Practical No. 1: Install and configure Linux (or alike) operating system.

I. **Practical Significance:**
Linux is the base of many of open source operating systems designed to replace Windows and Mac OS. It is free to download and install on any computer. Because it is open source, there are a variety of different versions, or distributions, available developed by different groups. To prevent hacking attempts, many organizations keep their Linux operating systems private. Many others make their variations of Linux available publicly so the whole world can benefit at large.

II. **Relevant Program Outcomes (POs)**
- **Basic knowledge:** Apply knowledge of basic mathematics, sciences and basic engineering to solve the computer group related problems.
- **Discipline knowledge:** Apply Computer Programming knowledge to solve the computer group related problems.
- **Experiments and practice:** Plan to perform experiments and practices to use the results to solve the computer group related problems.
- **Engineering tools:** Apply relevant Computer programming / technologies and tools with an understanding of the limitations.
- **Individual and Team work:** Function effectively as a leader and team member in diverse/multidisciplinary teams.
- **Communication:** Communicate effectively in oral and written form.

III. **Competency and Practical skills**
Manage operations of Operating System.
The practical is expected to develop the following skills:
Able to install operating system and configure it.

IV. **Relevant Course Outcome(s)**
Install operating system and configure it.

V. **Practical Outcome (PrOs)**
Install and configure Linux (or alike) operating system.

VI. **Relevant Affective domain related Outcome(s)**
1. Follow precautionary measures.
2. Follow installation steps.
3. Follow ethical practices.

VII. **Minimum Theoretical Background**
Step 1: Download the ISO file.
Step 2: Boot your system with Bootable DVD / USB drive.
    To start the installation click on "Install Ubuntu"
Step 3: Check Install Prerequisite
Step 4: Select the Installation Type
Step 5: Select your respective Time Zone
Step 6: Select your respective Keyboard Layout
Step 7: Set the Hostname of your system and User credentials that will be used after installation.

Installation has started. Once the installation is completed, it will ask to restart the Machine. Click on "Restart Now".

Step 8: Login Screen after reboot.

Use the same user and its credentials that we have set during the installation.

We will get below screen after entering the credentials.

Ubuntu Installation is Completed Now.

Similarly any open source installation shall be considered.

VIII. Resources required (Additional)-Nil

Sr. No.	Name of Resource	Broad Specification	Quantity	Remarks (If any)
1	Computer System	Processor (i3-i5), RAM-2GB and above (As per need of OS)	As per batch Size	For all Experiments
2	Operating System	Unix/Linux/Ubuntu/any other open sources operating system		

IX. Resources used (Additional)

Sr. No.	Name of Resource	Broad Specification	Quantity	Remarks (If any)
1	Computer System	Processor (i₃-i5) Ram-2GB	1	-
2	Operating System	Linux	1	-

X. Program Code: Teacher must assign a separate program statement to students.

Install and configure Linux (or similar) operating system on your computer. Write down the steps for same.

Steps for Linux Installation

1. Download the linux distribution of your choice.

2. Boot into the Live CD or Live USB.

3. Try out the Linux distribution before installing.

4. Start the installation process.

5. Create a username and password.

6. Set up the partition.

7. Boot into Linux

8. Check your hardware.

9. Start using Linux.

2

Q.3] →

Multiuser operating System:
i) Linux
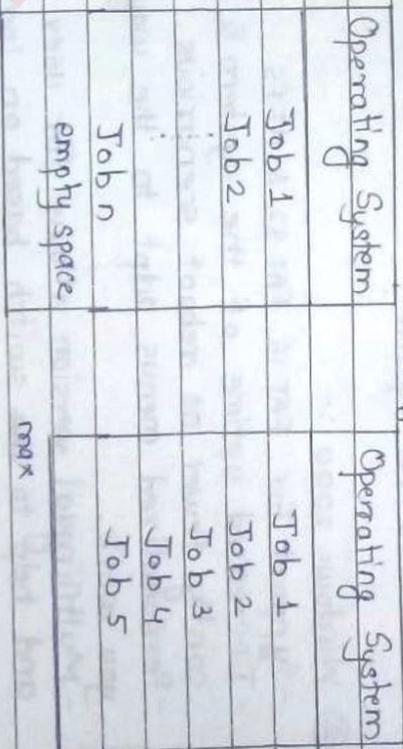2) Unix
3) Window 2000
4) Ubundo

Advantages –
- When one computer in the network get affected, then it does not affect another computer in the network.
- different user can access the same document on their computer.
- Airlines also use this operating system for ticket reservation.

XIII Exercise:

Q.2] →

i] Draw the diagram of multiprograming System and state concept of it

Operating System	Operating System
Job 1	Job 1
Job 2	Job 2
...	Job 3
Job n	Job 4
empty space	Job 5
max	

- Multiprogramming is also ability of operating System to execute more than one program on a single progress machine.
- More than one program can reside into the main memory at one point of time

Q.1) → Features of the following operating Systems

① Window 98:-
- Internet based application.
- Window drivers model (WDM).
- System file network
- FAT 32 file system

② Window 2000 :-
- Support for FAT 16, FAT 32 & NTFS
- Increased uptime of the System & sign...
  only fewer OS reboot scenarios
- Personalized menus adapt to the way you work
- Multilingual version allows for users info...
  and help to the switch based on login

③ Window XP :-
- Unifying windows ...
- Crashed with features.
- A new look : Bliss Hill
- Windows themes.

XI. Result (Output of installation):

XII. Practical Related Questions

Note: Below given are few sample questions for reference. Teacher must design more such questions so as to ensure the achievement of identified CO.

1. What are different versions of Linux operating system?
2. Enlist the steps for booting the operating system.
3. State names of latest multiuser operating system and its advantages.

(Space for answer)

Q.1) Different versions of Linux operating System.
→ ① Ubuntu
② Fedora
③ Linux mint
④ Open Source
⑤ PC Linux OS
⑥ Debian

Q.2) Steps for booting operating System.
→ ① Power up
② Power-on self Test
③ Find a boot device.
④ Load the operating System.
⑤ Transfer control

Q.3) → Unix is an open source OS whose code can be easily read out by the users, but still is the more Secure OS when Compared to the OS.
- Unix is more processing power than window.
- It requires less administration & maintainance.
- Unix is the leader is serving the web.

I. Practical Significance:

General purpose commands are inbuilt programs that can be invoked in multiple ways. These commands work interactively from a terminal. A terminal that provides a command line interface using a shell program.

II. Relevant Program Outcomes (POs)

- **Discipline knowledge:** Apply Computer Programming knowledge to solve the computer group related problems.
- **Experiments and practice:** Plan to perform experiments and practices to use the results to solve the computer group related problems.
- **Engineering tools:** Apply relevant Computer programming / technologies and tools with an understanding of the limitations.
- **Individual and Team work:** Function effectively as a leader and team member in diverse/multidisciplinary teams.
- **Communication:** Communicate effectively in oral and written form.

III. Competency and Practical skills

Manage operations of Operating System.

The practical is expected to develop the following skills:

1. Able to apply general purpose commands.

IV. Relevant Course Outcome(s)

Use operating system tools to perform various functions.

V. Practical Outcome (PrOs)

Execute general purpose commands date, time, cal, clear, banner, tty, script, man.

VI. Relevant Affective domain related Outcome(s)

1. Follow precautionary measures.
2. Follow naming conventions.
3. Follow ethical practices.

VII. Minimum Theoretical Background

Sr. No.	Commands	Meaning
1	$date	It displays system date and time
2	$cal	Displays calendar for current month.
3	$clear	Clears the screen
4	$banner OSY	Displays an argument string as a poster with maximum of ten characters per line
5	$tty	Name of terminal
6	$script	Record login session
7	$man	It gives manual help for any command.

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Specifying the date format:
(+ is used to concatenate date command with descriptor)

Descriptor	Example	Meaning	Example
%y		Year (2 Digits)	19
%b		Month abbreviation	Jan
%m		Month day	01
%d		Day of month	01 to 31
%j		Day of year	1 to 366

VIII. Resources required (Additional)

Sr. No.	Name of Resource	Broad Specification	Quantity	Remarks (If any)
1	Computer System	Processor i3~i5, RAM 2GB and above (As per need of OS)	As per batch size	For all Experiments
2	Operating System	Unix/Linux/Ubuntu any open source operating system		

IX. Resources used (Additional)

Sr. No.	Name of Resource	Broad Specification	Quantity	Remarks (If any)
1	Computer System	Processor (i3-i5) RAM 2GB	1	
2	Operating System	Linux	1	

X. Program Code: Teacher must assign a separate command statements to students.
1. Write down different options of cal command. (Use $man cal)
2. Write options of date command. (Use $man date).

Que 1] → Options of cal command

-h : Turns off highlighting of today.

-I : Display Julian calender if combined with the -o option, display date of orthodox Easter according to the Julian Calender

-e : Display date of Easter (for western church)

-j : Display Julian days (days one-based numbered from January 1)

-3 : Display the previous, current and next month surrounding today.

-1 : Display only the current month. This is the default.

-b : Use oldstyle format for ncal output.

-H : Use yyyy-mm-dd as the current date (for debugging of highlighting)

-N : Switch to ncal mode

-S : Weeks start on sunday

Que - 2] Options of date command

%A : locale's full weekly name (e.g., Sun)
%a : locale's abbreviated weekly name (e.g., Sun)
%B : locale's full month name (e.g., January)
%b : locale's abbreviated month name (e.g., Ja)
%C : locale's date & time (e.g., Thu Mar 3
          23:05:25 2005)
%f : full date; same as %Y - %M - %d
%H : hour (00....23)
%I : hour (01...12)
%J : day of year (0001....366)
%N : nanoseconds (000000000 .... 99999 999
%n : a newline
%N : day of week (0.6); 0 is Sunday

XII. Practical Related Questions

Note: Below given are few sample questions for reference. Teacher must design more such questions to ensure the achievement of identified CO.

1. How you record all the following activities performed by the user.
2. Give a command to display calendar for month of January.
3. Give single statement command to display the calendar of previous, current and next month.
4. Give the command to display full week day (eg. Sunday) using date command.

(Space for Answer)

→ Q.2) $ cal jan 2019

→ Q.3) for months in 6,7,8 : do cal of th
$ months $ (date + '%Y');done

→ Q.4) date ' + %A '

→ Q.1) By using script command.

....

XIII. Exercise:

1. What is output of following commands?
   a. Scal 04 2019
   b. State "Today's information:%D and %B", cal
   c. State "My clock is showing %H hours, %M minutes and %S seconds"
   d. Scal-3
   e. Scal-5
   f. Scal -2000

   (Attach page for output)

2. Give the syntax of commands for displaying the output (use date)
   i. This is date "+%b" Month of the year date "+%y" (Abbreviation for month and 4-digit year)
   ii. This is the "+%j" ...... 'th day of this year.

   (Space for answer)

Q.2

i) date "+ This is %5 %b month of the year %y"

output: This is jul month of the year 2019

ii) date "+ This is the %j th day of this year"

output: This is the 210 th day of this year

Practical No. 03: Work with multiple Linux terminals and basic commands.

I Practical Significance:

Work with terminal environment to know about users and set their security. It includes current status of all the users like details about all the users who accesses the terminal for particular duration and path of directory.

II Relevant Program Outcomes (POs)

- **Discipline knowledge:** Apply Computer Programming knowledge to solve the computer group related problems.
- **Experiments and practice:** Plan to perform experiments and practices to use the results to solve the computer group related problems.
- **Engineering tools:** Apply relevant Computer programming technologies and tools with an understanding of the limitations.
- **Individual and Team work:** Function effectively as a leader and team member in diverse/multidisciplinary teams.
- **Communication:** Communicate effectively in oral and written form.

III Competency and Practical skills

Manage operations of Operating System.

The practical is expected to develop the following skills:

1. Able to apply general purpose commands. (user related)

IV Relevant Course Outcome(s)

Use operating system tools to perform various functions.

V Practical Outcome (PrOs)

Work with multiple Linux terminals and basic commands: who, who am i, login, passwd, su, pwd.

VI Relevant Affective domain related Outcome(s)

1. Follow precautionary measures.
2. Follow naming conventions.
3. Follow ethical practices.

VII Minimum Theoretical Background

Sr. No.	Commands	Syntax	Description
1	who	$who	It is used to display who are the users connected to our computer currently
2	who am i	$who am i	Display the details of the current working directory
3	login	login: $username	Prompt, enter username
4	passwd	$passwd uname	Sets password for users
5	su(sudo)	$su ls	Provides super user privileges
6	pwd(Present Working Dir)	$pwd	To print the complete path of the current working directory

---

X. Options for who commands

-b, --boot : time of last system boot

-d, --dead : Print dead processes.

-H, --heading : Print line of column headings.

-ips : Print ips insted of hostname, with --lookup

-l, --login : Print system login process

--lookup : attempt to cononicalize hostnames via DNS

-m : Only hostnames and user associated with stdin

-p, --process : Print active processes spawned by init

-r, --runlevel : Print current runlevel

-s, --short : Print only name, line and time.

-q, --count : all login names and numbers of user logged on.

−t, −−time; print only name, last system clock change

−T, −w, −−mesg; add user's message s
05 +, − or ?

−u, −−users; List user logged user.

−−Version; Output version information
exit.

VIII   Resources required (Additional)

Sr. No.	Name of Resource	Broad Specification	Quantity	Remarks (If any)
1	Computer System	Processor (i3-i5), RAM-2GB and above (As per need of OS)		
2	Operating System	Linux/Linux/Ubuntu/any other open sources operating system	As per batch Size	For all Experiments

IX   Resources used (Additional)

Sr. No.	Name of Resource	Broad Specification	Quantity	Remarks (If any)
1	Computer System	Processor (i3-i5) RAM 2GB		
2	Operating System	Linux		

X   Program Code: Teacher must assign a separate command to students.
List down with all options for who commands and write its description.
Note: Write terminal's output in Result Section.

XI   Result (Output of Command):

....
....
....

more such questions so as to ensure the achievement of identified CO.

1. Give command for present working directory.
2. State currently login users by command.
3. Acquire the status of super user.

XIII Exercise:

1. Acquire the status of super user.
2. Write output for following commands
   i. $who;clear;who am i
   ii.$who;tty;date

<center>(Space for Answer)</center>

XIII

Que 1] Pwd

Que.2] who

Que 3] su

XIII. Exersize

Que 2]

ii- $ Who ; tty ; date

output: admin -sgdtp tty7
2018-01-28   21:28 (:0)

Practical No. 4: Working with a) operating system services b) Processes

Practical Significance:

The purpose of computer systems is to allow the user to execute programs. So the Operating systems provide an environment where the user can conveniently run programs. The user does not have to worry about the memory allocation or multitasking or anything. These things are taken care of by the operating systems.

Relevant Program Outcomes (POs)f

- **Basic knowledge:** Apply knowledge of basic mathematics, sciences, and basic engineering to solve the computer group related problems.
- **Discipline knowledge:** Apply Computer Programming knowledge to solve the computer group related problems.
- **Experiments and practice:** Plan to perform experiments and practices to use the results to solve the computer group related problems.
- **Engineering tools:** Apply relevant Computer programming / technologies and tools with an understanding of the limitations.
- **Individual and Team work:** Function effectively as a leader and team member in diverse/multidisciplinary teams.
- **Communication:** Communicate effectively in oral and written form.

Competency and Practical skills

Manage operations of Operating System.
The practical is expected to develop the following skills:
a. Able to work with services like editor, GUI etc.
b. Able to work with Processes like start, stop etc.

Relevant Course Outcome(s)

install operating system and configure it.

Practical Outcome (PrOs)

a) Use Operating services (Editor, GUI, File handling.)
b) Run commands to start, stop, and restart the specified service in Linux.

Relevant Affective domain related Outcomes(s)

1. Follow precautionary measures.
2. Follow naming conventions.
3. Follow ethical practices.

Minimum Theoretical Background

An Operating System supplies different kinds of services to both the users and to the programs as well. It also provides application programs (that run within an Operating system) an environment to execute it freely. It provides users the services run various programs in a convenient manner. File editing is done with the help of any editor. The default editor that comes with the UNIX operating system is called vi (visual editor).
The UNIX vi editor is a full screen editor and has two modes of operation:
usert mode in which entered text is inserted into the file.

Editor:

There are many ways to edit files in Unix. vi Editor works in Unix. This editor enables you to edit lines in context with other lines in the file. An improved version of the vi editor which is called the VIM has also been made available now. Here, VIM stands for Vi IMproved.

GUI:

Linux system provides both the interface that is GUI and CLI. As per the requirement you can decide when you should use the Linux command line interface (CLI) and when you should use a graphical user interface (GUI).

File Handling:

Following are the Processes commands;
Command to add and remove services in your system start-up: use chkconfig
Enter the command to show currently running services.
ls /etc/init.d
Enter the restart command.
sudo systemctl
To stop service
sudo systemctl
To start service.
sudo systemctl

VIII.   Resources required(Additional)-Nil

Sr. No.	Name of Resource	Broad Specification	Quantity	Remarks (If any)
1	Computer System	Processor (i3-i5), RAM-2GB and above (As per need of OS)		
2	Operating System	Unix/Linux/Ubuntu/any other open sources operating system	As per batch Size	For all Experiments

IX.   Resources used (Additional)

Sr. No.	Name of Resource	Broad Specification	Quantity	Remarks (If any)
1	Computer System	Processor (i3-i5) RAM 2GB		
2	Operating System	Linux		

GUI	CLI
Graphical User Interface	Command Line Interface
Even a beginer can easily handle	User should have good knowledge of commands.
Require more memory.	Does not require more memory.
Slower	Fast
More flexible	Not much Flexible

Que 1] System calls for file Management

1. Create file ()
2. Read file ()
3. Write file ()
4. delete file ()
5. close.Handle file ()

① Process management
② Main memory management.
③ I/o system management.
④ File system management.
⑤ Secondary storage management.

XIV. References/ Suggestions for Further Reading
1. https://www.tutorialspoint.com/unix/
2. http://www.ee.surrey.ac.uk/Teaching/Unix/
3. https://www.cs.sfu.ca/~ggbaker/reference/unix/

XV. Assessment Scheme

	Performance Indicators	Weightage
	Process related (15 Marks)	**30%**
1.	Logic formation	10%
2.	Debugging ability	10%
3.	Follow ethical practices	10%
	Product related (35 Marks)	**70%**
4.	Expected output	30%
5.	Timely Submission	30%
6.	Answer to sample questions	10%
	Total (50 Marks)	**100%**

List of Students /Team Members

1. ....
2. ....
3. ....

Marks Obtained			Dated signature of Teacher
Process Related(15)	**Product Related(35)**	**Total(50)**	
12	32	44	
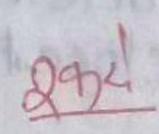
I. Practical Significance:

Process is program in execution. ps Commands is used to manage and to see the active processes on Unix operating system. ps basically means 'Process Status' which is used to display currently running processes in Unix operating system.

II. Relevant Program Outcomes (POs)

- **Basic knowledge:** Apply knowledge of basic mathematics, sciences and basic engineering to solve the computer group related problems.
- **Discipline knowledge:** Apply Computer Programming knowledge to solve the computer group related problems.
- **Experiments and practice:** Plan to perform experiments and practices to use the results to solve the computer group related problems.
- **Engineering tools:** Apply relevant Computer programming / technologies and tools with an understanding of the limitations.
- **Individual and Team work:** Function effectively as a leader and team member in diverse/multidisciplinary teams.
- **Communication:** Communicate effectively in oral and written form.

III. Competency and Practical skills

Manage operations of Operating System.
The practical is expected to develop the following skills:
1. Able to execute process commands like ps, wait, sleep, exit, kill.

IV. Relevant Course Outcome(s)

Execute process commands for performing process management operations.

V. Practical Outcome (PrOs)

Execute process commands- ps, wait, sleep, exit, kill.

VI. Relevant Affective domain related Outcome(s)

1. Follow precautionary measures.
2. Follow naming conventions.
3. Follow ethical practices.

VII. Minimum Theoretical Background

Sr. No.	Commands	Meaning
1	$ps	Display the characteristics of a process. (ie. terminal number, time required, PID no, and command name)
2	$wait	Waits until all background processes are completed and then exits.
3	$sleep 30	Used to execute commands after certain amount of time by sleeping for given seconds.

Options of ps commands:

Sps -f — Full listing showing PPID of each process

Sps -u username — Displays processes of user 'username'

Sps -a — Processes of all users

Sps -e — Process including user and system processes

Options of kill commands:

Skill 0 — Kills all the processes on the terminal except the login shell by special argument '0'

Skill 120 230 234 — Kills three processes with pid 120 230 234

Skill -9 0 — Kills all processes including login shell

Skill -9 $$ — Kills login shell

Resources required (Additional)-Nil

Name of Resource	Bread Specification	Quantity	Remarks (If any)
Computer System	Processor (i3-i5), RAM-2GB and above (As per need of OS)	As per batch Size	For all Experiments
Operating System	Unix/Linux/Ubuntu any other open sources operating system		

Resources used (Additional)

Name of Resource	Bread Specification	Quantity	Remarks (If any)
Computer System	Processor (i3-i5) RAM 2GB		
Operating System	Linux.		

Program Code: Teacher must assign a separate command to students.

What is process id of your login shell?

Give PID of all processes, how you will terminal the processes running on your terminal.

What is difference between wait and sleep?

Q.1) Process id is 1697 Pts|0 00:00:00 bash

XII. Practical Related Questions

Note: Below given are few sample questions for reference. Teacher must design more such questions so as to ensure the achievement of identified CO.

1. What is name of your login shell?
2. What are options of kill commands?
3. What are various options of ps commands?
4. Explain about exit command.
5. List the system calls for process management.

(Space for answer)

Que 4] Exit Command

- This command causes the shell or program to terminate.
- If performed within on interactive command shell, the user is logged out of their current session.
- Typically, an optional exit code can be specified which is typically a simple integer value that is then returned to the parent process.

Que 5] System calls for process Management.

1. Load, execute
2. end, abort
3. resume
4. Create Process
5. Terminate Process
6. get process attribute
7. set Process attribute
8. wait for time
9. wait for event

→ (Q.1) name of login shell is bash.

→ (Q.2) kill command
  ① kill -9 -1
  ② kill -l 11
  ③ kill -L
  ④ kill 123 543 2341 3453

→ (x.9)

X.3 difference between wait and sleep

wait	sleep
It is static method on object class.	It is a method on Thread class.
The wait method belongs to java.lang.object class, thus can be called on any object.	The sleep method belongs to java.lang. Thread class, thus can be called on Threads Hig-
The wait() can be called from synchronized context	The sleep() can be called from any context.
A waiting thread can be awake by notify() or notify all() method	A sleeping can be awaked by interrupt or time expires.
The wait() method release the lock on an object and gives others an chance to execute.	The sleep() method does not release the lock of object for specified time or unit interrupt.

XIII. Exercise:
1. Observe the output of following commands:
Sleep 30: date Display Current date after 30 second
$echo $$ PID of terminal =1697
2. Display full listing of all the processes running on your terminal.
  ps -e
3. Write output of following command.
Sleep 60, banner GOOD
sleep 0; echo GOOD
output:- After 10 second
  GOOD ps display

XII (Q.3)
→ options of ps command

ps -e
ps -ef
ps -ely
ps -ax
ps -axu
ps -ejH
ps -exjf
ps -elf
ps -axms

- Security Info:
ps -eo, euser, ruser, suser, fuser, f, comm, label
ps -axZ
ps -eM

4. Write all the process commands.
1. $ ps
2. $ wait
3. $ sleep
4. $ exit
5. $ kill

XIV. References/ Suggestions for Further Reading
1. https://www.tutorialspoint.com/unix/
2. http://www.cc.surrey.ac.uk/Teaching/Unix/
3. https://www.cs.sfu.ca/~ggbaker/reference/unix/

XV. Assessment Scheme

Performance Indicators	Weightage
Process related (15 Marks)	30%
1. Logic formation	10%
2. Debugging ability	10%
3. Follow ethical practices	10%
Product related (35 Marks)	70%
4. Expected output	30%
5. Timely Submission	30%
6. Answer to sample questions	10%
Total (50 Marks)	100%

List of Students/Team Members
1. Pooja Bengre
2. Vaishnavi Bhau
3. Jagruti Narvekar

	Marks Obtained		Dated signature of Teacher
Process Related(35)	Product Related(15)	Total(50)	
30	12	42	

Practical No. 6: Execute file and directory manipulation commands.

I. Practical Significance:
Basically, the operations perform in Unix/Linux are done on a prompt / terminal which is not stored anywhere. But most of the commands are written to store the information. One way is to store the information in a file. Various operations that can be performed on a file are create, open, read, write, move, close and rename.

II. Relevant Program Outcomes (POs)
- **Basic knowledge:** Apply knowledge of basic mathematics, sciences and basic engineering to solve the computer group related problems.
- **Discipline knowledge:** Apply Computer Programming knowledge to solve the computer group related problems.
- **Experiments and practice:** Plan to perform experiments and practices to use the results to solve the computer group related problems.
- **Engineering tools:** Apply relevant Computer programming / technologies and tools with an understanding of the limitations.
- **Individual and Team work:** Function effectively as a leader and team member in diverse/multidisciplinary teams.
- **Communication:** Communicate effectively in oral and written form.

III. Competency and Practical skills
Manage operations of Operating System.
The Practical is expected to develop the following skills:
1. Able to execute file and directory manipulation commands.

IV. Relevant Course Outcome(s)
Apply file management techniques.

V. Practical Outcome (PrOs)
Execute file and directory manipulation commands – ls, rm, mv, cp, join, split, cat (file saving and redirection operator), head, tail, touch.

VI. Relevant Affective domain related Outcome(s)
1. Follow precautionary measures.
2. Follow naming conventions.
3. Follow ethical practices.

VII. Minimum Theoretical Background
File and directory manipulation commands –
ls command : it is used to lists files in the current working directory.
Syntax:
$ls

Options

Options	Meaning
ls -a	list all files including hidden file starting with '.'
ls -d	list directories - with '*'
ls -i	list file's inode index number
ls -l	list with long format - show permissions

Example:
$ls -t abc.txt   list contents of abc.txt file
$ls -l   List of all files along with permissions given to it.
$ls ???   List the names of files with exact three characters in it name.
$ls d*s   List of files names which starts for d and ends with s
$ls -l   Gives full listing of all files and directories.

Output

Figure 1

rm command: It is used to remove the file
Syntax:
$rm filename
Example
$rm abc.txt   Removes abc.txt
$rm abc.txt xyz.txt   Removes abc.txt and xyz.txt files
$rm *   Removes all files

mv command : it is used to move a file from one location to another.
Syntax:
mv [Option] source destination
(consider 3 files having name abc.txt, xyz.txt and pqr.txt.)
To rename the file abc.txt to aaa.txt (not exist):
$ ls
abc.txt xyz.txt pqr.txt
$ mv abc.txt aaa.txt
$ ls
xyz.txt pqr.txt aaa.txt

Options:
1. -i (Interactive): The mv command with -i option ask for confirmation
$ mv -i abc.txt aab.txt

Combine 2 text files to another file

$ cat list1.txt list2.txt > todo.txt

In this example contents of files list1.txt and list2.txt is saved to todo.txt file.

$cat list1.txt>>list2.txt

It appends the contents list1.txt to list2.txt. It adds the contents at the end of file.

Now check it

$ls list2.txt

VIII. Resources required (Additional)-Nil

Sr. No.	Name of Resource	Broad Specification	Quantity	Remarks (If any)
1	Computer System	Processor (i3-i5), RAM-2GB and above (As per need of OS)	As per batch Size	For all Experiments
2	Operating System	Unix/Linux Ubuntu any other open sources operating system		

IX. Resources used (Additional)

Sr. No.	Name of Resource	Broad Specification	Quantity	Remarks (If any)
1	Computer System	*Processor (i3-i5) RAM -2GB*		
2	Operating System	*Linux*		

X. Program Code: Teacher must assign a separate program statement to students.

1. Create three files a1 a2 a3.
2. Apply different commands like
ls, mv, cp, rm, join, split and check the list of files at the end.

XI. Result (Output of Code):

....

....

....

XII. Practical Related Questions

Note: Below given are few sample questions for reference. Teacher must design more such questions so as to ensure the achievement of identified CO.

1. What are different options of ls command? Write down the command along with the option and note down the output. (Use $man ls command to check options)
2. What are different options of mv command?
3. What is use of split command?
4. How to use join command?

Que 1) Options of ls command

-a : list all files including hidden file starting with .
-d : list directories - with '*/'
-i : list file's inode index number
-l : list with long format - show permissions

Que 2) Use of split command

It is used to split the large file into smaller files. Default size is 1000 lines per file.

Que 3) Use of join command

It is use for joining lines of two files on the basis of common field in.

Que.2) Options of MV command

-b : like --backup but does not accept on argument
-f ; --force : do not promt before overwriting
-i, --interactive : prompt before overwrite.
-n, --no-clobber : do not overwrite an existing file.
-- string-trailing-slashes : remove any trailing slashes from each SOURCE argument
-s, --suffix = SUFFIX : override the usual backup suffix
-t, --target-directory = : move all SOURCE arguments DIRECTORY into DIRECTORY
-T, --no-target-directory : treat DEST as a normal file

−u, −update : move only when the source file is newer than the destination file or when the destination file is missing

−v, −verbose : explain what is being done

−Z, −−context : set SELinux security context of destination file to default type.

−help : display this help and exit

−−version & Output version information and exit.

XIII. Exercise:

1 Write output of following commands:

i) Display all file names which starts with 'a' and ends with 'y'.

ii) Enlist all the files beginning with 'm' and ending with any range of 1 to 5.

iii) Show the contents of the files whose file names contains exactly two characters.

iv) Create a file ABCD.txt, create a copy with XXX.txt. Rename the original file with AACD.txt. Delete the file XXX.txt.

v) Display the modes of any two files at the same time.

2 List all file processing commands.

3 How many lines will be displayed with head command if number is not specified.

4 Create two files chapter1 and chapter2 and perform the following operations
   1. Copy contents of chapter1 to chapter2 by asking the user before overwrite.
   2. Display modes of two files.
   3. Rename the file 'chapter1' to 'Lesson1'.

5 Execute the following commands:
   $ls a*n
   $ls s?
   $cat abc>>xz

(Space for Answer)

→ Q.1) ls r*a

    O/P: rasika ruchita

→ Q.2) ls r*2

    O/P: rohit 2 ruchita 2 rushi 2

→ Q.3) cat ??   O/P:— Hi
                                Hello
                                By

Practical No. 7: Execute file and directory manipulation commands

I. **Practical Significance:**

Data and programs are stored in **files**. These are organized in directories. In a simple way, a directory is just a file that contains other files (or directories).

II. **Relevant Program Outcomes (POs)**
- **Basic knowledge:** Apply knowledge of basic mathematics, sciences and basic engineering to solve the computer group related problems.
- **Discipline knowledge:** Apply Computer Programming knowledge to solve the computer group related problems.
- **Experiments and practice:** Plan to perform experiments and practices to use the results to solve the computer group related problems.
- **Engineering tools:** Apply relevant Computer programming / technologies and tools with an understanding of the limitations.
- **Individual and Team work:** Function effectively as a leader and team member in diverse/multidisciplinary teams.
- **Communication:** Communicate effectively in oral and written form.

III. **Competency and Practical skills**

Manage operations of Operating System.

The practical is expected to develop the following skills:

1. Able to execute file and directory manipulation commands.

IV. **Relevant Course Outcome(s)**

Apply file management techniques.

V. **Practical Outcome (PrOs)**

Execute file and directory manipulation commands – diff, comm.,pr, chmod, mkdir, rmdir, cd, pwd, dir, cmp. (Use wild card character).

VI. **Relevant Affective domain related Outcome(s)**
1. Follow precautionary measures.
2. Follow naming conventions.
3. Follow ethical practices.

VII. **Minimum Theoretical Background**

Unix uses a hierarchical structure for organizing files and directories. This structure is called as a directory tree. The tree has a single root node, the slash character (/), and all other directories are contained below it. When user first log in to the Unix server, the specified directory is called as Home directory.

Directory Structure in Unix/Linux:

VIII. Resources required (Additional)-Nil

Sr. No.	Name of Resource	Broad Specification	Quantity	Remarks (If any)
1	Computer System	Processor (I3-I5), RAM-2GB and above (As per need of OS)	As per batch Size	For all Experiments
2	Operating System	Unix/Linux/Ubuntu/any other open sources operating system		

IX. Resources used (Additional)

Sr. No.	Name of Resource	Broad Specification	Quantity	Remarks (If any)
1	Computer System	Processor (I3-I5) RAM 2GB		
2	Operating System	Linux		

X. Program Code: Teacher must assign a separate program statement to students.
1. Create the following structure
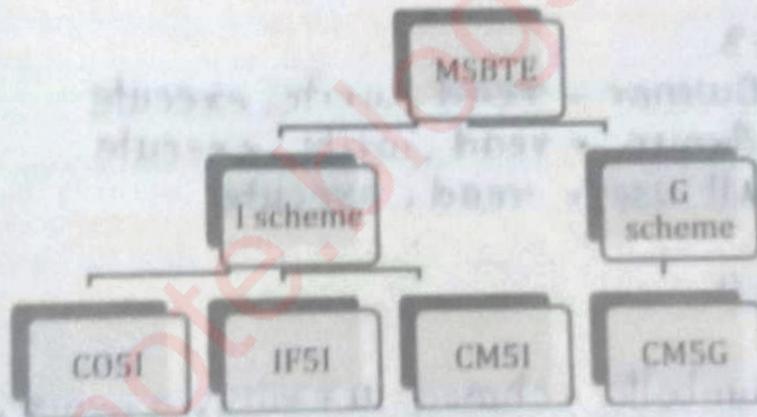
Figure 6

XI. Result (Output of Code):

_____

_____

_____

actical Related Questions

re: Below given are few sample questions for reference. Teacher must design re such questions so as to ensure the achievement of identified CO.

How to shift from Root directory to User (Home) directory?

How to see directories?

What is default set of permissions given by the system to the directory?

Assign all the permissions to your directory for all the users using symbolic and octal method

What is difference between comm and cmp command?

(Space for answer)

1. using cd command (cd home)

2. using dir command

owner - read, write, execute
group - read, write, execute
user - read, write, execute

symbolic - chmod u+rwx, g+rwx, o+rx wmsbte

octal method - chmod 477 msbte

Comm : divides the output into three.

Columns

1. Columns shows the content in first file
2. Columns shows the content in second file
3. Columns shows the content common in both files.

Cmp : If compare.

XIII. Exercise:

1. Write the command for performing the following tasks sequentially
   a. Display your current directory.
   b. Create a directory 'subject' in the current directory.
   c. Create a file 'sample' in the directory 'subject'.
   d. Remove the write permission for the owner for 'sample' using symbolic method
   e. Delete the file 'sample'. What is an error message displayed?

2. What are the permissions assigned to the file/files after execution of following commands?
   a. $chmod 700 abc
   1.Owner - read, write, execute 2.Group - No permission 3. All user - No permission
   b. $chmod u+rwx, go-rwx file1 file2
   1.Owner - read, write, execute 2.Group - No permission 3.All user - No permission
   c. $chmod 536 xyz
   1.Owner - read, execute 2.Group-execute, write 3. All user-read, write

3. Create new files pqr and prqi.
   Perform the commands
   $chmod ugo+r pqr
   o/p A: Owner-read, Group- read, All user- Read
   $chmod ugo+r pqi
   o/p1.Owner- Read, write,..Group. read ,write,All) user-read

4. Assign read and write permission for the owner, write permission for the group and execute permission for others using octal method for file mfile

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a. ___
b. _rw_r_x|___
c. r_x_r_x

6. Write commands to assign following permissions to the file OSY using symbolic method.
a. _rwxr_x|__
b. _rwxrwxrwx

(Space for Answer)

Que 4

chmod 621 m

Owner-read, write Group-write
All user-execute

Que-5

i) chmod 000 OSY
o/p - - - - - - - -

ii) chmod 664 OSY
o/p - rw-r-xr-

iii) chmod 555 OSY
-r-xr_xr_x

Que-6

i) chmod o-wx OSY
o/p: _rwr_xr_

ii) chmod ugo = rwx OSY
o/p: _rwxrwxrwx
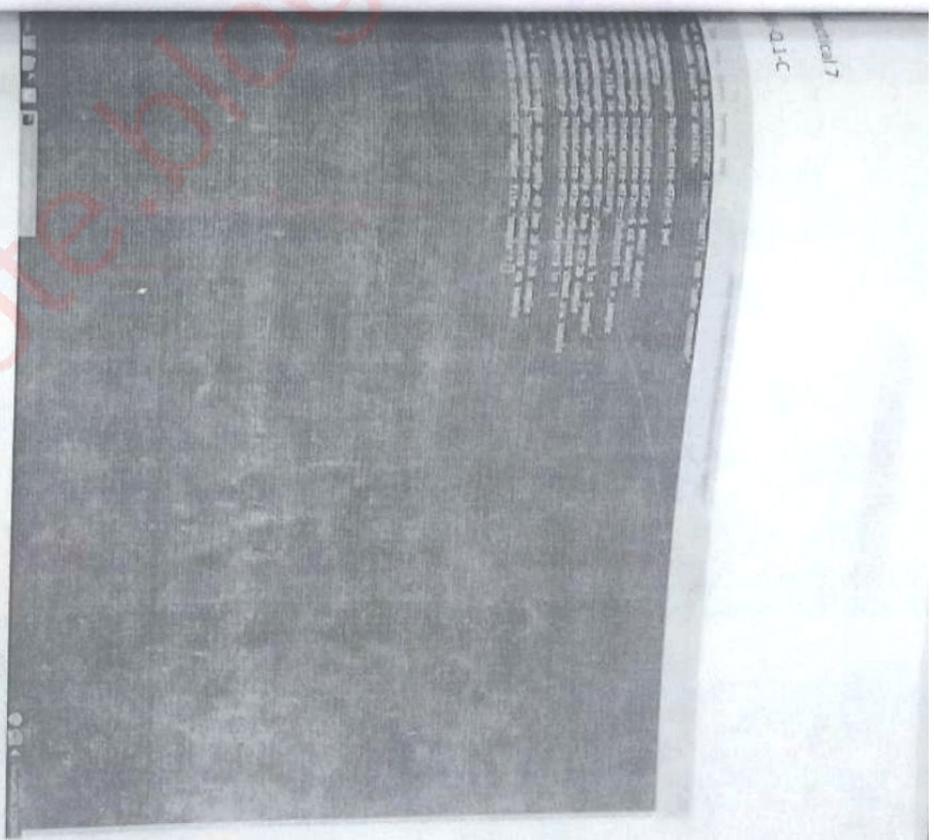
Practical No. 8: Execute text processing commands.

I. Practical Significance:
There are many text processing commands. A filter is a program that takes a flow of data from the standard input, processes or filters it and send the result to standard output. cut, wc, tr, sort, grep are all simple filters.

II. Relevant Program Outcomes (POs)
- **Basic knowledge:** Apply knowledge of basic mathematics, sciences and basic engineering to solve the computer group related problems.
- **Discipline knowledge:** Apply Computer Programming knowledge to solve the computer group related problems.
- **Experiments and practice:** Plan to perform experiments and practices to use the results to solve the computer group related problems.
- **Engineering tools:** Apply relevant Computer programming technologies and tools with an understanding of the limitations.
- **Individual and Team work:** Function effectively as a leader and team member in diverse/multidisciplinary teams.
- **Communication:** Communicate effectively in oral and written form.

III. Competency and Practical skills
Manage operations of Operating System.
The practical is expected to develop the following skills.
1. Able to execute commands for text processing.

IV. Relevant Course Outcome(s)
Apply file management techniques.

V. Practical Outcome(s) (PrOs)
Execute text processing tr, wc, cut, paste, spell, sort, grep, more.

VI. Relevant Affective domain related Outcome(s)
1. Follow precautionary measures.
2. Follow naming conventions.
3. Follow ethical practices.

VII. Minimum Theoretical Background
1. **tr** (Unix):- tr is a command in Unix-like operating systems. It is an abbreviation of *translate* or *transliterate*, indicating its operation of replacing or removing specific characters in its input data set.

Syntax
The syntax of tr command is
$ tr [OPTION] SET1 [SET2]

Translation
If both the SET1 and SET2 are specified and '-d' OPTION is not specified, then tr command will replace each character in SET1 with each character in same position in SET2.

---

1. Convert lower case to upper case
- The following tr command is used to convert the lower case to upper case
$ tr

```
operating system
OPERATING SYSTEM
fifth semester
FIFTH SEMESTER
```

- The following command will also convert lower case to upper case
$ tr [:lower:] [:upper:]

```
java
JAVA
```

- You can also use ranges in tr. The following command uses ranges to convert lower to upper case.
$ tr a-z A-Z'

2. wc
The wc (word count) command in Unix/Linux operating systems is used to find out number of lines, words and characters in a file.
The syntax of wc command as shown below.
wc [-l -w -c] <filename>
-l counts only number of lines
-w counts only number of words
-c counts only number of characters
Example:

```
$cat student1
Ajay
Vijay
Sujit
$wc student1
3 3 14
```

Means 3 lines, 3 words and 14 characters.

```
# wc [options] filenames
[root@tecmint ~]# wc tecmint.txt
12 16 112 tecmint.txt
```

The following are the options and usage provided by the command.

Sr. No.	Command	Description
1	wc-l	Prints the number of lines in a file
2	wc-w	Prints the number of words in a file.
3	wc-c	Displays the count of bytes in a file
4	wc-m	Prints the count of characters from a file
5	wc-L	Prints only the length of the longest line

Sr. No.	Name of Resource	Broad Specification	Quantity	Remarks (If any)
1	Computer System	Processor (i3-i5). RAM-2GB and above (As per need of OS)	As per batch Size	For all Experiments
2.	Operating System	Unix/Linux/Ubuntu/any other open sources operating system		

IX. Resources used (Additional)

Sr. No.	Name of Resource	Broad Specification	Quantity	Remarks (If any)
1	Computer System	Processor (i3-i5) RAM 2GB		
2.	Operating System	Linux		

X. Program Code: Teacher must assign a separate program statement to students.

Write the commands for:

Counting number of words in the 'data.txt'

Counting number of lines in 'data.txt'

Counting all characters in the 'data.txt'

XI. Result (Output of Command):

1. wc -w data.txt   o/p: 5 data.txt
2. wc -l data.txt   o/p: 5 data.txt
3. wc -m data.txt   o/p: 87 data.txt

XII. Practical Related Questions

Note: Below given are few sample questions for reference. Teacher must design more such questions so as to ensure the achievement of identified CO.

1. Give Applications of Paste Command.
2. How to move cursor to end of a line?
3. What are the options of wc command?
4. What are different types of filters used in Linux?
5. What is difference between $cat abc and $cat abc|more (File abc shall consists of more than 25 lines in it)

(Space for answer)

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2.3 Option of wc command -

-c, -- bytes
- print the character counts.

-l, -- lines
- print the newline counts.

- -- files0-from=f
- read input from the files specified by NUL-terminated.

-L, -- max-line-length
- print the maximum display width

-w, -- words
- print the word counts.

-- help display this help and exit

-- version
- output version information and exit.

```
1|Arunachal Pradesh,Itanagar
2|Assam,Dispur
3|Andhra Pradesh,Hyderabad
4|Bihar,Patna
5|Chhattisgrah,Raipur
```

iii. -s (serial), Combination of -d and -s, –version (write its syntax and example)

1. Create a new file and practice executing shell commands from within the editor. Capture the results of some shell commands into the file.

2. How to get help?

2. Try the commands and write output with its meaning

   i. tr "[a-f]" "[0-5]" < employee (employee is name of file)

   Vi3y0
   Nikit0   (string containing a to f
   5ay0li   character replace by 0-5
   2n4t0n0   number respectively.)

   ii. tr -s " " < employee

   Vidya   (replace each sequence of a repeated
   Nikita   character that is listed in the last
   Sayali   specified SET, with a single occurrence
   chetana   of that character)

   iii. tr -d "f" < employee

   vdya
   Nikita   (delete character in SET1, do not
   sayali   translate, SET 1 = employee.)
   chetana

(Space for Answer)

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I. Practical Significance:

There are many ways to edit files in Unix. Editing files using the screen-oriented text editor **vi** is one of the best ways. This editor enables you to edit lines in context with other lines in the file. Vi is intended as a plain text editor (similar to Notepad on Windows, or Textedit on Mac) as opposed to a word processing suite such as Word or Pages. It does, however have a lot more power compared to Notepad or Textedit.

II. Relevant Program Outcomes (POs)

- **Basic knowledge:** Apply knowledge of basic mathematics, sciences and basic engineering to solve the computer group related problems.
- **Discipline knowledge:** Apply Computer Programming knowledge to solve the computer group related problems.
- **Experiments and practice:** Plan to perform experiments and practices to use the results to solve the computer group related problems.
- **Engineering tools:** Apply relevant Computer programming / technologies and tools with an understanding of the limitations.
- **Individual and Team work:** Function effectively as a leader and team member in diverse/multidisciplinary teams.
- **Communication:** Communicate effectively in oral and written form.

III. Competency and Practical skills

Manage operations of Operating System
The practical is expected to develop the following skills:
1. Able to execute commands in the given modes.
2. Able to identify vi editor commands.

IV. Relevant Course Outcome(s)

Apply file management techniques.

V. Practical Outcome (PrOs)

Use vi editor and perform all editor commands.

VI. Relevant Affective domain related Outcome(s)

1. Follow precautionary measures.
2. Follow naming conventions.
3. Follow ethical practices.

VII. Minimum Theoretical Background

Starting the vi Editor
The following table lists out the basic commands to use the vi editor –

Sr. No.	Command	Description
1	vi filename	Creates a new file if it already does not exist, otherwise opens an existing file.

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I.

If is a statement that allows the programmer to make a decision in the program based on conditions he specified. If the condition is met, the program will execute certain lines of code otherwise, the program will execute other tasks the programmer specified.

II. **Relevant Program Outcomes (POs)**
- **Basic knowledge:** Apply knowledge of basic mathematics, sciences and basic engineering to solve the computer group related problems.
- **Discipline knowledge:** Apply Computer Programming knowledge to solve the computer group related problems.
- **Experiments and practice:** Plan to perform experiments and practices to use the results to solve the computer group related problems.
- **Engineering tools:** Apply relevant Computer programming / technologies and tools with an understanding of the limitations.
- **Individual and Team work:** Function effectively as a leader and team member in diverse/multidisciplinary teams.
- **Communication:** Communicate effectively in oral and written form.

III. **Competency and Practical skills**
Manage operations of Operating System
The practical is expected to develop the following skills:
1. Able to execute script for single decision if statement.
2. Able to execute script for double decision if statement.

IV. **Relevant Course Outcome(s)**
Apply file management techniques.

V. **Practical Outcome (PrOs)**
Write and execute Shell Script by using following Control statements features- "if" statement.

VI. **Relevant Affective domain related Outcome(s)**
1. Follow precautionary measures.
2. Follow naming conventions.
3. Follow ethical practices.

VII. **Minimum Theoretical Background**
The **if...else...fi** statement is the control statement that allows Shell to execute statements in a controlled way and make the right choice.
Syntax;
if [expression]
then
Statement(s) to be executed if expression is true
else
Statement(s) to be executed if expression is not true
fi

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4. **Double –bracket:-**
   Syntax:-
   if ((condition))
   then
   Statements goes here
   fi

To type any program in Linux you need the compiler. vi editor is used for creating file in Linux.
Write a shell script to display welcome message with today's date in it.
In vi editor write a program code and save and quit with filename 'sample.sh'.

   $vi sample.sh

   (Now press escape and i to change the input mode and type following program)
   #sample.sh

```
#use of if-then statement
if whoami; then
var1='whoami'
echo "Welcome $var1"
fi
if date; then
echo "It displays todays date"
fi
echo "This is end of script"
To run the script
```

$./sample.sh
Save this program press escape+shift+:(colon) and type wq (:wq)
"Welcome User1"
Mon Feb 25 22:29:29 PST 2019
"It displays todays date"
"This is end of script"

VIII. Resources required (Additional)

Sr. No.	Name of Resource	Broad Specification	Quantity	Remarks (If any)
1	Computer System	Processor (i3-i5), RAM-2GB and above (As per need of OS)	As per batch Size	For all Experiments
2.	Operating System	Unix/Linux/Ubuntu/any other open sources operating system		

IX. Resources used (Additional)

Sr. No.	Name of Resource	Broad Specification	Quantity	Remarks (If any)
1	Computer System	Processor (i3-i5) RAM 2GB	—	
2.	Operating System	Linux		

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Program Code: Teacher must assign a separate program statement to students, learner shall write script by considering example to find passing grades of students.

1. Single Decision
2. Double Decision
3. Multiple if statements.

Note: Attach the code at the end.

```
#!/bin/sh
echo "enter marks m1"
read m1
echo "enter marks m2"
read m2
echo "enter marks m3"
read m3
total=$(($m1 + $m2 + $m3))
echo "sum of-subject are : $per"
if [ $per -gt 80]
then
echo "you get distinction"
elif [$per -gt 60]
then
echo "You get First class "
elif [$per -lt 40] then
echo "You get fail"
else
echo "You fail " fi
```

Result/Output of Code:

Practical Related Questions

Note: Below given are few sample questions for reference. Teacher must design more such questions so as to ensure the achievement of identified CO.

A. Write and execute script for nested if statements
B. Write difference between
   1. if [condition]
   2. if((condition))

Write script for finding greatest number among given three number.

Que 1

```
#!/bin/sh
echo "Is it Morning ? Please answer Yes or no"
read timeofday
if [ $ timeofday = "Yes" ]
then
echo " Good Morning "
elif [ $ timeofday = "no" ]; then
echo " Good afternoon "
else
echo "Sorry, $timeofday not recognized.
Enter Yes or no."
exit 1
fi
exit 0
```

XIII. Exercise:

1. Correct the following script and write its output.
   1. if [! -r $1] then echo "File $1 is not readable." fi
   2. if "$X" -nt "etc/passwd"); Then
      echo "X is a file which is newer than /etc/passwd"
      if

(Space for Answer)

Que.1 → if [! -r "$1"] then echo "File $1 is not readable - skipping "; fi

Que.2 → if ["$x" -nt "/etc/passwd"] Then
echo "x is a file which is newer than
etc/passwd"
fi

Practical No. 11: Execute Shell Script by using for statements.

I.   Practical Significance:
The **for** loops iterate through a set of values until the list is exhausted. In simple terms the for loop operates on lists of items. It repeats a set of commands for every item in a list.

II.   Relevant Program Outcomes (POs)
- **Basic knowledge:** Apply knowledge of basic mathematics, sciences and basic engineering to solve the computer group related problems.
- **Discipline knowledge:** Apply Computer Programming knowledge to solve the computer group related problems.
- **Experiments and practice:** Plan to perform experiments and practices to use the results to solve the computer group related problems.
- **Engineering tools:** Apply relevant Computer programming / technologies and tools with an understanding of the limitations.
- **Individual and Team work:** Function effectively as a leader and team member in diverse/multidisciplinary teams.
- **Communication:** Communicate effectively in oral and written form.

III. Competency and Practical skills
Manage operations of Operating System
The practical is expected to develop the following skills:
1. Able to execute script for 'FOR' loop.

IV.   Relevant Course Outcome(s)
Apply file management techniques.

V.   Practical Outcome (PrOs)
Write and execute Shell Script by using following Control statements feature- "for" statement, exit, break, continue.

VI.   Relevant Affective domain related Outcome(s)
1. Follow precautionary measures.
2. Follow naming conventions.
3. Follow ethical practices.

VII. Minimum Theoretical Background
Syntax of FOR loop: -
for var in item1 item2 ... itemN
            do
                    command1
                    command2
                    ...
                    ...
                    commandN
            done

VIII. Resources required (Additional)

Sr. No.	Name of Resource	Broad Specification	Quantity	Remarks (If any)
1	Computer System	Processor (i3-i5), RAM-2GB and above (As per need of OS)	As per batch Size	For all Experiments
2	Operating System	Unix/Linux/Ubuntu/any other open sources operating system		

IX. Resources used (Additional)

Sr. No.	Name of Resource	Broad Specification	Quantity	Remarks (If any)
1	Computer System	Processor(i3-i5) RAM 2GB		
2	Operating System	Linux		

X. Program Code: Teacher must assign a separate program statement to students.

1. Execute shell script by considering example like printing table of given number by FOR loop.
2. Execute shell script by considering example like printing following output by FOR loop

```
******
****
**
*
```

Note: Attach the code at the end.

```
echo "Type any no. for printing table"
read n
i=1
while [$i -le 10]
do
echo "$n + $i = `expr $n\* $i`"
i=`expr $i + 1`
done
```

```
i = 2
echo "fibonaci series up...
echo "$x"
echo "$y"
while [$i -lt $n]
do
i = 'expr $i + i'
z = expr $x + $y'
echo "$z"
x = $y
y = $z
done
```

XIII. Exercise:

Execute the script for the following.

1. The for loop using day of week list.
2. The while loop to print different * patterns.
3. The case statement for performing various mathematical operations.

(Space for Answer)

I. Practical Significance:

In Unix files come with permissions, a way to decide who can read, write or execute a file. These permissions are divided into three parts: those for the owner (user) of the file, those for the group to which the owner belongs and then permissions for all the other users from the point of view of what is allowed to do in a file or directory, permissions are for reading, writing and executing.

II. Relevant Program Outcomes (POs)

- **Basic knowledge:** Apply knowledge of basic mathematics, sciences and basic engineering to solve the computer group related problems.
- **Discipline knowledge:** Apply Computer Programming knowledge to solve the computer group related problems.
- **Experiments and practice:** Plan to perform experiments and practices to use the results to solve the computer group related problems.
- **Engineering tools:** Apply relevant Computer programming / technologies and tools with an understanding of the limitations.
- **Individual and Team work:** Function effectively as a leader and team member in diverse/multidisciplinary teams.
- **Communication:** Communicate effectively in oral and written form.

III. Competency and Practical skills

The practical is expected to develop the following skills:
1. Able to execute shell script to check and grant file permissions.

IV. Relevant Course Outcome(s)

Apply file management techniques.

V. Practical Outcome (PrOs)

Write Shell script to find out whether - File has read, write, and execute permissions

VI. Relevant Affective domain related Outcome(s)

1. Follow precautionary measures.
2. Follow naming conventions.
3. Follow ethical practices.

VII. Minimum Theoretical Background

Test Commands

Test	Returns true if
-r file	True if file exists and is readable.
-s file	True if file exists and has a size greater than zero.
-w file	True if file exists and is writable.
-x file	True if file exists and is executable.

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III. Resources required (Additional)-

Sr. No.	Name of Resource	Broad Specification	Quantity	Remarks (If any)
1	Computer System	Processor (i3-i5), RAM-2GB and above (As per need of OS)	As per batch Size	For all Experiments
2	Operating System	Unix/Linux/Ubuntu/any other open sources operating system		

Resources used (Additional)

Sr. No.	Name of Resource	Broad Specification	Quantity	Remarks (If any)
1	Computer System	Processor (i3-i5) RAM 2GB		
2	Operating System	Linux		

(This practical can be performed in any of the compiler like C, vi editor etc)

Note: Attach the code at the end.

Program Code: Teacher must assign a separate program statement to students. Write Shell script to find out whether - File has read, write, and execute permissions

```
echo "Type any"
read file
echo -n "enter file name"

[-w $ file] && w= "Write = Yes"]
            w= "Write = No"

Ex $ file] &&
      x= "Execute = Yes"]
      x= "Execute = No"

[-R $ file]&&  R = "Read = Yes"]
               R = "Read = No"]

echo "$ file permission"
echo "$w"
echo "$P"
echo "$x"
```

XI.   Result (Output of Code):

XII.   Practical Related Questions

Note: Below given are few sample questions for reference. Teacher must design more such questions so as to ensure the achievement of identified CO.

1. What are permissions of a file?
2. How to assign permission to a file?
3. What happens when exception is thrown by main method?
4. How to check permissions of all files and directories?
5. What are the test commands to check the permission of a file?

(Space for answer)

Q.1→ Linux divides the file permissions into read, write, and execute denoted by r,w, and x. The permissions on a file can be changed by 'chmod' command which can be further divided into Absolute and symbolic code.

Q.2→ The chmod command is used to change the permissions of a file or directory. To use it, you specify the desired permission settings & the file or files that you wish to modify.

Q.3→ When an exception is thrown by main() method, Java Runtime terminates the program & print the exception message and stack trace in system Console. The throws clause only states that the method throws a checked fileNotfoundException and the calling method should catch or rethrow it.

Q.5] →
1. file is directory or not.
2. file has read permission or not.
3. file has write permission or not.
4. file has execute permission or not.

XIII. Exercise:
1. Write a shell script which displays the list of all executable files in the current working directory.
2. Write a shell script which displays a list of all the files in the current directory to which user has read, write and execute permission.
3. Write a shell script which accepts a filename and assigns it all the permissions.

(Space for Answer)

Practical No. 14: Implement scheduling algorithms.

I. Practical Significance:
In Multiprogramming systems, the Operating system schedules the processes on the CPU to have the maximum utilization of it and this procedure is called CPU scheduling. The Operating System uses various scheduling algorithm to schedule the processes. First come first serve (FCFS) scheduling algorithm simply schedule the jobs according to their arrival time.

II. Relevant Program Outcomes (POs)
- **Basic knowledge:** Apply knowledge of basic mathematics, sciences and basic engineering to solve the computer group related problems.
- **Discipline knowledge:** Apply Computer Programming knowledge to solve the computer group related problems.
- **Experiments and practice:** Plan to perform experiments and practices to use the results to solve the computer group related problems.
- **Engineering tools:** Apply relevant Computer programming / technologies and tools with an understanding of the limitations.
- **Individual and Team work:** Function effectively as a leader and team member in diverse/multidisciplinary teams.
- **Communication:** Communicate effectively in oral and written form.

III. Competency and Practical skills
Manage operations of Operating System
The practical is expected to develop the following skills:
1. Able to find out turnaround time and average waiting time and performance of the algorithm.

IV. Relevant Course Outcome(s)
Apply scheduling algorithms to calculate turnaround time and average waiting time.

V. Practical Outcome (POs)
Write a program to calculate total waiting and turnaround time of n process with First Come First Serve CPU scheduling algorithm.

VI. Relevant Affective domain related Outcome(s)
1. Follow precautionary measures
2. Follow naming conventions
3. Follow ethical practice

VII. Minimum Theoretical Background
In multiprogramming systems, when there is more than one runnable process (i.e, ready), the operating system must decide which one to activate. The decision is made by the part of the operating system called the scheduler, using a scheduling algorithm. CPU scheduling decides the process from memory that are ready to execute, and allocates the CPU to one of them.
For example, in FCFS the job which comes first in the ready queue will get the CPU first. The lesser the arrival time of the job, the sooner will the job get the CPU. FCFS
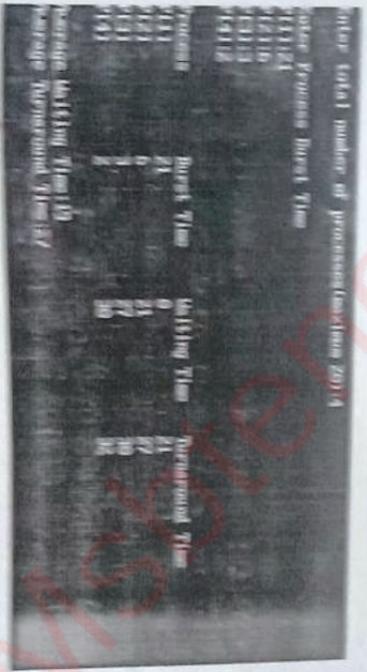
```
#include<stdio.h>

int main()
{
    int n,bt[20],wt[20],tat[20],avwt=0,avtat=0,i,j;
    printf("Enter total number of processes(maximum 20):");
    scanf("%d",&n);

    printf("\nEnter Process Burst Time\n");
    for(i=0;i<n;i++)
    {
        printf("P[%d]:",i+1);
        scanf("%d",&bt[i]);
    }

    wt[0]=0;
    for(i=1;i<n;i++)
    {
        wt[i]=0;
        for(j=0;j<i;j++)
            wt[i]+=bt[j];
    }

    printf("\nProcess\t\tBurst Time\tWaiting Time\tTurnaround Time");
    for(i=0;i<n;i++)
    {
        tat[i]=bt[i]+wt[i];
        avwt+=wt[i];
        avtat+=tat[i];
        printf("\nP[%d]\t\t%d\t\t%d\t\t%d",i+1,bt[i],wt[i],tat[i]);
    }

    avwt/=i;
    avtat/=i;
    printf("\n\nAverage Waiting Time:%d",avwt);
    printf("\nAverage Turnaround Time:%d",avtat);
    return 0;
}
```

Enter total number of processes(maximum 20):4

Process	Burst Time	Waiting Time	Turnaround Time
P[1]	21	0	21
P[2]	3	21	24
P[3]	6	24	30
P[4]	2	30	32

Average Waiting Time:18
Average Turnaround Time:26

XII. **Practical Related Questions**
Note: Below given are few sample questions for reference. Teacher must design more such questions so as to ensure the achievement of identified CO.

1. Compare SJF, Priority and RR with respect to turnaround time and average waiting time.
2. State the conditions for preemptive and non-preemptive scheduling algorithm.
3. Give the reason of problems arises in FCFS.
4. Write a formula for turnaround Time.
5. Write a formula for Average waiting Time.

(Space for answer)

Que-2
Conditions for pre-emptive scheduling Alogrithm :-

1. When a process switches from the running state to the ready state (for example, when an interrupt occures)

2. When a process switches from the waiting state to the ready state (for example at completion of I/o)

Conditions for Non-pre-emptive scheduling Algorithm :-

1. When a process switches from the running state to the waiting state (for example, as the result of an I/o requests or an invocation of wait for the termission of one of the child process)

2. When a process terminates.

3. Calculate average waiting time using R.R algorithm for the following set of processes with the length of the CPU burst time given in milliseconds. (Time quantum 20 ms)
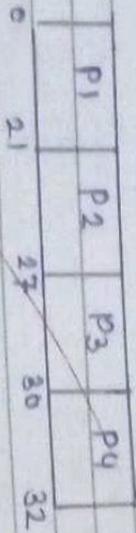
Process	Arrival Time	Burst Time
P1	0	10
P2	1	4
P3	2	14
P4	3	8

Process	Burst Time
P1	12
P2	45
P3	78
P4	90

(Space for Answer)

Que 1

Gantt chart

P1	P2	P3	P4

0   21   27   30   32

Avg. waiting time $= \dfrac{12+0+20+2}{4}$

$= \dfrac{34}{4}$

$= 8.5$

Q.3 Round Robbin

Gantt chart

P1	P2	P3	P4	P2	P3	P4	P2	P3	P4	P3	P4	P4

0 12 32 52 72 92 112 132 137 157 177 195 215 225
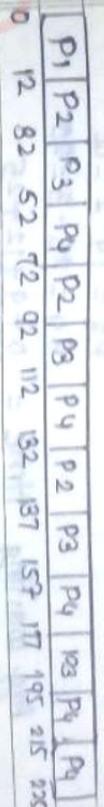
Waiting time for:

$P_1 = 0$

$P_2 = 12 + (72-32) + (132-92) = 92$

$P_3 = 32 + (92-52) + (137-112) + (177-157) = 117$

$P_4 = 52 + (112-72) + (157-132) + (195-177) = 135$

Avg. waiting time $= \dfrac{0+92+117+135}{4}$

$= \dfrac{344}{4}$

$= 86$

Que.2

→ ① FCFS

Gantt chart

P1	P2	P3	P4

0   10   14   28   36
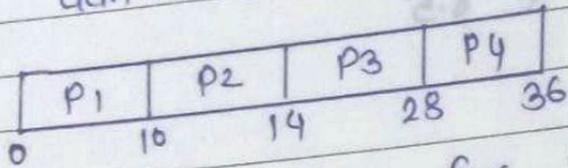
Waiting time for P1 = 0-0 = 0

$$P2 = 10-1 = 9$$

$$P3 = 14-2 = 12$$

$$P4 = 28-3 = 25$$

$$Avg.\ waiting\ time = \frac{0+9+12+25}{4}$$

$$= \frac{46}{4}$$

$$= 11.5$$

② Pre-emptive SJF

Gantt chart

P1	P2	P4	P1	P3

0   1   5   13   22   36
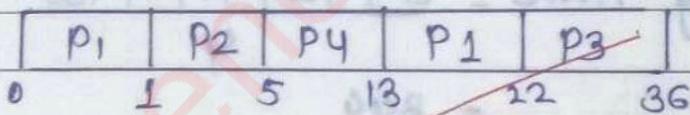
waiting time P1 = (0-0) + (13-1) = 12

$$P2 = 1-1 = 0$$

$$P3 = 22-2 = 20$$

$$P4 = 5-3 = 2$$