O handling, Resource allocation.

Q. 1 (c)

- (1) Explain process state transition diagram in brief.



- > A process state transition diagram illustrates the various states that a process can go through during its lifecycle in an operating system and the events or actions that trigger transitions between these states.

- (1) Start: This is the initial state where a process is being created but has not yet been admitted to the system.

2) Ready :-

In this state, the process is ready to execute but is waiting for the CPU to be allocated to it by the scheduler.

3) Running :-

The process is currently being executed on the CPU.

4) Blocked/Waiting :-

When a process is waiting for an event to occur.

5) Terminated :-

This is the final state where the process has finished execution and is terminated.

Explain multithreading.

-> A multithreaded application, multiple threads are created within a single process to perform concurrent tasks.

-> Each thread has its own program counter, register set, and shares the same memory space with other threads in the process.

\* Benefit of Multithreading:-

• Concurrency:

Multithreading enables concurrent execution of multiple task within a single process.



- Resources Sharing: Thread within the same process can share resources such as memory, file and network connections.

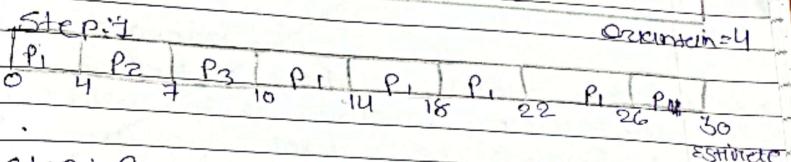
\* Responsiveness: Multithreading allows certain tasks, such as I/O operation or user interface interaction, to be performed asynchronously without blocking the execution of other threads.

### Q. 1 (d)

- (i) Explain RR with suitable example.  
→ RR stands for Round Robin.

- Round Robin is the preemptive process scheduling algorithm.
- Each process is provided a time quantum.
- Once a process is executed for a given time period, it is preempted and other process executes for a give time period.

Process	Process time (BT)
P <sub>1</sub>	24
P <sub>2</sub>	3
P <sub>3</sub>	3



Step: 2

PC	TT = PC - Q	WT = TI - BT
30	30	6
7	7	4
10	10	7

Step: 3 :-

$$AT = \frac{30+7+10}{3} = \frac{47}{3} = 15.66$$

Step: 4 :-

$$W.T = \frac{6+4+7}{3} = \frac{17}{3} = 5.66$$

Step: 5 :-

$$\text{Throughput} = \frac{\text{No. of Process}}{\text{ET}} = \frac{3}{30} = 0.1$$

Step: 6 :-

$$\text{Process utilization} = \frac{ET}{ET + T} = \frac{30}{30+100} = 0.75$$

## (2) Explain function of OS :-

- I/O system management
- Secondary storage management
- Security
- Command interpretation
- Networking
- Job accounting
- Communication management.

## 1. I/O System management :-

- one of the main objects of any OS is to hide the specialty of that hardware device from the user.

(2) Secondary storage management :-  
→ Systems have several levels of storage which includes primary storage, secondary storage, and cache storage.

## (3) Security :-

- Security module protects the data and info of a computer system against malware threat and unauthorized access.

## (4) Command Interpretation :-

- This module is interpreting command given by the end acting system resources to process those commands.

## (5) Networking :-

- A distributed system is a group of processes which do not share memory hardware devices.

## (6) Job Accounting :-

- Keeping track of time & resource used by various job and users.

## (7) Communication Management :-

- Coordination and assignment of compilers, interpreters, and another slow resource of various user of the computer system.

### Q. 2(A)

- > What is fragmentation?
- > Fragmentation in the context of operating system refers to the phenomenon where memory or disk space becomes divided into small.

#### (2) PCB Stands

- > Process control Block
- > It is the process of memory allocation it the process of assigning memory allocation to the process or assigning and managing memory space to program or processes in a computer's memory system.

#### (ii) SMT Full form

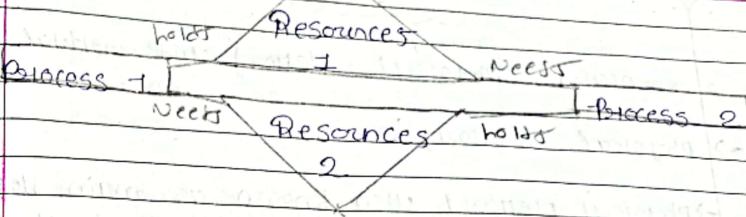
- > Simultaneous multithreading

### Q. 2(B)

#### (i) Explain - Deadlocks

- > All the processes in a system require some resources such as central processing unit, file storage, input output devices etc. to execute its function.

- > Once the execution is finished, the process releases the resource it was holding.



2] Explain difference between Paging & Segmentation

#### Paging

#### Segmentations

- > In paging program is divided into fixed or mounted size pages.
- > In segmentation, program is divided into various size sections.

- > Fault in paging operating system is accountable.

- > Fault in segmentation, compiler is accountable.

- > Page size is determined by hardware.

- > Here, the section size is given by the user.

- > It is faster in the comparison of segmentation.

- > Segmentation is slow.

- > Paging could result in internal fragmentation.

- > Segmentation could result in external fragmentation.

Q. 2 (c)

1 Explain physical Memory and virtual Memory

→ physical memory :-

→ physical memory also known as main memory or RAM, refers to the actual hardware memory chips installed in a computer system.

→ it is the physical storage medium where data, programs and operating system code resides during execution.

→ physical memory is directly accessible by the CPU and other hardware.

→ Virtual memory :-

→ virtual memory is a memory management technique that extends other available physical memory by using disk storage as in RAM.

→ it creates an illusion of a large memory space than physically available by allowing processes to use virtual address that map to physical address in memory.

→ when a process requires more memory than available physical RAM

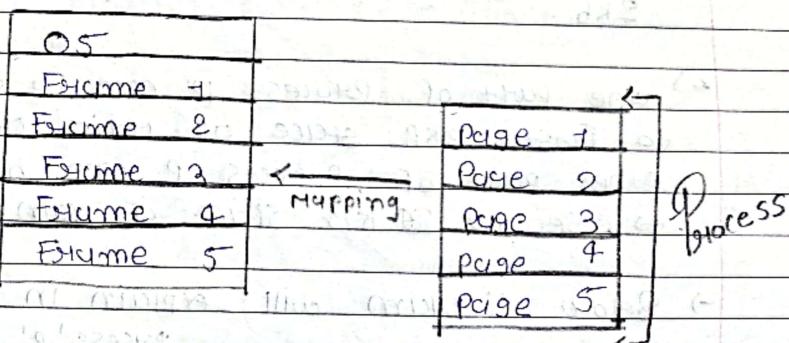
(e) write a short note on Paging.  
→ Paging is a method or techniques which is used for non-contiguous memory allocation.

→ it is a fixed size partitioning scheme.

→ In paging both Main memory and secondary memory are divided into equal fixed size partitions.

Page : A fixed-length continuous block of virtual memory residing on disk.

Frame : A fixed-length continuous block located in RAM.



Main Memory  
Collection  
of  
Frame )

Pages

Q. 2 (D)

7. Explain non-contiguous memory allocation.

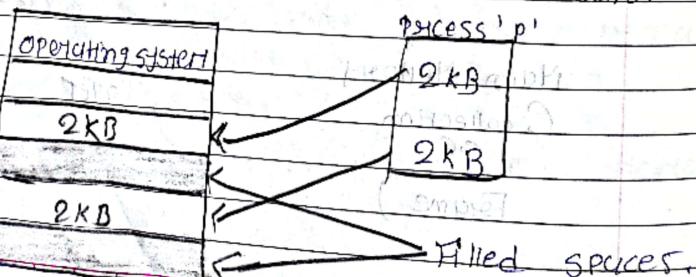
→ In the non-contiguous memory allocation, a process will allocate the memory space, but is not at one place it is at the different location according to the process requirement.

→ This utilizes all the free memory space which is created by a different process.

→ In this example, process P can be divided into two parts of equal size 2kb.

→ One part of process P can be allocated to first 2KB space of Main Memory and other part of process P can be allocated to second 2KB space of Main Memory.

→ Below diagram will explain in better way:



(2) Explain virtual memory using paging.

→ Virtual memory is a memory management technique that allows a computer to compensate for physical memory shortages by temporarily suspending data from random access memory to disk storage.

→ This technique enables processes to use more memory than is physically available, through the illusion of a larger memory space.

→ Virtual memory is typically implemented using paging as a memory management scheme where memory is divided into fixed-size blocks called pages.

\* How virtual memory is implemented using paging?

→ Page table is maintained by the operating system. The operating system maintains a data structure called a page table for each process.

→ This table contains mapping between virtual address used by the process and the corresponding physical address in RAM.

- Address Translation :  
when a process accesses a virtual address the CPU's memory management unit intercepts the address and translates it to a physical address using the page table.

-> Page faults :-  
If the page table does not contain a mapping for the virtual address being accessed by the process a page fault occurs.

The operating system selects a victim page to evict from memory if all page frames are currently in use.

-> Swapping :-  
If there are no available page frames in RAM the operating system must make space by swapping out a page from RAM to disk.

-> Page Replacement :-  
The operating system employs page replacement algorithms, such as LRU, recently used or FIFO, to select the page for eviction when a page fault occurs.

Q. 3(A)

- 1 UNIX was developed by.  
→ Ken Thompson and Dennis Ritchie.
- 2 which is the extension for shell-script file.  
→ .sh
- 3 The Bourne shell written by  
→ Stephen Bourne

4 BASH stands for  
→ Bourne Again Shell

Q. 3(B)

- 1 Explain what is a shell.  
→ The shell is the utility that processes your requests.

when you type in a command at your terminal the shell interprets the command and calls the program that you want.

2 shell Bourne shell and Korn shell are the most famous shell.

(2) Explain following command.

- cat
- ls

**cat**:  
the 'cat' command stands for "concatenate" cmd is primarily used to display the contents of files.  
- It can also be used to concatenate multiple files and display their combined content to the standard output.

→ Syntax: 'cat [Options] [File]'

Q25 :-

The 'ls' command is used to list directory contents.

- It displays the files and directories within a specified directory, the current working directory if none is specified.

→ Syntax: 'ls [Options] [File]'

1

→ Explain Comparison command in Linux  
Comparison command cat. Commonly used in scripting and command-line operation to compare varieties, strings or files.

→ They are essential for decision-making process cmd. Place control in scripts.

→ Here are three commonly used comparison commands.

1. Test 'c' [] command:

→ The 'test' command also available in its shorthand form 'c', is used to perform various types of comparisons within shell scripts.

→ It evaluates conditional expressions and returns an exit status of 0 or 1 based on the result of the comparison.

Example:-

```
if [ " " > " " ]; then
    echo "Unequal"
else
    echo "Equal"
```

S1

## (2) [[ double brackets

- > The '[[ command is an enhanced version of the test command 'c'.
- > It provides additional features such as pattern matching and logical operators.

Example :-

```
if [[ "$STR1" = "$STR2" ]]; then
    echo "String one same"
```

fi

## 2 Explain any three process related command

→ (1) ps :

- The 'ps' command is used to display info about currently running processes.

- It provides a snapshot of the active processes on the system, including their Process IDs (PIDs), CPU and Memory usage, execution status, and other characteristics.

- Syntax : 'ps [options]'

(2) top :

The 'top' command provides a dynamic real-time view of system processes and resource usage.

- It continuously updates the display to show CPU, memory and other system metrics.

Syntax : 'top [options]'

## 3) kill :

The 'kill' command is used to terminate or send signals to processes.

- It can gracefully terminate a process by sending the SIGTERM signal or forcefully terminate them with the SIGKILL signal.

- Syntax : 'kill [options] < PIDs'

## Q. 5 [D]

## I Explain type of file in unix

⇒ Files are classified into several types based on their char and purpose.

→ Here we the main types of files in Unix

## 1) Regular files :

Regular files are the most common type of files in unix system.

- Regular files can be created, modified and deleted by user using various command and application.

## 2) Directories :

Directories are special files that contains for other files and directory.

- Directories are managed by the operating system and can be created, renamed and deleted by user or system utilities.

## 5) Special Files:

- Special files represent system resources or devices and provide access to hardware or kernel-level functionality.
- There are two main types of special files: Character Device and Block Device.

## 4) Symbolic Link:

- Symbolic link or symlinks are files that point to another file or directory in the file system.
- They provide a way to create shortcuts or aliases to other files or directories.
- Symlinks are represented by a special type of file that contains the path to the target file or directory.

## 5) FIFOs:

- FIFO or named pipes are special files used for inter-process communication.
- They allow multiple processes to communicate with each other by reading from and writing to a common named pipe.
- FIFOs provide a simple and efficient way to pass data between processes without the need for shared memory or sockets.

2

## Explain Unix architecture.

The architecture of a Unix-like operating system is typically organized into several layers, each responsible for different aspects of system functionality.

- The Unix operating system is a set of programs that act as links between the computer and the user.

- Unix was originally developed in 1969 by a group of AT&T employees Ken Thompson and Dennis Ritchie at Bell Labs.

- Users communicate with the kernel through a program known as the shell.

- The Shell is a command line interpreter; it translates commands entered by the user and converts them into a language that is understood by the kernel.

- The main concept that unites all the layers of Unix is the following: **robustness!**

## • Kernel:

- The kernel is the heart of the operating system.
- It interacts with the hardware and most of tasks like memory management.

- Shell : - The shell is the utility that processes your requests.
- when you type in a command at your terminal, the shell interprets the command and calls the program that you want.
- c shell, Bourne shell and Korn shell are the most famous shell.

#### • Commands and Utilities :-

- there are various commands and utilities which you can make use of in your day-to-day activities.
- cp, mv, cut cmd etc. are few examples of commands and utilities.
- All the commands come along with various options.

- file and Directories :-
- All the data of unix is organized into files.
- All files are then organized into directories.
- These directories are further organized into a three-type like called the filesystem.

Q. 4(A)

- 1 How to define variable?
- syntax :- var name = value
- Here 'variable name' is the name of the variable and 'value' is the data assigned to the variable.

- 2 Give the name of some shell keywords.
- if, else, while, for, case, do, done, function, return etc.

3 What is System Variable?

- these variables are used to config the environment during the session one after user login.

4 Explain test Command

- The test command is used to check file types and compare value. test is used in conditional execution.

Q. 4(B)

5 Explain Positional Parameters?

- A positional parameters is variables within a shell program its value is set from an argument specified on the command line that invokes the program.

→ Positional parameters are numbered  
cmd are referred to with \$1 preceding  
" \$1, \$2, \$3, and so on.

example  
\$1 \$2 \$3 \$4 \$5  
first second third fourth fifth

- (2) Explain Loops structure in unix.  
→ There are total 2 Loops statements which can be used in Unix Programming  
(1) while Statement  
(2) for Statement  
→ To alter the flow of loop statements; two commands are used they are  
1) break  
2) continue.

## Q. UCC

- 1 Explain decision Statement in Unix.  
→ While writing a shell script, there be a situation when you need to adopt one path out of the given two paths.  
- So, you need to make use of condition statement that allows your program to make correct decision and perform the right action.  
- Unix Shell provides decision making using if, then, else and case structure.

- IF - then - fi

Syntax :-

if [condition]

then

execute command; if condition is true

fi

- IF - else - fi

Syntax :- If given conditional is true then Command is executed else command 2 is executed

Syntax :- if [condition]

then

execute command if condition is true

else

execute command if condition is false

fi

- if -- elif -- else -- fi

→ The if-- elif-- else-- fi Statement is the one level advance form of control statement that allows shell to make correct decision out of several condition

Syntax :- if [condition]

then

statement to be executed if condition

elif [condition 2]

then

statement to be executed if condition 2 is true

else

statement to be executed if no expression

is true

fi



### Q. Explain nano editor.

→ nano is simple and user-friendly text editor commonly found unix-like operating system such as Linux. Here's explanation of alone with respect to its features, usage and characteristics.

#### \* Features:

- nano is designed to be lightweight and easy to use, making an ideal choice for beginners or users who prefer a straightforward text editor.
- It provides basic text editing functions such as editing, cutting, pasting, searching and replacing text.
- nano offers multiple undo and redo levels.

#### \* Usage:

- nano is launched from the command line by typing 'nano' followed by the name of the file to be edited. e.g. nano filename.txt
- Once opened, users can navigate through the file using arrow keys or keyboard shortcuts.
- Users can save changes and exit nano by pressing 'Ctrl + o' to write the file and 'Ctrl + x' to exit the editor.

### (Q. 4C)

#### 1 Explain vi editor in detail?

→ The 'vi' editor is a powerful cmd widely used text editor in unix-like operating system.

#### \* Model Editing:

- one of the distinctive features of vi is its model editing mode.

- it has two main modes: command mode and insert mode.

- In command mode users can navigate the file, make change and execute command.

- In Insert mode, users can insert and edit text.

#### \* Navigation:

- In command mode user can navigate through the text using various keystrokes.

- For example, h = left arrow, j = down arrow, k = up arrow, l = right keys are used to move the cursor respectively.

#### \* Editing:

"vi" provides variant command for writing text.

-> users can delete character ('x') , delete entire lines ('dd'), copy ('y') cmd paste ('p') text, and replace character ('r') among others.

- Advanced editing features include going line ('J'), changing text ('c'), undoing / redoing Change ('u' and 'ctrl+z').

- Search and Replace :
- 'vi' supports powerful search and replace functionality, users can search for text using the 'i' command followed by the search term.

- To replace text, users can use the 's' command followed by the search pattern replacement pattern and optional flags.

• customization and extensibility:

- 'vi' offers extensive customization option through config file such as 'vimrc'

- user can define custom key mapping, set editor preference and install plugin to extend functionality.

(2) write a shell script to display a digital clock.

=> #!/bin/bash  
clear; screen( ) {  
clear;

3. display

display\_clock() {

while true; do

date +".%T"

sleep 1

done

4. main()

display\_clock

main

Q. 5(a)

1. Give full form LDAP?

→ Light weight Directory Access Protocol.

2. Write a syntax to add user to particular group  
→ sudo usermod -aG <groupname> <username>

3. The UFW is an acronym for  
Uncomplicated Firewall.

4. wine stands for = wine is not an Emulator

Q.5(B)

Q] difference between Lilo cmd & RUB

Lilo	GRUB
- Lilo stands for Linux Loader.	GRUB stands for GRAND UNIFIED BOOT LOADER.
- Lilo does not boot from network.	GRUB boots from network.
- Lilo does not have interactive command interface.	GRUB has interactive command interface.
- Lilo doesn't have any knowledge of file system.	GRUB has knowledge of file system.
-> Lilo old default boot loader.	GRUB New default boot loader.
-> Simple and easier to use than GRUB.	More complex than LIO.
-> Does not have a GUI menu choice.	Includes a GUI menu choice.

2 Explain FTP optimization.

- File transfer optimization, refers to the process of improving the efficiency and speed of the file transfer using the FTP protocol.

(2) minimizing networks latency;

- By shortening the time it takes for data packets to travel between the client and server.

## (2) Implementing compression:

- Compressing file before transferring them can reduce the amount of data that needs to be transmitted

0,5 (c)

(7) what is wine?

- Stand for it - wine is not an emulator.  
is a compatibility layer capable of  
running windows application on post-  
Compliant operating system such as Linux,  
macOS, and BSD.

• Compatibility layer;

- WINE does not emulate windows, instead, it provides a layer of code that translates windows API calls into POSIX calls

- open source:
- wine is an open-source project, meaning its source code is freely available for anyone to view, modify and distribute under the terms of the GNU Lesser General Public License.

- wineHQ:
- wine HQ is the official website of the wine project, providing resources such as documentation, support forums and a compatibility database.

## Ques 2 Explain firewall and How to enable Firewall in Linux?

→ A firewall is a network security system that monitors and controls incoming and outgoing network traffic based on predetermined security rules.

→ Purpose is to establish a barrier between a trusted internal network and untrusted access and protect against cyber threats.

To enable the firewalls in Linux you can use the 'iptables' command or its successor 'firewalld' depending on your distribution and preference.

- \* using iptables:
  - 'iptables' is a command-line utility for config the Linux kernels netfilter firewall.

Sudo iptable - P INPRH DROP

Sudo iptable - P FORWARD DROP

Sudo iptable - P OUTPU MR ACCEPT

- \* using firewalld:

- firewalld is a dynamic daemon to manage firewall rules in Linux.

Sudo systemctl start firewalld

Sudo systemctl enable firewalld

## Q. 5 (d)

(1) what is samba server? Explain install process

⇒ → Samba is an open-source software that enables file and print services to SMB/CIFS client in a Unix-like operating system environment.

→ It allows Unix-like systems (including Linux) to share files and printers with Windows systems as if they were native Windows desktops.

Installation:

- install samba package:
  - First, you need to install the samba package on your Linux system.
  - This can be done using the package manager specific to your Linux distribution.

Sudo apt-get update

Sudo apt-get install samba

Configure Samba:

Once samba is installed, you need to config it to define the share you want to make available to windows clients.

The main config file for samba is typically located at '/etc/samba/smb.conf'.  
→ You can edit this file using a text editor such as 'nano' or 'vi'.

[Share]

comment = shared directory

path = /path/to/shared/directory

browseable = yes

writable = yes

guest ok = yes

- Create Samba User Accounts:
  - Samba uses its own user accounts separate from the system accounts.
  - You need to create samba user accounts and set passwords for them using the 'smbpasswd' command.

Sudo smbpasswd -a Username

Restart Samba Services:

- After making changes to the config file and creating user accounts, you need to restart the samba service to apply the changes.

Sudo systemctl restart smbd

Explaining Apache Server in detail with installation:

→ Apache HTTP server, commonly referred to an open source web server software developed and maintained by the Apache Software Foundation.

→ It's one of the most widely used web servers on the internet, powering a large portion of websites worldwide.

→ Apache is known for its reliability, scalability, and extensibility making it a popular choice for hosting websites and web applications.

## \* Installation of Apache Server :-

### (1) Update package repository :-

→ First, ensure that your package repository is up-to-date by running `sudo apt update`.

### 2. Install Apache :-

→ Use the package manager to install Apache : `sudo apt install apache2`

### 3. Start Apache service :-

→ Once installed, start the Apache service :  
`sudo systemctl start apache2`

### 4. Enable Apache to start on boot :-

→ To ensure Apache starts automatically on system boot

`sudo systemctl enable apache2`

### 5. Verify installation :-

→ Open a web browser and enter your server IP address and domain name.