Diploma Engineering

Laboratory Manual

Linux Operating System
4331602

Information Technology – Semester 3

Enrolment No:	
Name:	
Branch:	
Academic Term:	
Institute:	

Directorate of Technical Education
Gandhinagar - Gujarat

DTE's Vision:

- To provide globally competitive technical education;
- Remove geographical imbalances and inconsistencies;
- Develop student friendly resources with a special focus on girls' education and support to weaker sections;
- Develop programs relevant to industry and create a vibrant pool of technical professionals.

DTE's Mission:

Institute's Vision:

Institute's Mission:

Department's Vision:

Department's Mission:

Certificate

This is to certify that Mr./Ms……………………………………………………………….. Enrolment No. …………..……………….……………….of 3rd **Semester** of ***Diploma in Information Technology*** of ………………………………………………….(GTU Code) has satisfactorily completed the term work in course **Linux Operating System (4331602)** for the Academic Year: ……………………….……… Term: **Odd** prescribed in the GTU curriculum.

Place:…………………..

Date: …………………..

Signature of Course Faculty **Head of the Department**

Preface

The primary aim of any laboratory/Practical/field work is enhancement of required skills as well as creative ability amongst students to solve real time problems by developing relevant competencies in psychomotor domain. Keeping in view, GTU has designed competency focused outcome-based curriculum -2021 (COGC-2021) for Diploma engineering programmes. In this more time is allotted to practical work than theory. It shows importance of enhancement of skills amongst students and it pays attention to utilize every second of time allotted for practical amongst Students, Instructors and Lecturers to achieve relevant outcomes by performing rather than writing practice in study type. It is essential for effective implementation of competency focused outcome- based Green curriculum-2021. Every practical has been keenly designed to serve as a tool to develop & enhance relevant industry needed competency in each and every student. These psychomotor skills are very difficult to develop through traditional chalk and board content delivery method in the classroom. Accordingly, this lab manual has been designed to focus on the industry defined relevant outcomes, rather than old practice of conducting practical to prove concept and theory.

By using this lab manual, students can read procedure one day in advance to actual performance day of practical experiment which generates interest and also, they can have idea of judgement of magnitude prior to performance. This in turn enhances predetermined outcomes amongst students. Each and every Experiment /Practical in this manual begins by competency, industry relevant skills, course outcomes as well as practical outcomes which serve as a key role for doing the practical. The students will also have a clear idea of safety and necessary precautions to be taken while performing experiment.

This manual also provides guidelines to lecturers to facilitate student-centred lab activities for each practical/experiment by arranging and managing necessary resources in order that the students follow the procedures with required safety and necessary precautions to achieve outcomes. It also gives an idea that how students will be assessed by providing Rubrics.

Linux is an open-source Unix-like operating system-based family on the Linux kernel, and the OS kernel was first published on 17 September 1991 by ***Linus Torvalds***. Typically, Linux is packaged as the Linux distribution, which contains the supporting libraries and system software and kernel, several of which are offered by the GNU Project. Several Linux distributions use the term ***"Linux"*** in the title, but the Free Software Foundation uses the ***"GNU/Linux"*** title to focus on the necessity of GNU software, causing a few controversies.

Although we try our level best to design this lab manual, but always there are chances of improvement. We welcome any suggestions for improvement.

Programme Outcomes (POs):

1. **Basic and Discipline specific knowledge:** Apply knowledge of basic mathematics, science and engineering fundamentals and engineering specialization to solve the *engineering* problems.

2. **Problem analysis**: Identify and analyse well-defined *engineering* problems using codified standard methods.

3. **Design/ development of solutions:** Design solutions for *engineering* well-defined technical problems and assist with the design of systems components or processes to meet specified needs.

4. **Engineering Tools, Experimentation and Testing:** Apply modern *engineering* tools and appropriate technique to conduct standard tests and measurements.

5. **Engineering practices for society, sustainability and environment:** Apply appropriate technology in context of society, sustainability, environment and ethical practices.

6. **Project Management:** Use engineering management principles individually, as a team member or a leader to manage projects and effectively communicate about well-defined engineering activities.

7. **Life-long learning:** Ability to analyze individual needs and engage in updating in the context of technological changes *in field of engineering.*

Practical Outcome - Course Outcome matrix

Course Outcomes (COs):

a. CO1: Differentiate various operating systems & explain Linux Operating System.

b. CO2: Illustrate various aspects of process, process scheduling and deadlock management.

c. CO3: Understand various file management and file allocation techniques.

d. CO4: Justify the need of security and protection mechanism in Operating System.

e. CO5: Perform various Linux command and develop shell scripts.

Sr. No	Practical Outcome/Title of experiment	CO1	CO2	CO 3	CO 4	CO 5
1	Install & test different types of Operating System & compare its features.	√				
2	Compare following process scheduling algorithm. a) First come first serve and Round Robin b) SJF and SRTN		√			
3	Test and execute Linux process commands: top, ps, kill.		√			
4	Test and run basic Linux commands to perform following task: a) Display the calendar for the month in which you born. b) Display the calendar for the year 2030. c) Display the date and time of your system. d) Display the date of your system in mm/dd/yyyy format for e.g. 07/14/2030.					√
5	Test and execute Linux file and directory commands to perform following task: a) Display help for pwd command. b) Write a Linux command to clear your screen. c) Display the history of previously executed command.			√		√
6	Test and execute Linux Super User command to perform following task: a) Display the user id of the currently logged-in user of your system. b) Display host name of your system.				√	√

	c) Write a Linux command to display the history of logins into the system. d) Write a Linux command to display the server name. e) Execute the Linux command : who, w ,last					
7	Test and execute Linux editing file commands to perform following task: a) Write a shell script to (i) create user defined directory (ii) rename it and (iii) remove the directory b) Write a shell script to create a blank file with name "MyCollege.txt" and write at least 10 lines. Display the content of file. c) Write a shell script to read two different file names from the command line and copy the content of first file into second file and display suitable message on standard output. d) Write a shell script to search your name from a file and display suitable message.			√		√
8	Test and execute wc command. a) Write a shell script to accept the string "diploma in information technology" from user in lower case letter and convert it into upper case letter. Display output with suitable user-friendly message. b) Create a Shell script to find numbers of characters, words & lines of a given input file "MyCollege.txt".			√		
9	Understand and Apply Arithmetic Operators. Write a shell script to perform arithmetic operations: a) Write a shell script to read two numbers from users and perform addition, subtraction, multiplication,					√

	division and modulus operation of two numbers and display suitable user friendly message on standard output for each operation. b) Write a shell script to read five numbers from user and find average of five numbers. c) Write a shell script to read radius (R) in cm from user and find area (A) of circle and display suitable user friendly message on standard output.					
10	Understand and apply control statements Write a shell script to perform given operations: a) Write a shell script to find maximum number among three numbers. b) Write a shell script to find sum and average of N numbers. c) Create a shell script to reverse the digits of a given 5-digit number. (for e.g. , if the no. is 57429 then answer is 92475).					√

Industry Relevant Skills

The following industry relevant skills are expected to be developed in the students by performance of experiments of this course.

1) Installation of operating systems.
2) Test and execute basics and advance Linux command.
3) Developed shell script.

Guidelines to Course Faculty

1. Couse faculty should demonstrate experiment with all necessary implementation strategies described in curriculum.
2. Couse faculty should explain industrial relevance before starting of each experiment.
3. Course faculty should involve & give opportunity to all students for hands on experience.
4. Course faculty should ensure mentioned skills are developed in the students by asking.
5. Utilise 2 hrs of lab hours effectively and ensure completion of write up with quiz also.
6. Encourage peer to peer learning by doing same experiment through fast learners.

Instructions for Students

1. Organize the work in the group and make record of all observations.
2. Students shall develop maintenance skill as expected by industries.
3. Student shall attempt to develop related hands-on skills and build confidence.
4. Student shall develop the habits of evolving more ideas, innovations, skills etc.
5. Student shall refer technical magazines and data books.
6. Student should develop habit to submit the practical on date and time.
7. Student should well prepare while submitting write-up of exercise.

Continuous Assessment Sheet

Enrollment No: **A.Y:**

Name: **Term: Odd**

Sr. No	Practical Outcome/Title of Experiment	Page No	Date	Marks	Sign
1	Install & test different types of Operating System & compare its features.	**12**			
2	Compare following process scheduling algorithm. a) First come first serve and Round Robin b) SJF and SRTN	**18**			
3	Test and execute Linux process commands: top, ps, kill.	**26**			
4	Test and run basic Linux commands to perform following task: a) Display the calendar for the month in which you born. b) Display the calendar for the year 2030. c) Display the date and time of your system. d) Display the date of your system in mm/dd/yyyy format for e.g. 07/14/2030.	**34**			
5	Test and execute Linux file and directory commands to perform following task: a) Display help for pwd command. b) Write a Linux command to clear your screen. c) Display the history of previously executed command.	**40**			
6	Test and execute Linux Super User command to perform following task: a) Display the user id of the currently logged-in user of your system. b) Display host name of your system. c) Write a Linux command to	**46**			

	display the history of logins into the system. d) Write a Linux command to display the server name. e) Execute the Linux command : who, w ,last				
7	Test and execute Linux editing file commands to perform following task: a) Write a shell script to (i) create user defined directory (ii) rename it and (iii) remove the directory b) Write a shell script to create a blank file with name "MyCollege.txt" and write at least 10 lines. Display the content of file. c) Write a shell script to read two different file names from the command line and copy the content of first file into second file and display suitable message on standard output. d) Write a shell script to search your name from a file and display suitable message.	**51**			
8	Test and execute wc command. a) Write a shell script to accept the string "diploma in information technology" from user in lower case letter and convert it into upper case letter. Display output with suitable user-friendly message. b) Create a Shell script to find numbers of characters, words & lines of a given input file "MyCollege.txt".	**57**			
9	Understand and Apply Arithmetic Operators. Write a shell script to perform	**63**			

	arithmetic operations: d) Write a shell script to read two numbers from users and perform addition, subtraction, multiplication, division and modulus operation of two numbers and display suitable user friendly message on standard output for each operation. e) Write a shell script to read five numbers from user and find average of five numbers. f) Write a shell script to read radius (R) in cm from user and find area (A) of circle and display suitable user friendly message on standard output.				
10	Understand and apply control statements Write a shell script to perform given operations: d) Write a shell script to find maximum number among three numbers. e) Write a shell script to find sum and average of N numbers. f) Create a shell script to reverse the digits of a given 5-digit number. (for e.g. , if the no. is 57429 then answer is 92475).	**69**			

Date: ……

Practical No.1: Install & test different types of Operating System & compare its features.

A. Objective:

An operating system is software that enables applications to interact with a computer's hardware. The primary purposes of an Operating System are to enable applications (Software) to interact with a computer's hardware and to manage a system's hardware and software resources. Every IT students must know the installation of Operating System.

B. Expected Program Outcomes (POs):

1. Basic and Discipline specific knowledge: Apply knowledge of basic mathematics, science and engineering fundamentals and engineering specialization to solve the *engineering* problems.

4. Engineering Tools, Experimentation and Testing: Apply modern *engineering* tools and appropriate technique to conduct standard tests and measurements.

7. Life-long learning: Ability to analyse individual needs and engage in updating in the context of technological changes *in field of engineering.*

C. Expected Skills to be developed based on competency:

"Installation of Operating System".

This practical is expected to develop the following skills.

1) Installation of various operating system.
2) Testing of operating system.
3) Compare features of different operating system.

D. Expected Course Outcomes (Cos):

CO1: Differentiate various operating systems & explain Linux Operating System.

E. Practical Outcome(PRo):

After performing this practical students will be able to Install & test different types of Operating System & compare its features.

F. Expected Affective domain Outcome(ADos):

1) Following safety practices.
2) Demonstrate working as a leader / a team member.
3) Follow ethical practice.
4) Maintain tools and equipment.

G. Prerequisite Theory:

- Basic knowledge of Computer parts. Students must know the configuration of Computer system like Processor speed, RAM Capacity, HDD type and its storage capacity, Graphics card etc.

H. Experimental set up/ Program Logic-Flow chart (CE & IT 1st and 2nd semester software subjects only):

- **NA**

I. Resources/Equipment Required

Sr. No.	Instrument/Equipment /Components/Trainer kit	Specification	Quantity

1	Computer with CD/DVD/USB drive	• Latest configuration system is recommended.
		• Minimum requirement for installing Linux Operating System are as follows:
		  • RAM: 1-2 GB.
		  • CPU: Intel Pentium or higher processor.
		  • Hard Disk: 4 to 5 GB.
			As per Batch size

2	Source of Operating System	• Any operating system (Linux is recommended)	As per Batch size

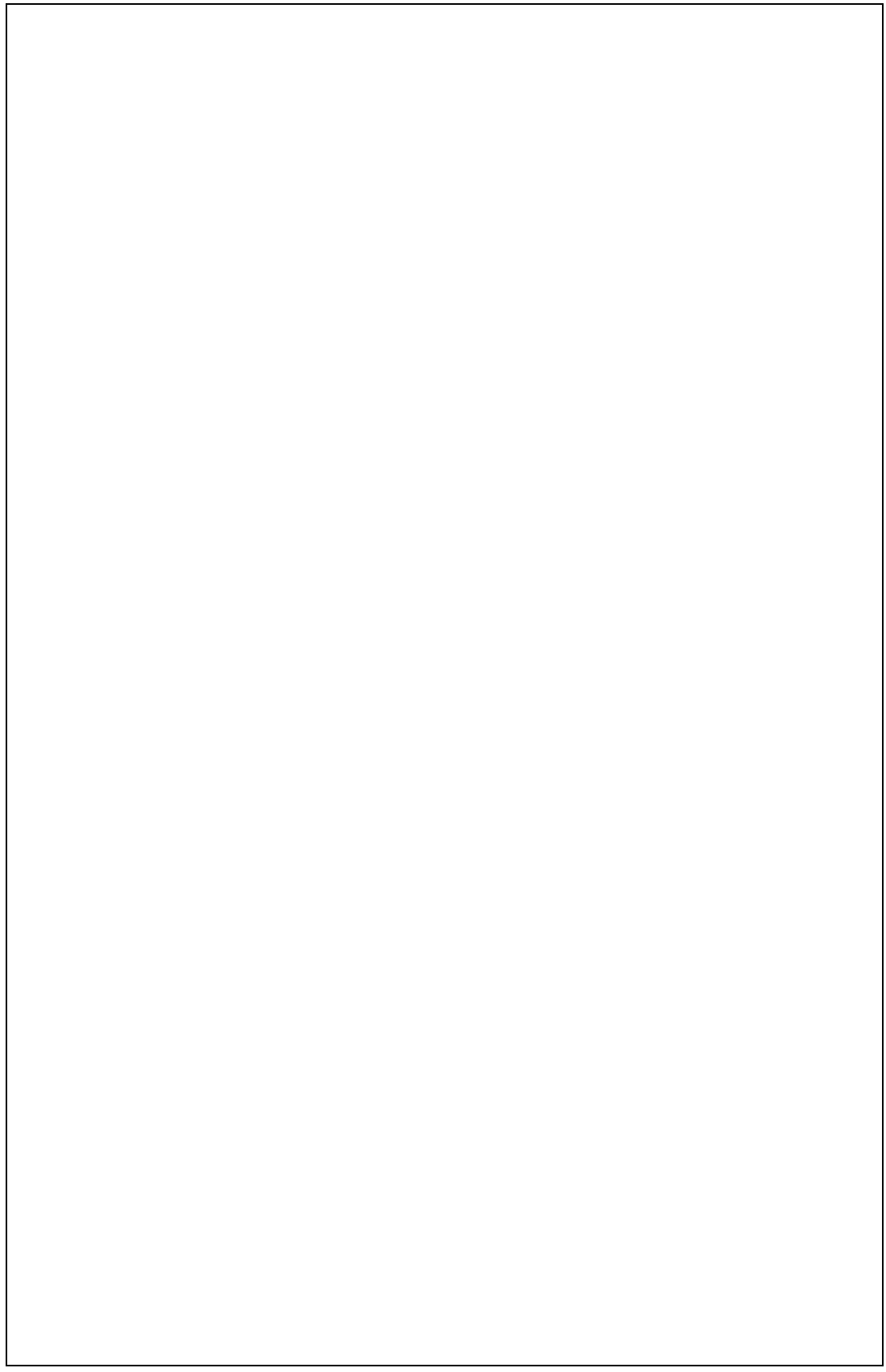
J. Safety and necessary Precautions followed:

Following safety and necessary Precautions are required while installing Operating system on your computer system.

- Read system requirements of operating system before installing any operating system.
- If any operating system is exist and if you want to install another operating system either on existing operating system or on another drive then take a back-up of your important documents.
- Do not turn off computer while installing operating system.
- Selection of custom installation is recommended.
- Uncheck installation of extra software.
- Install operating system on C drive is recommended.
- NTFS partition is recommended.

K. Procedure to be followed/Source code:

Write down steps to Install Linux operating system & compare features of different operating system:



L. Observations and Calculations/Input-Output:

NA

M. Interpretation of Results:

NA

N. Conclusion:

NA

O. Practical related Quiz.

1) OS stand for _____.
2) RAM stand for _____.
3) CPU stand for _____.

P. References / Suggestions:

1) https://www.tutorialspoint.com/operating_system/index.htm
2) https://www.youtube.com/watch?v=Dx2dJUPsJso
3) https://www.youtube.com/watch?v=mxUQT8bcoVQ

Q. Graph:

NA

R. Assessment-Rubrics:

Criteria	M	Rubrics
Practical Correctness (R1)	2	**Poor (0):** Significant Problems while performing the program/practical.
		Average (1): Minor problems in program/practical. Sometimes algorithms/toolsdo not work.
		Excellent (2): Program/practical is excellent and algorithms/tools work as per expectations.
Logical skillsAnd Practical Efficiency (R2)	2	**Poor (0):** No logical skills, Uses poorly-chosen approach.
		Average (1): Minor issues with Logic, uses the average approach.
		Excellent (2): Excellent logical skills, uses the best approach.
Documentation (R3)	2	**Poor (0):** Report with more than twomistakes.
		Average (1): Report with one or two mistake and no comments/theoretical explanation.
		Excellent (2): Reports with no mistake, well-commented/goodtheoretical explanation.
Topic/SubjectKnowledge (R4)	2	**Poor (0):** No knowledge of thetopic/subject.
		Average (1): Average knowledge of thetopic/subject.
		Excellent (2): Ample knowledgeof the topic/subject.
Submission within time limit (R5)	2	**Poor (0):** No submission till one weekafter given time limit.
		Average (1): Submission within one week after given time limit.
		Excellent (2): Submission in given time limit.

Marks:

R1	R2	R3	R4	R5	Total

Signature with Date

Date: ……

Practical No.2: Compare following process scheduling algorithm.

a) First come first serve and Round Robin
b) SJF and SRTN.

A. Objective:

An objective of this practical is that students should know the definition of process scheduling and types of process scheduling algorithm in Operating System.

B. Expected Program Outcomes (POs):

1. Basic and Discipline specific knowledge: Apply knowledge of basic mathematics, science and engineering fundamentals and engineering specialization to solve the *engineering* problems.

7. Life-long learning: Ability to analyse individual needs and engage in updating in the context of technological changes *in field of engineering.*

C. Expected Skills to be developed based on competency:

"Compare process scheduling algorithm".

This practical is expected to develop the following skills.

1) Understanding of process scheduling algorithm.
2) Compare various scheduling algorithm.

D. Expected Course Outcomes (Cos):

CO2: Illustrate various aspects of process, process scheduling and deadlock management.

E. Practical Outcome(PRo):

After performing this practical students will be able to compare process scheduling algorithm.

F. Expected Affective domain Outcome(ADos):

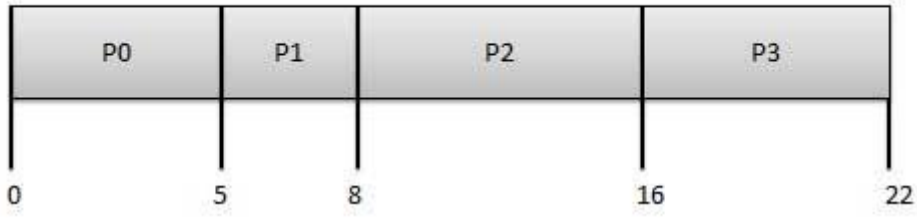
1) Following safety practices.
2) Demonstrate working as a leader / a team member.
3) Follow ethical practice.

G. Prerequisite Theory:

First come first serve (FCFS) scheduling algorithm:

- Jobs are executed on first come, first serve basis.
- It is a non-pre-emptive, scheduling algorithm.
- Easy to understand and implement.
- Its implementation is based on FIFO queue.
- Poor in performance as average wait time is high.

Process	Arrival Time	Execute Time	Service Time
P0	0	5	0
P1	1	3	5
P2	2	8	8
P3	3	6	16



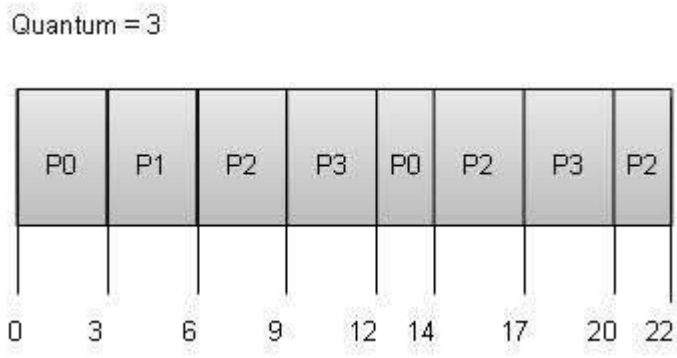
Wait time of each process is as follows:

Process	Waiting time = Service time – Arrival time
P0	0 – 0 = 0
P1	5 – 1 = 4
P2	8 – 2 = 6
P3	16 – 3 = 13

Average Wait Time: (0+4+6+13) / 4 = 5.75

Round Robin scheduling algorithm:

- Round Robin is the preemptive process scheduling algorithm.
- Each process is provided a fix time to execute, it is called a quantum.
- Once a process is executed for a given time period, it is preempted and other process executes for a given time period.
- Context switching is used to save states of preempted processes.



Wait time of each process is as follows:

Process	Waiting time = Service time – Arrival time
P0	(0 – 0) + (12 - 3) = 9
P1	3 – 1 = 2
P2	(6 – 2) + (14 – 9) + (20 – 17) = 12
P3	(9 - 3) + (17 - 12) = 11

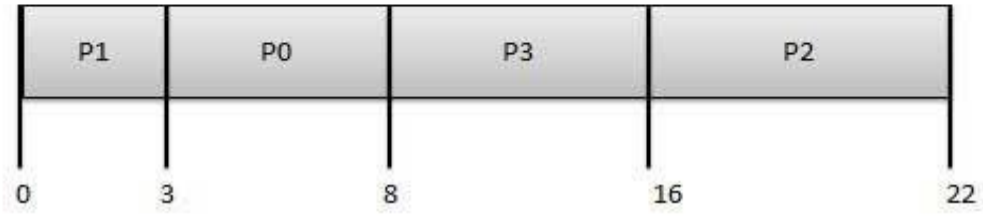
Average Wait Time: (9+2+12+11) / 4 = 8.5

Shortest Job First algorithm:

- This is a non-preemptive, pre-emptive scheduling algorithm.
- Best approach to minimize waiting time.
- Easy to implement in Batch systems where required CPU time is known in advance.
- Impossible to implement in interactive systems where required CPU time is not known.
- The processer should know in advance how much time process will take.
- Given: Table of processes, and their Arrival time, Execution time

Process	Arrival Time	Execution Time	Service Time
P0	0	5	0
P1	1	3	5
P2	2	8	14
P3	3	6	8

Process	Arrival Time	Execute Time	Service Time
P0	0	5	3
P1	1	3	0
P2	2	8	16
P3	3	6	8



Waiting time for each process is as follows:

Process	Waiting time
P0	0 – 0 = 0
P1	5 – 1 = 4
P2	14 – 2 = 12
P3	8 – 3 = 5

Average waiting time: (0 + 4 + 5 + 12)/4 = 5.25

Shortest Remaining Time Next (SRTN) algorithm:

- Shortest remaining time next (SRTN) is the preemptive version of the SJN algorithm.
- The processor is allocated to the job closest to completion but it can be preempted by a newer ready job with shorter time to completion.
- Impossible to implement in interactive systems where required CPU time is not known.
- It is often used in batch environments where short jobs need to give preference.

H. Experimental set up/ Program Logic-Flow chart:

NA

I. Resources/Equipment Required

Sr. No.	Instrument/Equipment /Components/Trainer kit	Specification	Quantity
1	NA	NA	NA

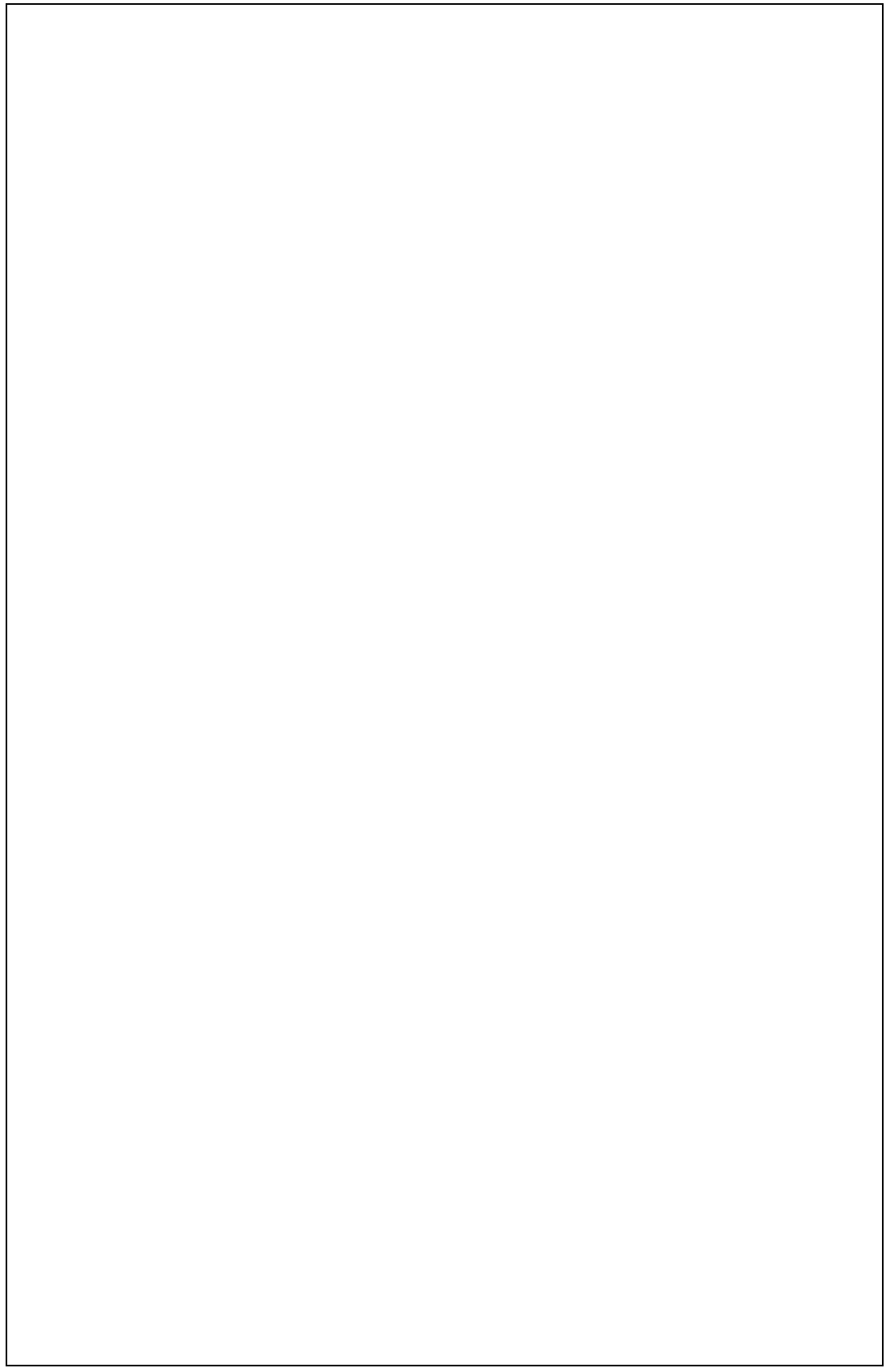
J. Safety and necessary Precautions followed:

NA

K. Procedure to be followed/Source code:

Compare:

1) First come first serve and Round Robin process scheduling algorithm.
2) SJF and SRTN process scheduling algorithm.



L. Observations and Calculations/Input-Output:

NA

M. Interpretation of Results:

NA

N. Conclusion:

NA

O. Practical related Quiz.

1. Select one which algorithms tend to minimize the process flow time?
   a) First come First served b) Earliest Deadline First
   c) Shortest Job First d) Longest Job First
2. Time quantum can be said.
   a) Multilevel queue scheduling algorithm
   b) Round-robin scheduling algorithm.
   c) Shortest job scheduling algorithm.
   d) Priority scheduling algorithm.
3. The FIFO algorithm said:
   a) Executes the job first that needs a minimal processor.
   b) The job first executes that comes last in the queue.
   c) The job first executes that has maximum processor needs.
   d) The job first executes that came in first in the queue.

P. References / Suggestions:

1) https://www.tutorialspoint.com/operating_system/os_process_scheduling_algorithms.htm
2) https://www.youtube.com/watch?v=oDUFwOTCItI
3) https://www.youtube.com/watch?v=2sfL8g5jgCk

Q. Graph:

NA

R. Assessment-Rubrics:

Criteria	M	Rubrics
Practical Correctness (R1)	2	**Poor (0):** Significant Problems while performing the program/practical.
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Submission within time limit (R5)	2	**Poor (0):** No submission till one weekafter given time limit.
		Average (1): Submission within one week after given time limit.
		Excellent (2): Submission in given time limit.

Marks:

R1	R2	R3	R4	R5	Total

Signature with Date

Date: ……

Practical No.3: Test and execute Linux process commands: top, ps, kill.

A. Objective:

Linux operating system provides different process management commands to manage the process. An objective of this practical is to aware the student with hands on practice of process management commands.

B. Expected Program Outcomes (POs):

1. Basic and Discipline specific knowledge: Apply knowledge of basic mathematics, science and engineering fundamentals and engineering specialization to solve the *engineering* problems.

4. Engineering Tools, Experimentation and Testing: Apply modern *engineering* tools and appropriate technique to conduct standard tests and measurements.

7. Life-long learning: Ability to analyse individual needs and engage in updating in the context of technological changes *in field of engineering.*

C. Expected Skills to be developed based on competency:

"Execute process management command".

This practical is expected to develop the following skill.

1) Apply process management command.

D. Expected Course Outcomes (Cos):

CO2: Illustrate various aspects of process, process scheduling and deadlock management.

E. Practical Outcome(PRo):

Test and execute process management command.

F. Expected Affective domain Outcome(ADos):

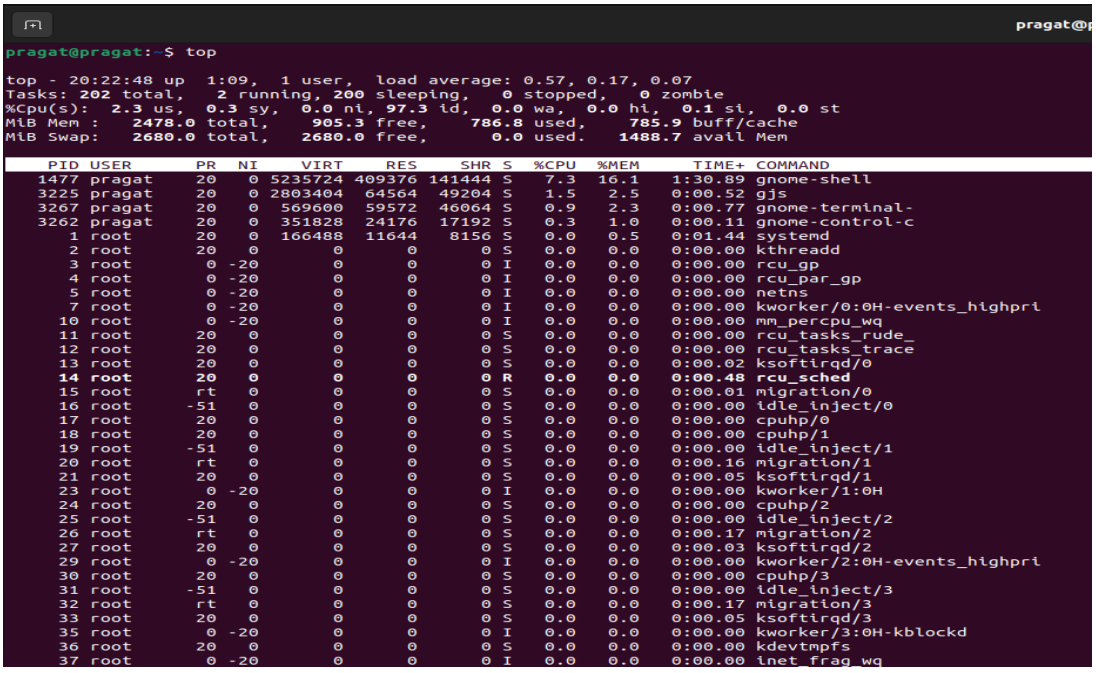
1) Following safety practices.
2) Demonstrate working as a leader / a team member.
3) Follow ethical practice.
4) Maintain tools and equipment.

G. Prerequisite Theory:

TOP Command: The ***top*** command is used to show the Linux processes. This command shows the summary information of the system and the list of processes or threads which are currently managed by the Linux Kernel.

Syntax: top [-option]

Example: top



PS command: Linux provides us a utility called ***ps*** for viewing information related with the processes on a system which stands as abbreviation for "**Process Status**". ***ps*** command is used to list the currently running processes and their PIDs along with some other information depends on different options. It reads the process information from the virtual files in /proc file-system. /proc contains virtual files, this is the reason it's referred as a virtual file system. ***ps*** provides numerous options for manipulating the output according to our need.

Syntax: ps [-option]

Example: ps

```
[root@rhel7 ~]# ps
  PID TTY          TIME CMD
12330 pts/0    00:00:00 bash
21621 pts/0    00:00:00 ps
```

Kill Command: ***kill*** command in Linux (located in /bin/kill), is a built-in command which is used to terminate processes manually. ***kill*** command sends a signal to a process that terminates the process. If the user doesn't specify any signal which is to be sent along with the kill command, then a default TERM signal is sent that terminates the process.

Syntax: kill [signal] PID

Example: kill -9 1212

H. Experimental set up/ Program Logic-Flow chart (CE & IT 1st and 2nd semester software subjects only):

- NA

I. Resources/Equipment Required

Sr. No.	Instrument/Equipment /Components/Trainer kit	Specification	Quantity
1	Computer System	• Linux or alike Operating System such as Ubuntu, CentOS or any other.	As per Batch size

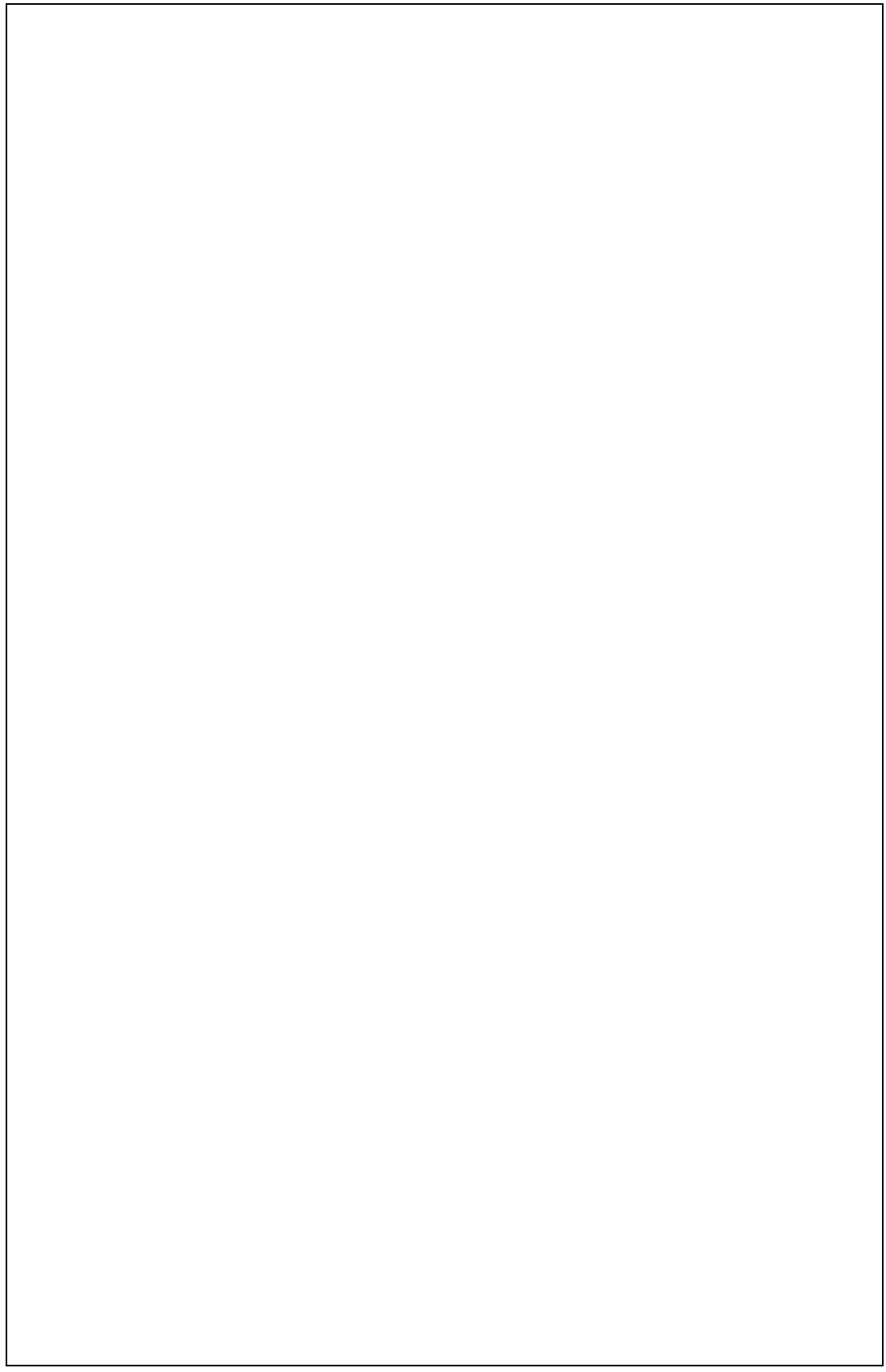
J. Safety and necessary Precautions followed:

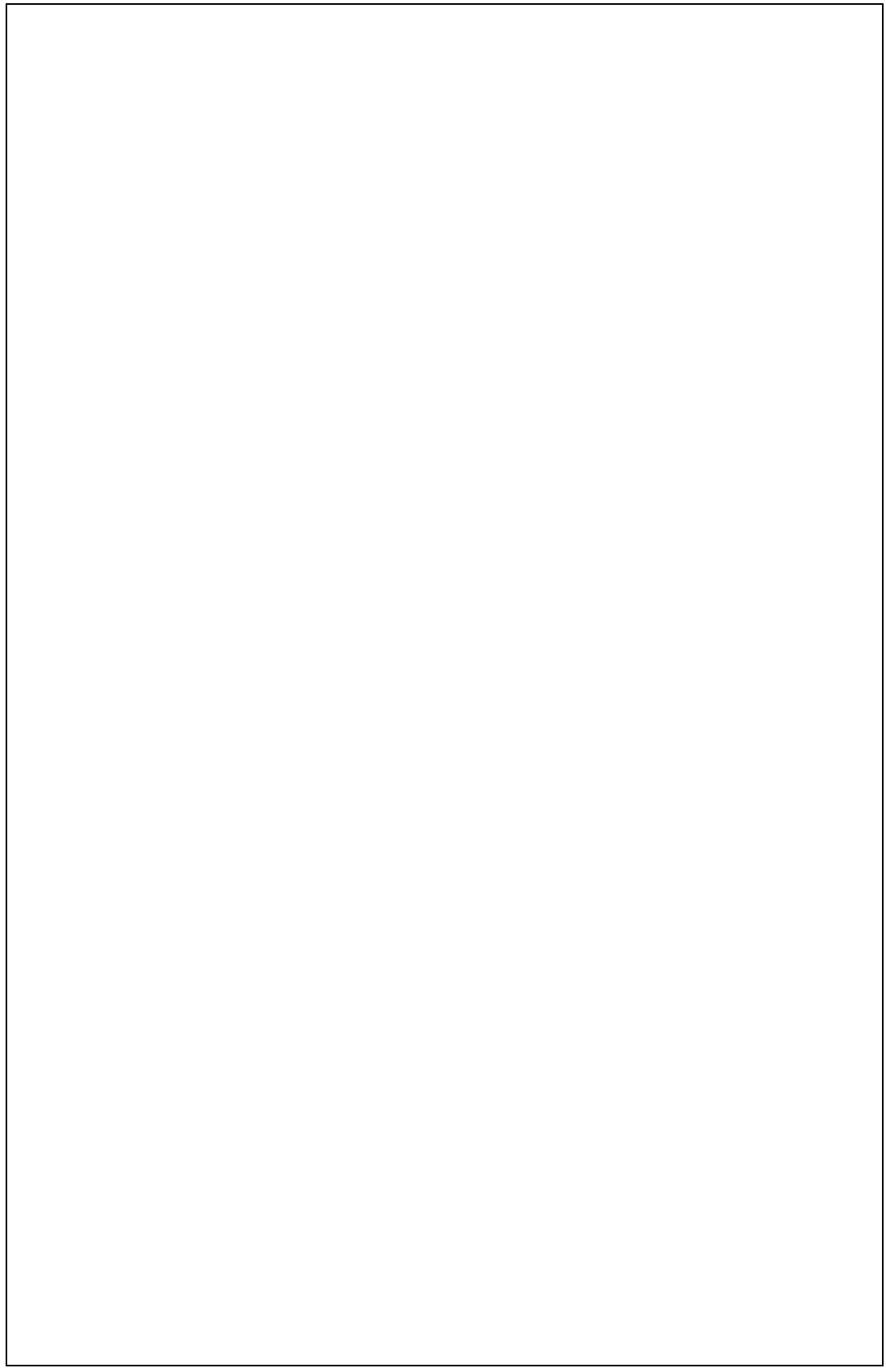
Following safety and necessary Precautions are required while performing practical.

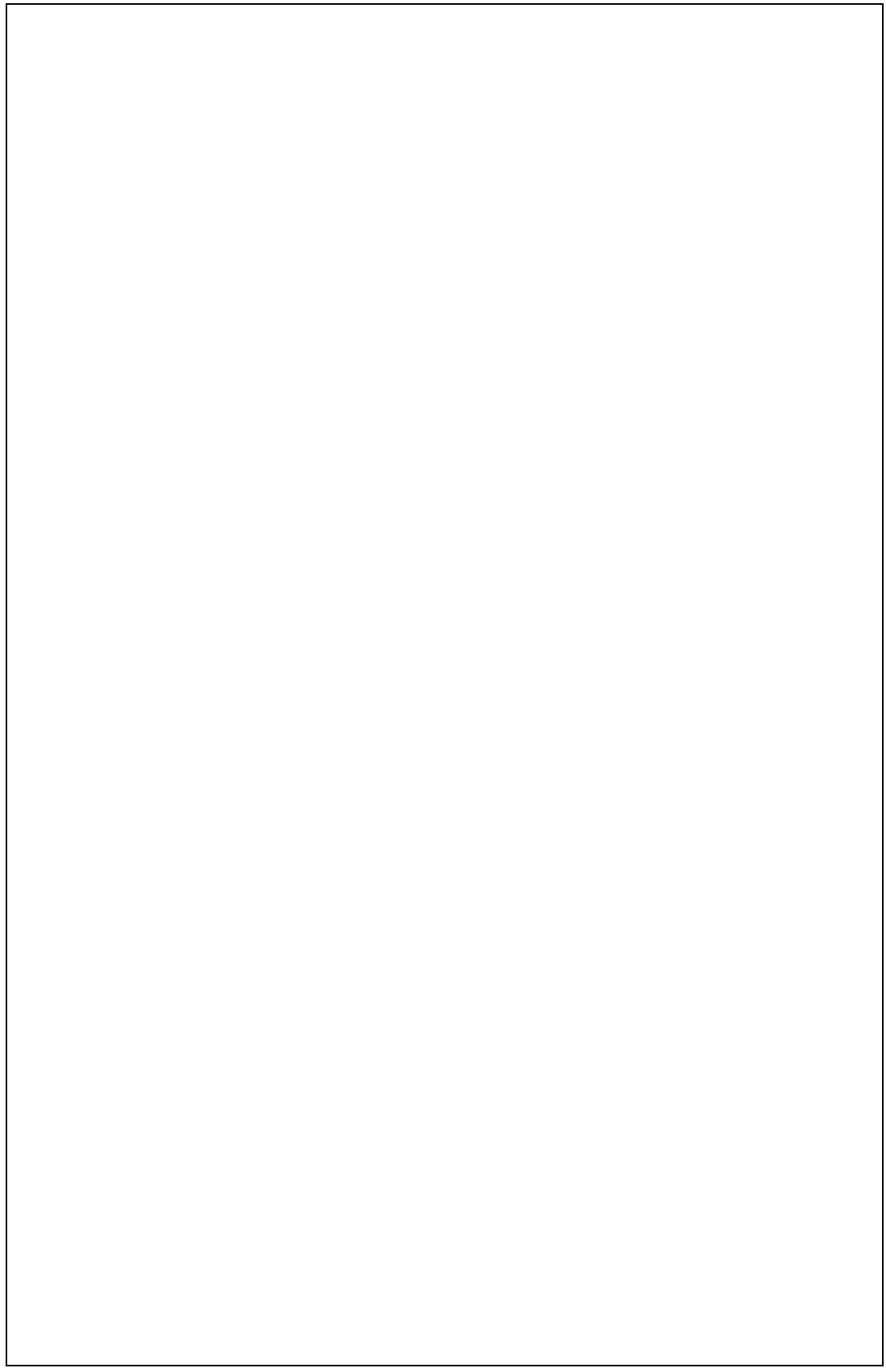
- Save your work/practical periodically.
- Save your practical with suitable name and extension.
- Shout down computer system at the end of laboratory session.
- Turn off power of computer system.

K. Procedure to be followed/Source code:

1) Test and execute top command with all options:
2) Test and execute ps command with all options:
3) Test and execute kill command with all options:







L. Observations and Calculations/Input-Output:

NA

M. Interpretation of Results:

NA

N. Conclusion:

NA

O. Practical related Quiz.

1) List out available options of top command.

2) List out available options of ps command.

P. References / Suggestions:

1) https://www.geeksforgeeks.org/top-command-in-linux-with-examples/
2) https://www.geeksforgeeks.org/ps-command-in-linux-with-examples/
3) https://www.geeksforgeeks.org/kill-command-in-linux-with-examples/

Q. Graph:

NA

R. Assessment-Rubrics:

Criteria	M	Rubrics
Practical Correctness (R1)	2	**Poor (0):** Significant Problems while performing the program/practical.
		Average (1): Minor problems in program/practical. Sometimes algorithms/toolsdo not work.
		Excellent (2): Program/practical is excellent and algorithms/tools work as per expectations.
Logical skillsAnd Practical Efficiency (R2)	2	**Poor (0):** No logical skills, Uses poorly-chosen approach.
		Average (1): Minor issues with Logic, uses the average approach.
		Excellent (2): Excellent logical skills, uses the best approach.
Documentation (R3)	2	**Poor (0):** Report with more than twomistakes.
		Average (1): Report with one or two mistake and no comments/theoretical explanation.
		Excellent (2): Reports with no mistake, well-commented/goodtheoretical explanation.
Topic/SubjectKnowledge (R4)	2	**Poor (0):** No knowledge of thetopic/subject.
		Average (1): Average knowledge of thetopic/subject.
		Excellent (2): Ample knowledgeof the topic/subject.
Submission within time limit (R5)	2	**Poor (0):** No submission till one weekafter given time limit.
		Average (1): Submission within one week after given time limit.
		Excellent (2): Submission in given time limit.

Marks:

R1	R2	R3	R4	R5	Total

Signature with Date

Date: ……

Practical No.4: Test and run basic Linux commands to perform following task:

a) Display the calendar for the month in which you born.
b) Display the calendar for the year 2030.
c) Display the date and time of your system.
d) Display the date of your system in mm/dd/yyyy format for e.g. 07/14/2030.

A. Objective:

Linux operating system provides different basic commands to manage daily life work. An objective of this practical is to aware the student with hands on practice of basic Linux commands.

B. Expected Program Outcomes (POs):

1. Basic and Discipline specific knowledge: Apply knowledge of basic mathematics, science and engineering fundamentals and engineering specialization to solve the *engineering* problems.

4. Engineering Tools, Experimentation and Testing: Apply modern *engineering* tools and appropriate technique to conduct standard tests and measurements.

7. Life-long learning: Ability to analyse individual needs and engage in updating in the context of technological changes *in field of engineering.*

C. Expected Skills to be developed based on competency:

"Execute basic commands of Linux".

This practical is expected to develop the following skill.

2) Apply basic commands of Linux.

D. Expected Course Outcomes (Cos):

CO5: Perform various Linux command and develop shell scripts.

E. Practical Outcome (PRo):

Test and run basic commands of Linux.

F. Expected Affective domain Outcome (ADos):

1) Following safety practices.
2) Demonstrate working as a leader / a team member.
3) Follow ethical practice.
4) Maintain tools and equipment.

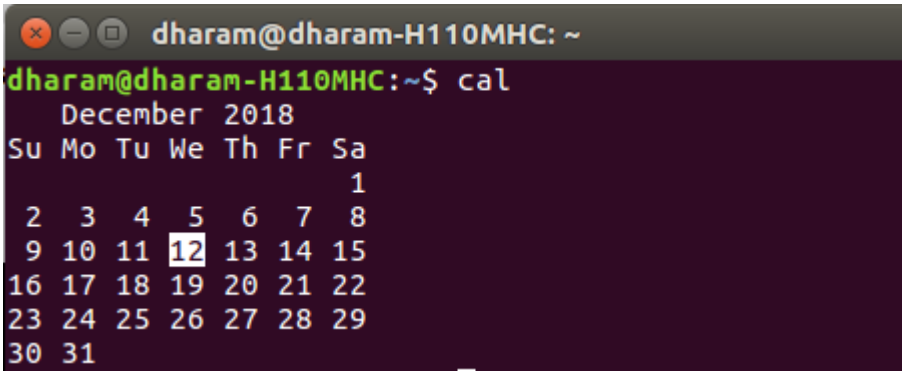
G. Prerequisite Theory:

Cal command: If a user wants a quick view of the calendar in the Linux terminal, ***cal*** is the command for you. By default, the ***cal*** command shows the current month calendar as output.

cal command is a calendar command in Linux which is used to see the calendar of a specific month or a whole year.

Syntax: cal [[month] year]

Example: cal



Date command: ***date*** command is used to display the system date and time. date command is also used to set date and time of the system. By default the ***date*** command displays the date in the time zone on which unix/linux operating system is configured. You must be the super-user (root) to change the date and time.

Syntax: date [OPTION]... [+]

date [-u|--utc|--universal] [MMDDhhmm[[CC]YY][.ss]]

Example: date

Output: Tue Oct 10 22:55:01 PDT 2017

H. Experimental set up/ Program Logic-Flow chart:

- NA

I. Resources/Equipment Required

Sr. No.	Instrument/Equipment /Components/Trainer kit	Specification	Quantity
1	Computer System	• Linux or alike Operating System such as Ubuntu, CentOS or any other.	As per Batch size

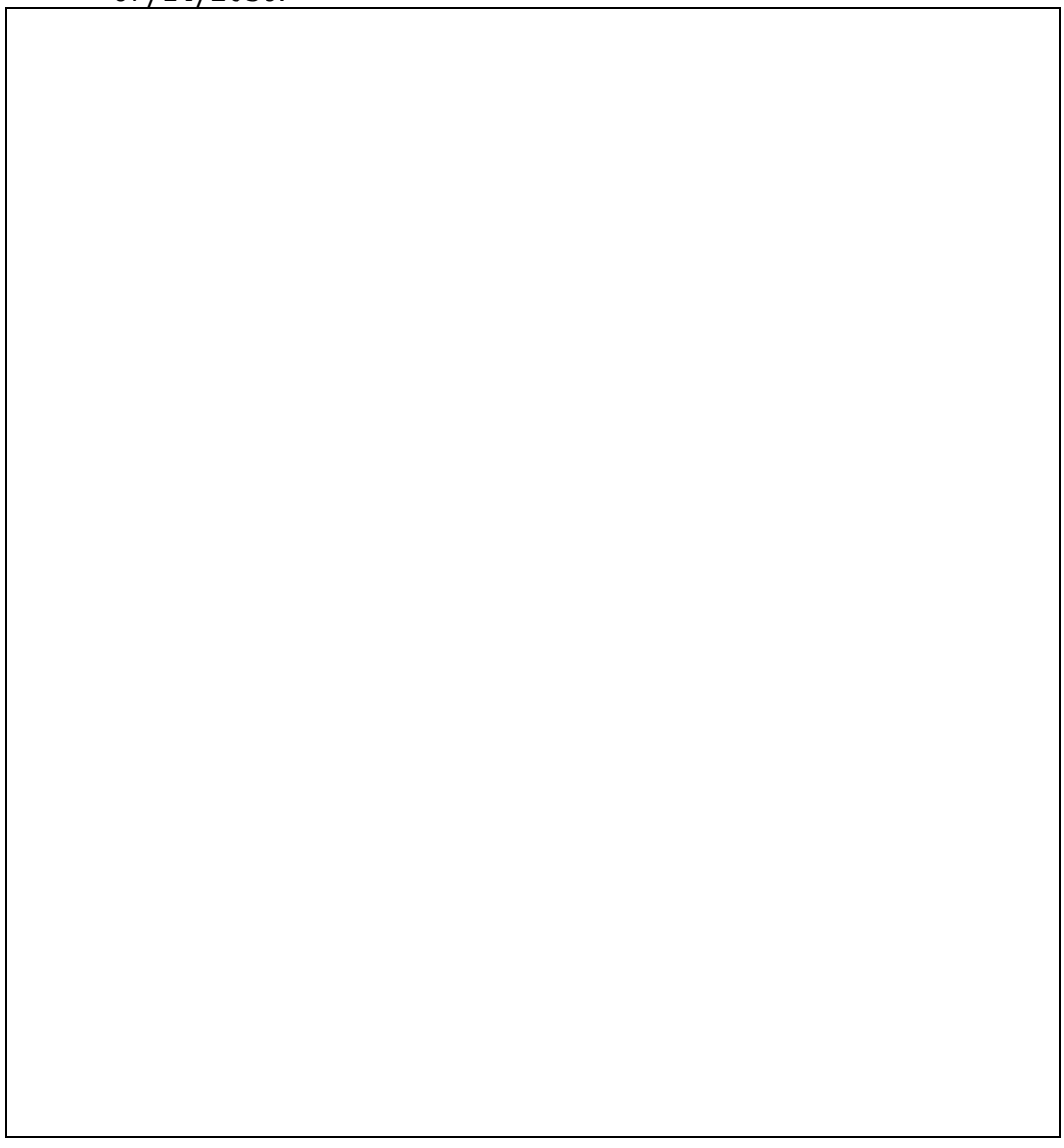
J. Safety and necessary Precautions followed:

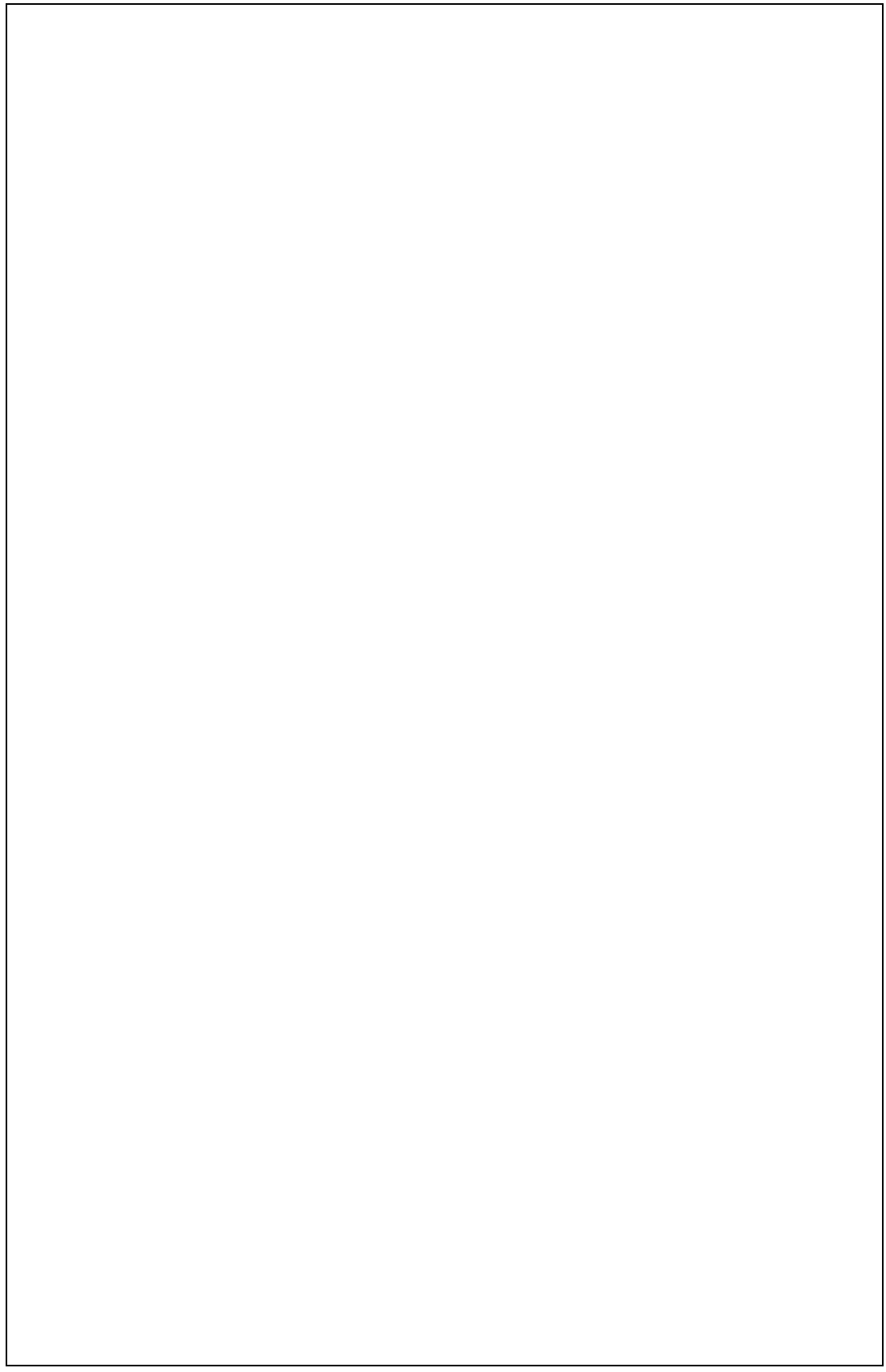
Following safety and necessary Precautions are required while performing practical.

- Save your work/practical periodically.
- Save your practical with suitable name and extension.
- Shout down computer system at the end of laboratory session.
- Turn off power of computer system.

K. Procedure to be followed/Source code:

1) Display the calendar for the month in which you born.
2) Display the calendar for the year 2030.
3) Display the date and time of your system.
4) Display the date of your system in mm/dd/yyyy format for e.g. 07/14/2030.





L. Observations and Calculations/Input-Output:

NA

M. Interpretation of Results:

NA

N. Conclusion:

NA

O. Practical related Quiz.

1) Write a command to show the calendar of the complete current year with the current date highlighted.

2) Write a command to shows calendar of previous, current and next month.

3) List out format specifiers used with date command.

P. References / Suggestions (lab manual designer should give):

1) https://www.geeksforgeeks.org/cal-command-in-linux-with-examples/
2) https://www.geeksforgeeks.org/date-command-linux-examples/

Q. Graph(Not Applicable for CE & IT subjects):

NA

R. Assessment-Rubrics:

Criteria	M	Rubrics
Practical Correctness (R1)	2	**Poor (0):** Significant Problems while performing the program/practical.
		Average (1): Minor problems in program/practical. Sometimes algorithms/toolsdo not work.
		Excellent (2): Program/practical is excellent and algorithms/tools work as per expectations.
Logical skillsAnd Practical Efficiency (R2)	2	**Poor (0):** No logical skills, Uses poorly-chosen approach.
		Average (1): Minor issues with Logic, uses the average approach.
		Excellent (2): Excellent logical skills, uses the best approach.
Documentation (R3)	2	**Poor (0):** Report with more than twomistakes.
		Average (1): Report with one or two mistake and no comments/theoretical explanation.
		Excellent (2): Reports with no mistake, well-commented/goodtheoretical explanation.
Topic/SubjectKnowledge (R4)	2	**Poor (0):** No knowledge of thetopic/subject.
		Average (1): Average knowledge of thetopic/subject.
		Excellent (2): Ample knowledgeof the topic/subject.
Submission within time limit (R5)	2	**Poor (0):** No submission till one weekafter given time limit.
		Average (1): Submission within one week after given time limit.
		Excellent (2): Submission in given time limit.

Marks:

R1	R2	R3	R4	R5	Total

Signature with Date

Date: ……

Practical No.5: Test and execute Linux file and directory commands to perform following task:

a) Display help for pwd command.
b) Write a Linux command to clear your screen.
c) Display the history of previously executed command.

A. Objective:

Linux operating system provides different basic commands to manage file and directory. An objective of this practical is to aware the student with hands on practice of file and directory commands of Linux.

B. Expected Program Outcomes (POs):

1. Basic and Discipline specific knowledge: Apply knowledge of basic mathematics, science and engineering fundamentals and engineering specialization to solve the *engineering* problems.

4. Engineering Tools, Experimentation and Testing: Apply modern *engineering* tools and appropriate technique to conduct standard tests and measurements.

7. Life-long learning: Ability to analyse individual needs and engage in updating in the context of technological changes *in field of engineering.*

C. Expected Skills to be developed based on competency:

"Execute file and directory commands of Linux".
This practical is expected to develop the following skill.

3) Apply file and directory commands of Linux.

D. Expected Course Outcomes (Cos):

CO3: Understand various file management and file allocation techniques.
CO5: Perform various Linux command and develop shell scripts.

E. Practical Outcome(PRo):

Test and execute file and directory commands of Linux.

F. Expected Affective domain Outcome(ADos):

1) Following safety practices.
2) Demonstrate working as a leader / a team member.
3) Follow ethical practice.
4) Maintain tools and equipment.

G. Prerequisite Theory:

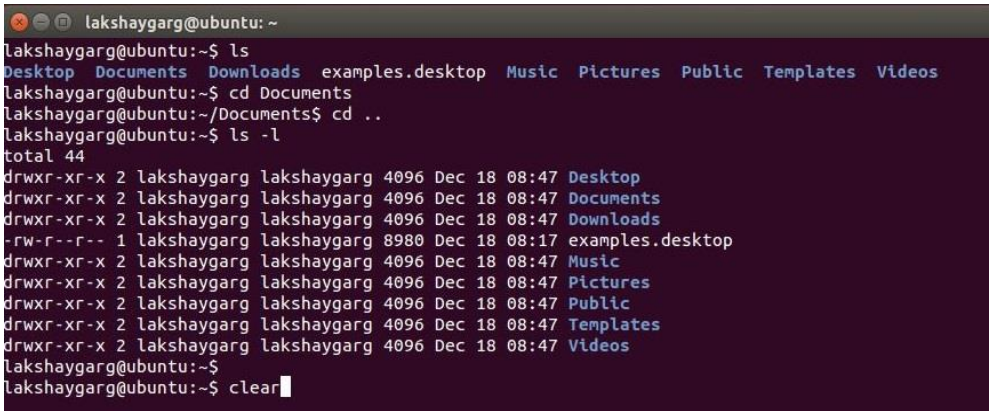
Pwd Command: ***pwd*** stands for Print Working Directory. It prints the path of the working directory, starting from the root. pwd is shell built-in command(pwd) or an actual binary(/bin/pwd).

Syntax: pwd [option]

Clear command: ***clear*** is a standard UNIX computer operating system command that is used to clear the terminal screen. This command first looks for a terminal type in the environment and after that, it figures out the **terminfo** database for how to clear the screen. This command will ignore any command-line parameters that may be present. The ***clear*** command doesn't take any argument and it is almost similar to ***cls*** command on a number of other Operating Systems.

Syntax: clear

Example: clear



History command: ***history*** command is used to view the previously executed command. This feature was not available in the Bourne shell. Bash and Korn support this feature in which every command executed is treated as the event and is associated with an event number using which they can be recalled and changed if required. These commands are saved in a history file. In Bash shell history command shows the whole list of the command.

Syntax: history

Example: history

H. Experimental set up/ Program Logic-Flow chart:
NA

I. Resources/Equipment Required

Sr. No.	Instrument/Equipment /Components/Trainer kit	Specification	Quantity
1	Computer System	• Linux or alike Operating System such as Ubuntu, CentOS or any other.	As per Batch size

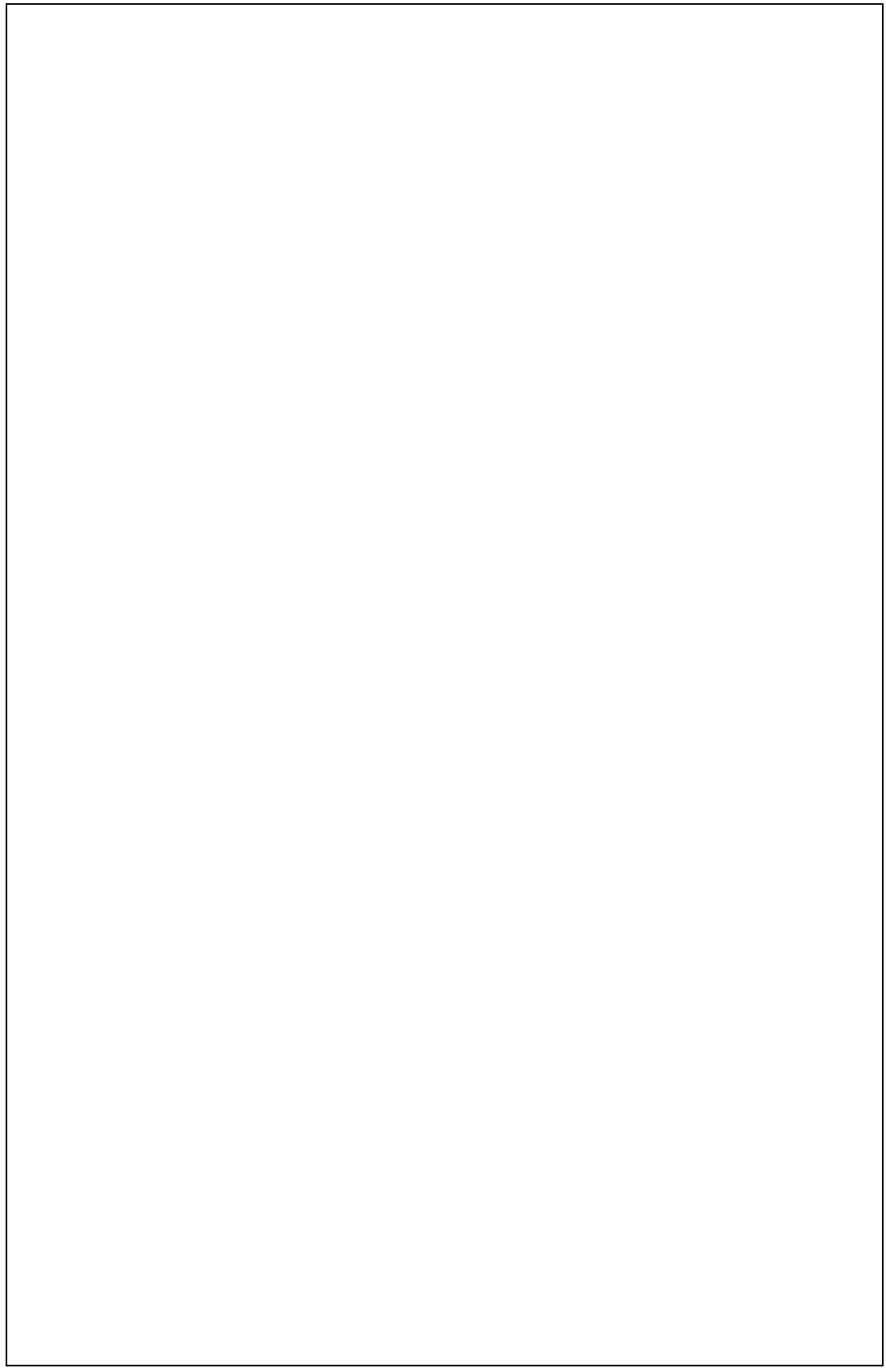
J. Safety and necessary Precautions followed:

Following safety and necessary Precautions are required while performing practical.

- Save your work/practical periodically.
- Save your practical with suitable name and extension.
- Shout down computer system at the end of laboratory session.
- Turn off power of computer system.

K. Procedure to be followed/Source code

1) Display help for pwd command.
2) Write a Linux command to clear your screen.
3) Display the history of previously executed command.



L. Observations and Calculations/Input-Output:
NA

M. Interpretation of Results:
NA

N. Conclusion:
NA

O. Practical related Quiz.
1) List out options available with pwd command.

P. References / Suggestions:
1) https://www.geeksforgeeks.org/pwd-command-in-linux-with-examples/
2) https://www.geeksforgeeks.org/history-command-in-linux-with-examples/
3) https://www.geeksforgeeks.org/clear-command-in-linux-with-examples/

Q. Graph:
NA

R. Assessment-Rubrics:

Criteria	M	Rubrics
Practical Correctness (R1)	2	**Poor (0):** Significant Problems while performing the program/practical.
		Average (1): Minor problems in program/practical. Sometimes algorithms/toolsdo not work.
		Excellent (2): Program/practical is excellent and algorithms/tools work as per expectations.
Logical skillsAnd Practical Efficiency (R2)	2	**Poor (0):** No logical skills, Uses poorly-chosen approach.
		Average (1): Minor issues with Logic, uses the average approach.
		Excellent (2): Excellent logical skills, uses the best approach.
Documentation (R3)	2	**Poor (0):** Report with more than twomistakes.
		Average (1): Report with one or two mistake and no comments/theoretical explanation.
		Excellent (2): Reports with no mistake, well-commented/goodtheoretical explanation.
Topic/SubjectKnowledge (R4)	2	**Poor (0):** No knowledge of thetopic/subject.
		Average (1): Average knowledge of thetopic/subject.
		Excellent (2): Ample knowledgeof the topic/subject.
Submission within time limit (R5)	2	**Poor (0):** No submission till one weekafter given time limit.
		Average (1): Submission within one week after given time limit.
		Excellent (2): Submission in given time limit.

Marks:

R1	R2	R3	R4	R5	Total

Signature with Date

Date: ……

Practical No.6: Test and execute Linux Super User command to perform following task:

a) Display the user id of the currently logged-in user of your system.
b) Display host name of your system.
c) Write a Linux command to display the history of logins into the system.
d) Write a Linux command to display the server name.
e) Execute the Linux command: who, w, last.

A. Objective:

The goal of this lab practical is to make students aware about super user commands of Linux.

B. Expected Program Outcomes (POs):

1. Basic and Discipline specific knowledge: Apply knowledge of basic mathematics, science and engineering fundamentals and engineering specialization to solve the *engineering* problems.

4. Engineering Tools, Experimentation and Testing: Apply modern *engineering* tools and appropriate technique to conduct standard tests and measurements.

7. Life-long learning: Ability to analyse individual needs and engage in updating in the context of technological changes *in field of engineering.*

C. Expected Skills to be developed based on competency:

"Execute super user commands of Linux".

This practical is expected to develop the following skill.

1) Perform Linux shell scripts for resource management in Operating System.

D. Expected Course Outcomes (Cos):

CO4: Justify the need of security and protection mechanism in Operating System.

CO5: Perform various Linux command and develop shell scripts.

E. Practical Outcome(PRo):

Test and execute super user commands of Linux.

F. Expected Affective domain Outcome(ADos):

1) Following safety practices.
2) Demonstrate working as a leader / a team member.
3) Follow ethical practice.
4) Maintain tools and equipment.
5) Can work as a leader/team member

6) Understand the security and privacy of hardware & software and practice them while performing practical.

G. Prerequisite Theory:

Commands – su, loginname, exit, whoami, hostname, sudo

H. Experimental set up/ Program Logic-Flow chart:

NA

I. Resources/Equipment Required

Sr. No.	Instrument/Equipment /Components/Trainer kit	Specification	Quantity
1	Computer System	• Linux or alike Operating System such as Ubuntu, CentOS or any other.	As per Batch size

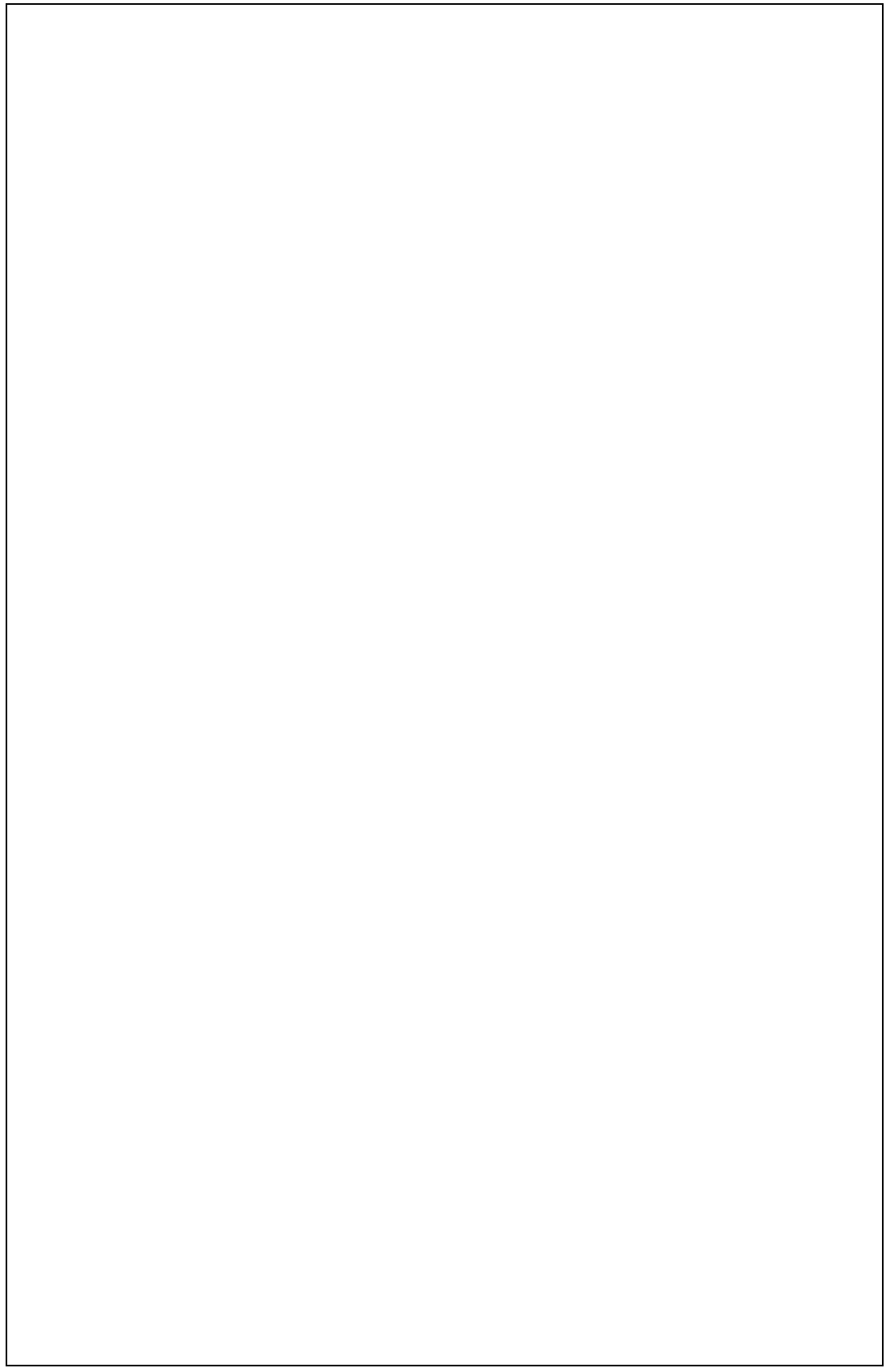
J. Safety and necessary Precautions followed:

Following safety and necessary Precautions are required while performing practical.

- Save your work/practical periodically.
- Save your practical with suitable name and extension.
- Shout down computer system at the end of laboratory session.
- Turn off power of computer system.

K. Procedure to be followed/Source code:

1) For Program -1: Type the command “whoami” in Linux editor.
2) For Program -2: Type the command “hostname” in Linux editor.
3) For Program -3: Type the command “last” in Linux editor.
4) For Program -4: Type the command “unme –n” in Linux editor.
5) For Program -5: Type the command “who”, “w” and “last” in Linux editor.



L. Observations and Calculations/Input-Output:

NA

M. Interpretation of Results:

NA

N. Conclusion:

NA

O. Practical related Quiz.

1) Describe working of id command.

2) List out available options of sudo command.

3) Write steps to print ip address of hostname.

P. References / Suggestions:

1) https://www.geeksforgeeks.org/sudo-command-in-linux-with-examples/
2) https://www.geeksforgeeks.org/whoami-command-linux-example/
3) https://www.javatpoint.com/linux-su-commands
4) https://www.javatpoint.com/linux-hostname

Q. Graph:

NA

R. Assessment-Rubrics:

Criteria	M	Rubrics
Practical Correctness (R1)	2	**Poor (0):** Significant Problems while performing the program/practical.
		Average (1): Minor problems in program/practical. Sometimes algorithms/toolsdo not work.
		Excellent (2): Program/practical is excellent and algorithms/tools work as per expectations.
Logical skillsAnd Practical Efficiency (R2)	2	**Poor (0):** No logical skills, Uses poorly-chosen approach.
		Average (1): Minor issues with Logic, uses the average approach.
		Excellent (2): Excellent logical skills, uses the best approach.
Documentation (R3)	2	**Poor (0):** Report with more than twomistakes.
		Average (1): Report with one or two mistake and no comments/theoretical explanation.
		Excellent (2): Reports with no mistake, well-commented/goodtheoretical explanation.
Topic/SubjectKnowledge (R4)	2	**Poor (0):** No knowledge of thetopic/subject.
		Average (1): Average knowledge of thetopic/subject.
		Excellent (2): Ample knowledgeof the topic/subject.
Submission within time limit (R5)	2	**Poor (0):** No submission till one weekafter given time limit.
		Average (1): Submission within one week after given time limit.
		Excellent (2): Submission in given time limit.

Marks:

R1	R2	R3	R4	R5	Total

Signature with Date

Date: ……

Practical No.7: Test and execute Linux editing file commands to perform following task:

a) Write a shell script to (i) create user defined directory (ii) rename it and (iii) remove the directory
b) Write a shell script to create a blank file with name "MyCollege.txt" and write at least 10 lines. Display the content of file.
c) Write a shell script to read two different file names from the command line and copy the content of first file into second file and display suitable message on standard output.
d) Write a shell script to search your name from a file and display suitable message.

A. Objective:

The goal of this lab practical is to make students aware about various file management concepts of Linux.

B. Expected Program Outcomes (POs):

1. Basic and Discipline specific knowledge: Apply knowledge of basic mathematics, science and engineering fundamentals and engineering specialization to solve the *engineering* problems.

2. Problem analysis: Identify and analyze well-defined engineering problems using codified standard methods.

3. Design/Development of Solutions: Design solutions for engineering well-defined technical problems and assist with the design of systems components or processes to meet specified needs.

4. Engineering Tools, Experimentation and Testing: Apply modern *engineering* tools and appropriate technique to conduct standard tests and measurements.

7. Life-long learning: Ability to analyse individual needs and engage in updating in the context of technological changes *in field of engineering.*

C. Expected Skills to be developed based on competency:

"Write a shell script".

This practical is expected to develop the following skill.

1) Perform Linux shell scripts for resource management in Operating System..

D. Expected Course Outcomes (Cos):

CO3: Understand various file management and file allocation techniques.

CO5: Perform various Linux command and develop shell scripts.

E. Practical Outcome (PRo):

Test and execute Linux editing file commands.

F. Expected Affective domain Outcome (ADos):

1) Following safety practices.
2) Demonstrate working as a leader / a team member.
3) Follow ethical practice.
4) Maintain tools and equipment.
5) Can work as a leader/team member
6) Understand the security and privacy of hardware & software and practice them while performing practical.

G. Prerequisite Theory:

Commands – mkdir , rmdir, mv, rm, cat, cp, grep

H. Experimental set up/ Program Logic-Flow chart:

NA

I. Resources/Equipment Required

Sr. No.	Instrument/Equipment /Components/Trainer kit	Specification	Quantity
1	Computer System	• Linux or alike Operating System such as Ubuntu, CentOS or any other.	As per Batch size

J. Safety and necessary Precautions followed:

Following safety and necessary Precautions are required while performing practical.

- Save your work/practical periodically.
- Save your practical with suitable name and extension.
- Shout down computer system at the end of laboratory session.
- Turn off power of computer system.

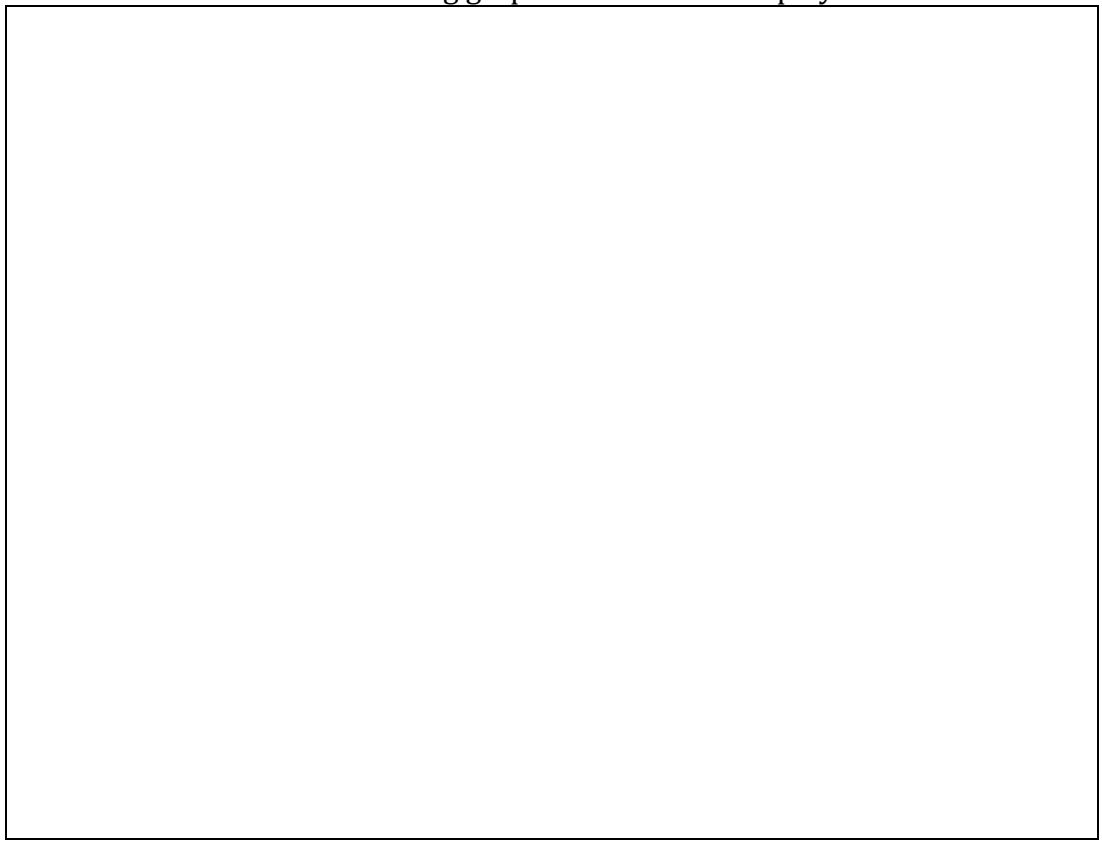
K. Procedure to be followed/Source code:

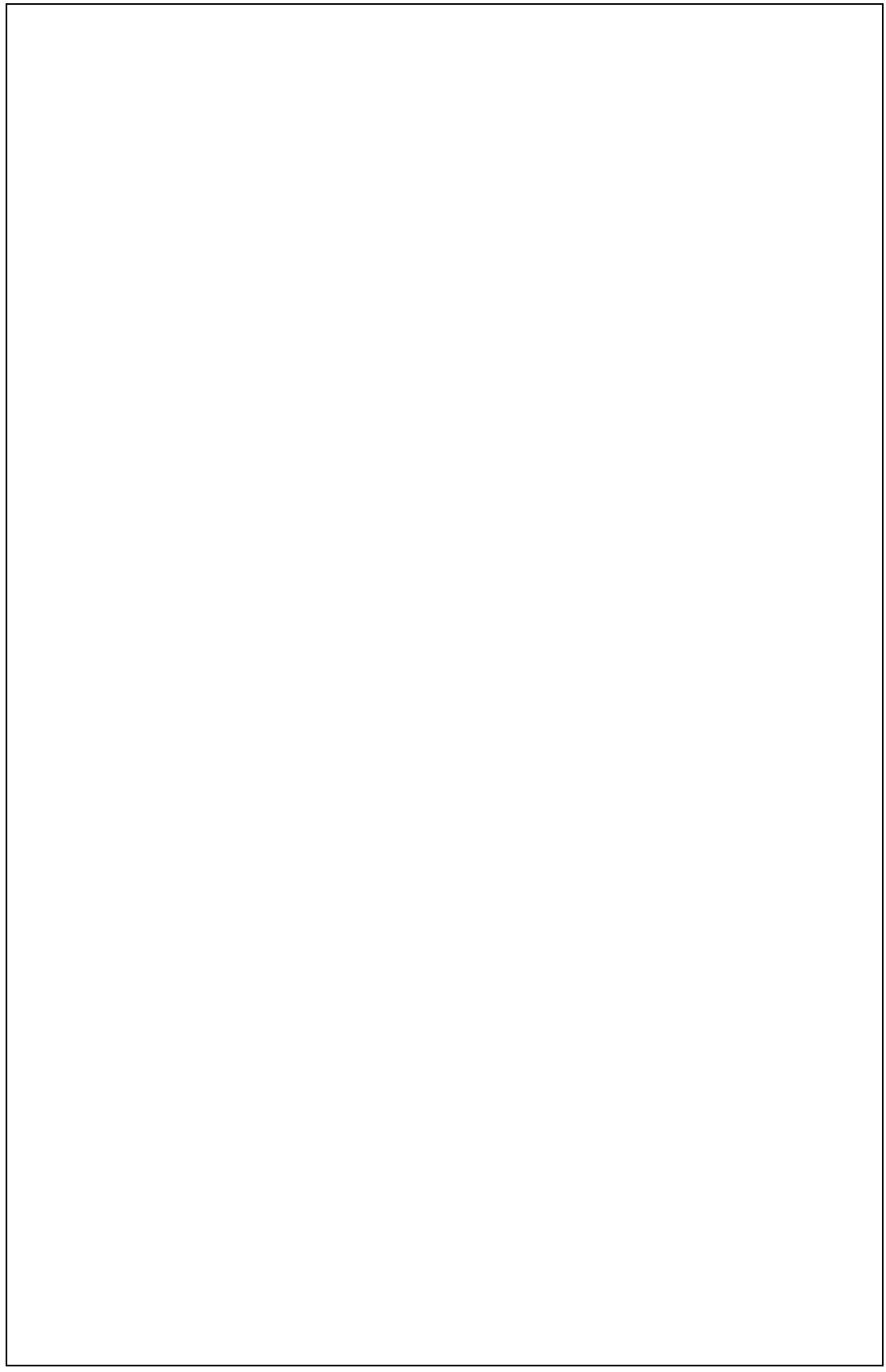
a. For Program -1 :
   - Read the name of directory from the user and store it in “dirname”. Make directory using mkdir command.
   - Ask for the new name of directory and store it in “newdir”. Rename directory name with mv command.
   - Remove the directory using rm command.

b. For Program -2 :
   - Create a blank file named “MyCollege.txt” using touch command.
   - Write 10 lines to the lines.
   - Display the content of a file using cat command.

c. For Program -3 :
   - Check if both file names are given or not using command line argument.
   - Assign first command line argument as “First_File”.
   - Assign second command line argument as “Second_File”.
   - Check if “First_File” exist or not.
   - If file exists, then copy the content of “First_File” into “Second_File” using cp command.

d. For Program -4:
   - Ask the name to be searched from a user.
   - Ask the filename from which your name to be searched.
   - Perform the search using grep command and display the results.





L. Observations and Calculations/Input-Output:

Input:

For Program -1: Directory name and new directory name
For Program -2: NA
For Program -3: Two file name
For Program -4: Name to be searched and filename.

Observations/Output:

For Program -1: Directory
For Program -2: Content display from the file.
For Program -3: Content of first file into second file
For Program -4: NA

M. Interpretation of Results:

NA

N. Conclusion:

NA

O. Practical related Quiz.

1) Write name of command to display list of directories.

2) Describe mkdir –p command.

3) Describe cd command.

P. References / Suggestions:

1) https://www.javatpoint.com/linux-directories
2) https://www.tutorialspoint.com/unix/unix-directories.htm
3) https://www.geeksforgeeks.org/file-management-in-linux/
4) https://www.tutorialspoint.com/unix/unix-file-management.htm

Q. Graph:

NA

R. Assessment-Rubrics:

Criteria	M	Rubrics
Practical Correctness (R1)	2	**Poor (0):** Significant Problems while performing the program/practical.
		Average (1): Minor problems in program/practical. Sometimes algorithms/toolsdo not work.
		Excellent (2): Program/practical is excellent and algorithms/tools work as per expectations.
Logical skillsAnd Practical Efficiency (R2)	2	**Poor (0):** No logical skills, Uses poorly-chosen approach.
		Average (1): Minor issues with Logic, uses the average approach.
		Excellent (2): Excellent logical skills, uses the best approach.
Documentation (R3)	2	**Poor (0):** Report with more than twomistakes.
		Average (1): Report with one or two mistake and no comments/theoretical explanation.
		Excellent (2): Reports with no mistake, well-commented/goodtheoretical explanation.
Topic/SubjectKnowledge (R4)	2	**Poor (0):** No knowledge of thetopic/subject.
		Average (1): Average knowledge of thetopic/subject.
		Excellent (2): Ample knowledgeof the topic/subject.
Submission within time limit (R5)	2	**Poor (0):** No submission till one weekafter given time limit.
		Average (1): Submission within one week after given time limit.
		Excellent (2): Submission in given time limit.

Marks:

R1	R2	R3	R4	R5	Total

Signature with Date

Date: ……

Practical No.8: Test and execute wc command.

a) Write a shell script to accept the string "diploma in information technology" from user in lower case letter and convert it into upper case letter. Display output with suitable user-friendly message.
b) Create a Shell script to find numbers of characters, words & lines of a given input file "MyCollege.txt".

A. Objective:

The goal of this lab practical is to make students aware about string conversion commands of Linux.

B. Expected Program Outcomes (POs):

1. Basic and Discipline specific knowledge: Apply knowledge of basic mathematics, science and engineering fundamentals and engineering specialization to solve the *engineering* problems.

2. Problem analysis: Identify and analyze well-defined engineering problems using codified standard methods.

3. Design/Development of Solutions: Design solutions for engineering well-defined technical problems and assist with the design of systems components or processes to meet specified needs.

4. Engineering Tools, Experimentation and Testing: Apply modern *engineering* tools and appropriate technique to conduct standard tests and measurements.

7. Life-long learning: Ability to analyse individual needs and engage in updating in the context of technological changes *in field of engineering.*

C. Expected Skills to be developed based on competency:

"Write a shell script".

This practical is expected to develop the following skill.

1) Perform Linux shell scripts to perform basic string operation.

D. Expected Course Outcomes (Cos):

CO3: Understand various file management and file allocation techniques.

E. Practical Outcome (PRo):

Design shell script for string operation.

F. Expected Affective domain Outcome (ADos):

1) Following safety practices.
2) Demonstrate working as a leader / a team member.
3) Follow ethical practice.
4) Maintain tools and equipment.
5) Can work as a leader/team member
6) Understand the security and privacy of hardware & software and practice them while performing practical.

G. Prerequisite Theory:

Tr Command: The command 'tr' stands for 'translate'. It is used to translate, like from lowercase to uppercase and vice versa or new lines into spaces.

Syntax: tr <old> <new>

Wc command: print newline count, word count and byte count for each file.

Syntax: wc [-option]

-c - print the byte counts
-m - print the character counts
-l - print the newline counts
-w - print the word counts

H. Experimental set up/ Program Logic-Flow chart:

NA

I. Resources/Equipment Required

Sr. No.	Instrument/Equipment /Components/Trainer kit	Specification	Quantity
1	Computer System	• Linux or alike Operating System such as Ubuntu, CentOS or any other.	As per Batch size

J. Safety and necessary Precautions followed:

Following safety and necessary Precautions are required while performing practical.

- Save your work/practical periodically.
- Save your practical with suitable name and extension.
- Shout down computer system at the end of laboratory session.
- Turn off power of computer system.

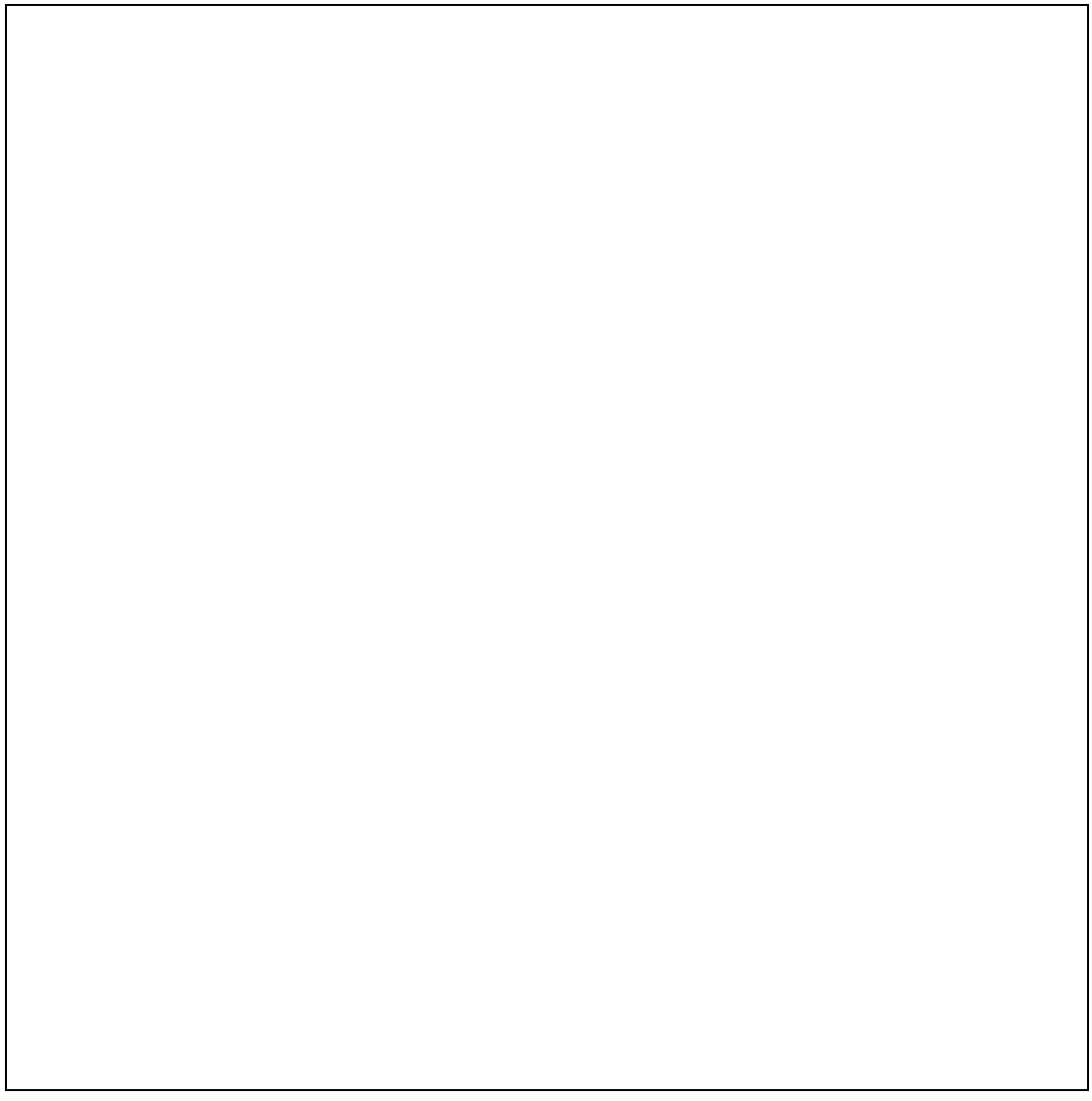
K. Procedure to be followed/Source code:

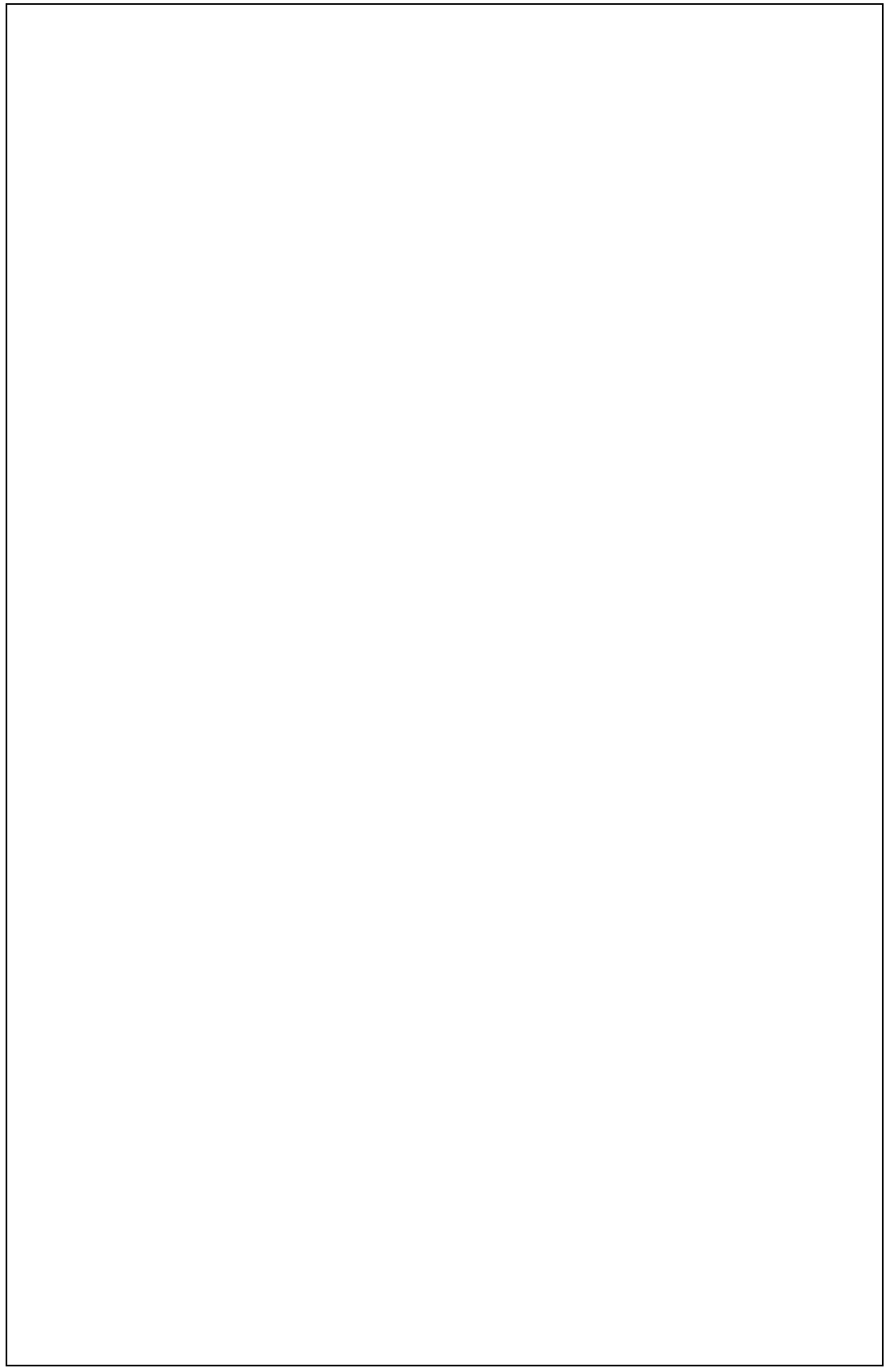
a. For Program -1 :

- Read input string “diploma in information technology” as lower case string from user.
- Convert the string into uppercase string using tr command.
- Display the output string as uppercase string and print user – friendly message.

b. For Program -2 :

- Define the input file as “MyCollege.txt”.
- Check if file exist or not. If file does not exist, display the proper message.
- If file exists, find the characters using wc –c, word count using wc – w and line count using wc –l command.
- Display the No. of characters, words and lines as output.





L. Observations and Calculations/Input-Output:

Input:

For Program -1: Lowercase string
For Program -2: Text file with some texts/paragraph.

Observations/Output:

For Program -1: Uppercase string
For Program -2: No. of characters, words and lines

M. Interpretation of Results:
NA

N. Conclusion:
NA

O. Practical related Quiz.

1) Describe wc-max-line-length command.

2) Write syntax and example of tr command.

3) List out the available options of wc command.

P. References / Suggestions:

1) https://www.geeksforgeeks.org/tr-command-in-unix-linux-with-examples/
2) https://www.tutorialspoint.com/unix_commands/wc.htm
3) https://www.geeksforgeeks.org/wc-command-linux-examples/
4) https://www.javatpoint.com/linux-tr

Q. Graph:

NA

R. Assessment-Rubrics:

Criteria	M	Rubrics
Practical Correctness (R1)	2	**Poor (0):** Significant Problems while performing the program/practical.
		Average (1): Minor problems in program/practical. Sometimes algorithms/toolsdo not work.
		Excellent (2): Program/practical is excellent and algorithms/tools work as per expectations.
Logical skillsAnd Practical Efficiency (R2)	2	**Poor (0):** No logical skills, Uses poorly-chosen approach.
		Average (1): Minor issues with Logic, uses the average approach.
		Excellent (2): Excellent logical skills, uses the best approach.
Documentation (R3)	2	**Poor (0):** Report with more than twomistakes.
		Average (1): Report with one or two mistake and no comments/theoretical explanation.
		Excellent (2): Reports with no mistake, well-commented/goodtheoretical explanation.
Topic/SubjectKnowledge (R4)	2	**Poor (0):** No knowledge of thetopic/subject.
		Average (1): Average knowledge of thetopic/subject.
		Excellent (2): Ample knowledgeof the topic/subject.
Submission within time limit (R5)	2	**Poor (0):** No submission till one weekafter given time limit.
		Average (1): Submission within one week after given time limit.
		Excellent (2): Submission in given time limit.

Marks:

R1	R2	R3	R4	R5	Total

Signature with Date

Date: ……

Practical No.9: Understand and Apply Arithmetic Operators. Write a shell script to perform arithmetic operations:

a) Write a shell script to read two numbers from users and perform addition, subtraction, multiplication, division and modulus operation of two numbers and display suitable user friendly message on standard output for each operation.
b) Write a shell script to read five numbers from user and find average of five numbers.
c) Write a shell script to read radius (R) in cm from user and find area (A) of circle and display suitable user friendly message on standard output.

A. Objective:

The goal of this lab practical is to make students aware about arithmetic operations of Linux.

B. Expected Program Outcomes (POs):

1. Basic and Discipline specific knowledge: Apply knowledge of basic mathematics, science and engineering fundamentals and engineering specialization to solve the *engineering* problems.

2. Problem analysis: Identify and analyze well-defined engineering problems using codified standard methods.

3. Design/Development of Solutions: Design solutions for engineering well-defined technical problems and assist with the design of systems components or processes to meet specified needs.

4. Engineering Tools, Experimentation and Testing: Apply modern *engineering* tools and appropriate technique to conduct standard tests and measurements.

7. Life-long learning: Ability to analyse individual needs and engage in updating in the context of technological changes *in field of engineering.*

C. Expected Skills to be developed based on competency:

"Write a shell script".

This practical is expected to develop the following skill.

1) Perform Linux shell scripts to perform arithmetic operation.

D. Expected Course Outcomes (Cos):

CO4: Justify the need of security and protection mechanism in Operating System.

E. Practical Outcome (PRo):

Apply arithmetic operators.

F. Expected Affective domain Outcome (ADos):

1) Following safety practices.
2) Demonstrate working as a leader / a team member.
3) Follow ethical practice.
4) Maintain tools and equipment.
5) Can work as a leader/team member
6) Understand the security and privacy of hardware & software and practice them while performing practical.

G. Prerequisite Theory:

Arithmetic operators.

H. Experimental set up/ Program Logic-Flow chart:

NA

I. Resources/Equipment Required

Sr. No.	Instrument/Equipment /Components/Trainer kit	Specification	Quantity
1	Computer System	• Linux or alike Operating System such as Ubuntu, CentOS or any other.	As per Batch size

J. Safety and necessary Precautions followed:

Following safety and necessary Precautions are required while performing practical.

- Save your work/practical periodically.
- Save your practical with suitable name and extension.
- Shout down computer system at the end of laboratory session.
- Turn off power of computer system.

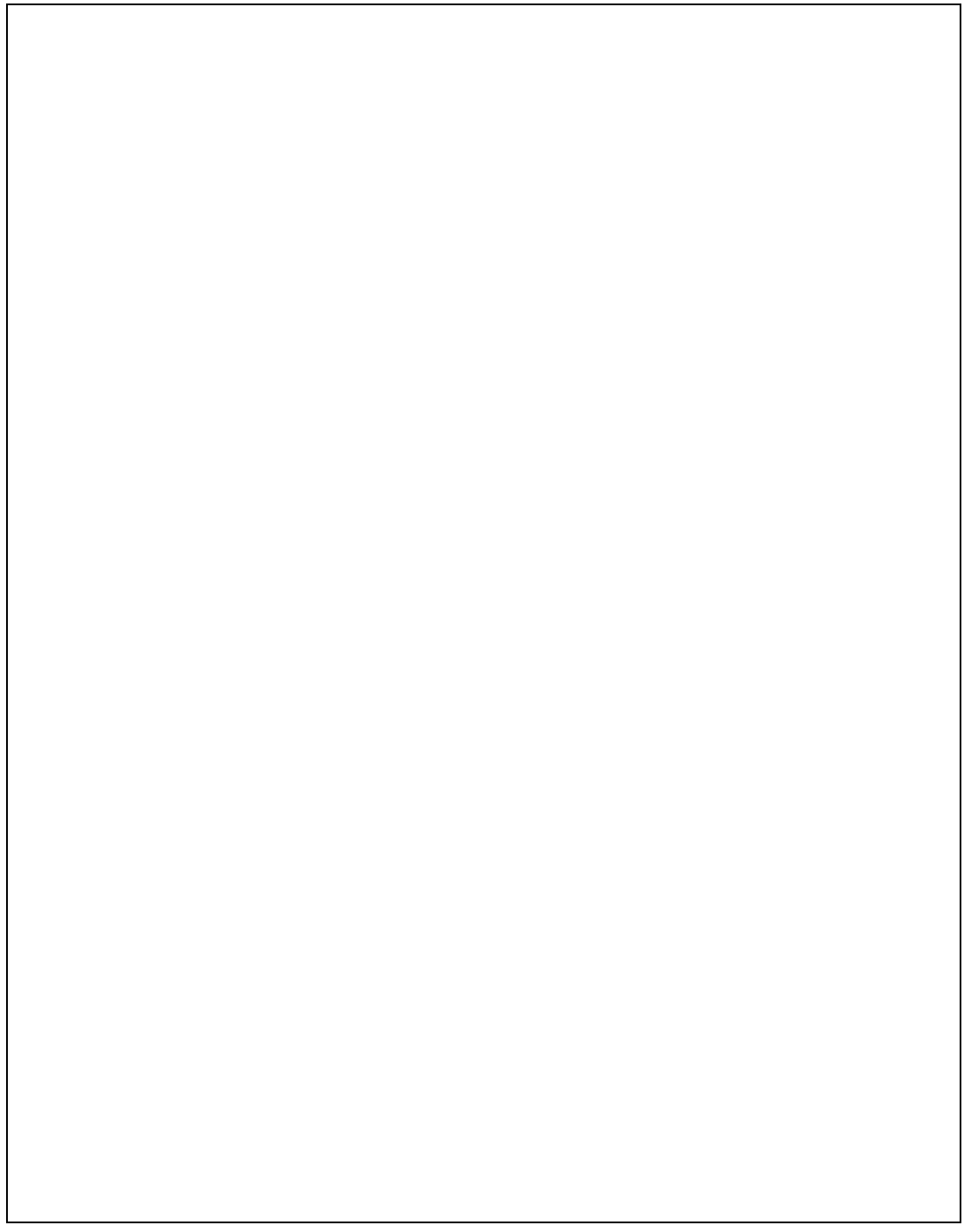
K. Procedure to be followed/Source code:

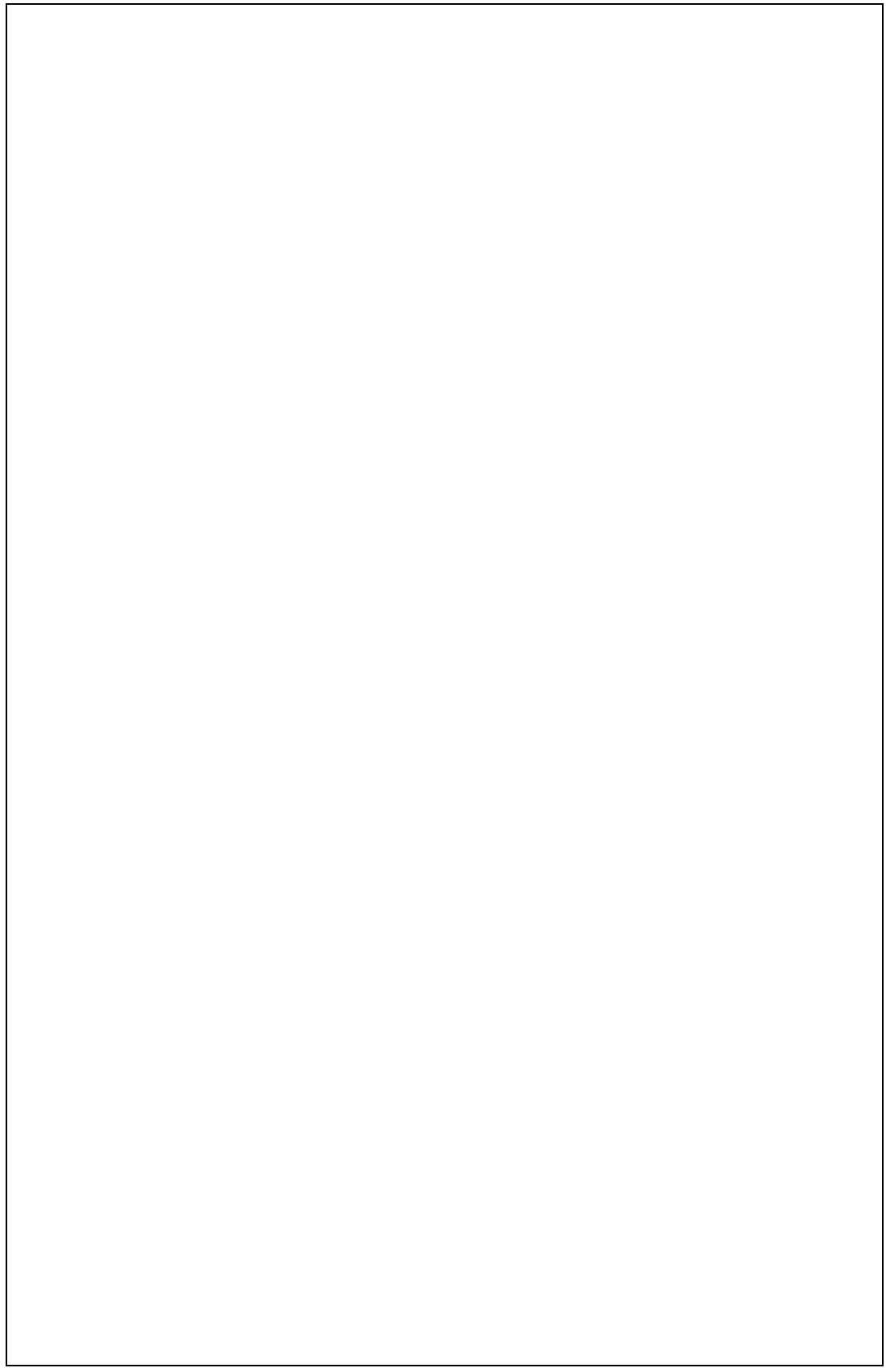
a. For Program -1 :
   - Read the first number “num1” from the user.
   - Read the second number “num2” from the user.
   - Perform addition, subtraction, multiplication, division, modulo operations of num.1 and num2
   - Display the results of all arithmetic operations.

b. For Program -2 :
   - Read five numbers “num1”, “num2”, “num3”, “num4”, “num5” from the

user.
- Find sum of all five numbers and store it in “Sum “ variable.
- Find average of all five numbers as “Sum/5” and display the average.

c. For Program -3 :
- Read radius from the user and store it in “radius” variable.
- Find area of circle as (3.14 * radius * radius) and store it in “area” variable.
- Display the area of circle.





L. Observations and Calculations/Input-Output:

Input:

For Program -1: Two numbers “num1” and “num2”
For Program -2: Five numbers “num1”, “num2”, “num3”, “num4”, “num5”
For Program -3: Radius “radius”.

Observations/Output:

For Program -1: Addition, subtraction, multiplication, division and modulo of two numbers.
For Program -2: Average of five numbers
For Program -3: Area of circle.

M. Interpretation of Results:

NA

N. Conclusion:

NA

O. Practical related Quiz.

1) Apply arithmetic operator to check two numbers are equal or not.

2) Write arithmetic operator to find exponent of a number in Linux.

P. References / Suggestions:

1) https://www.tutorialspoint.com/unix/unix-arithmetic-operators.htm
2) https://www.geeksforgeeks.org/bash-script-arithmetic-operators/
3) https://www.javatpoint.com/bash-arithmetic-operators

Q. Graph:

NA

R. Assessment-Rubrics:

Criteria	M	Rubrics
Practical Correctness (R1)	2	**Poor (0):** Significant Problems while performing the program/practical.
		Average (1): Minor problems in program/practical. Sometimes algorithms/toolsdo not work.
		Excellent (2): Program/practical is excellent and algorithms/tools work as per expectations.
Logical skillsAnd Practical Efficiency (R2)	2	**Poor (0):** No logical skills, Uses poorly-chosen approach.
		Average (1): Minor issues with Logic, uses the average approach.
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Documentation (R3)	2	**Poor (0):** Report with more than twomistakes.
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		Average (1): Submission within one week after given time limit.
		Excellent (2): Submission in given time limit.

Marks:

R1	R2	R3	R4	R5	Total

Signature with Date

Date: ……

Practical No.10: Understand and apply control statements, Write a shell script to perform given operations:

a) Write a shell script to find maximum number among three numbers.
b) Write a shell script to find sum and average of N numbers.
c) Create a shell script to reverse the digits of a given 5-digit number. (For e.g. if the no. is 57429 then answer is 92475).

A. Objective:

The goal of this practical is to make students aware about various control statements of Linux.

B. Expected Program Outcomes (POs):

1. Basic and Discipline specific knowledge: Apply knowledge of basic mathematics, science and engineering fundamentals and engineering specialization to solve the *engineering* problems.

2. Problem analysis: Identify and analyze well-defined engineering problems using codified standard methods.

3. Design/Development of Solutions: Design solutions for engineering well-defined technical problems and assist with the design of systems components or processes to meet specified needs.

4. Engineering Tools, Experimentation and Testing: Apply modern *engineering* tools and appropriate technique to conduct standard tests and measurements.

7. Life-long learning: Ability to analyse individual needs and engage in updating in the context of technological changes *in field of engineering.*

C. Expected Skills to be developed based on competency:

"Write a shell script".
This practical is expected to develop the following skill.
1) Perform Linux shell scripts using control structures.

D. Expected Course Outcomes (Cos):

CO5: Perform various Linux command and develop shell scripts.

E. Practical Outcome (PRo):

Apply control structures.

F. Expected Affective domain Outcome (ADos):

1) Following safety practices.
2) Demonstrate working as a leader / a team member.
3) Follow ethical practice.

4) Maintain tools and equipment.
5) Can work as a leader/team member
6) Understand the security and privacy of hardware & software and practice them while performing practical.

G. Prerequisite Theory:

- Decision Control statements: if, if..else, nested if
- Loop Control statements : for, while loop

H. Experimental set up/ Program Logic-Flow chart:

NA

I. Resources/Equipment Required

Sr. No.	Instrument/Equipment /Components/Trainer kit	Specification	Quantity
1	Computer System	• Linux or alike Operating System such as Ubuntu, CentOS or any other.	As per Batch size

J. Safety and necessary Precautions followed:

Following safety and necessary Precautions are required while performing practical.

- Save your work/practical periodically.
- Save your practical with suitable name and extension.
- Shout down computer system at the end of laboratory session.
- Turn off power of computer system.

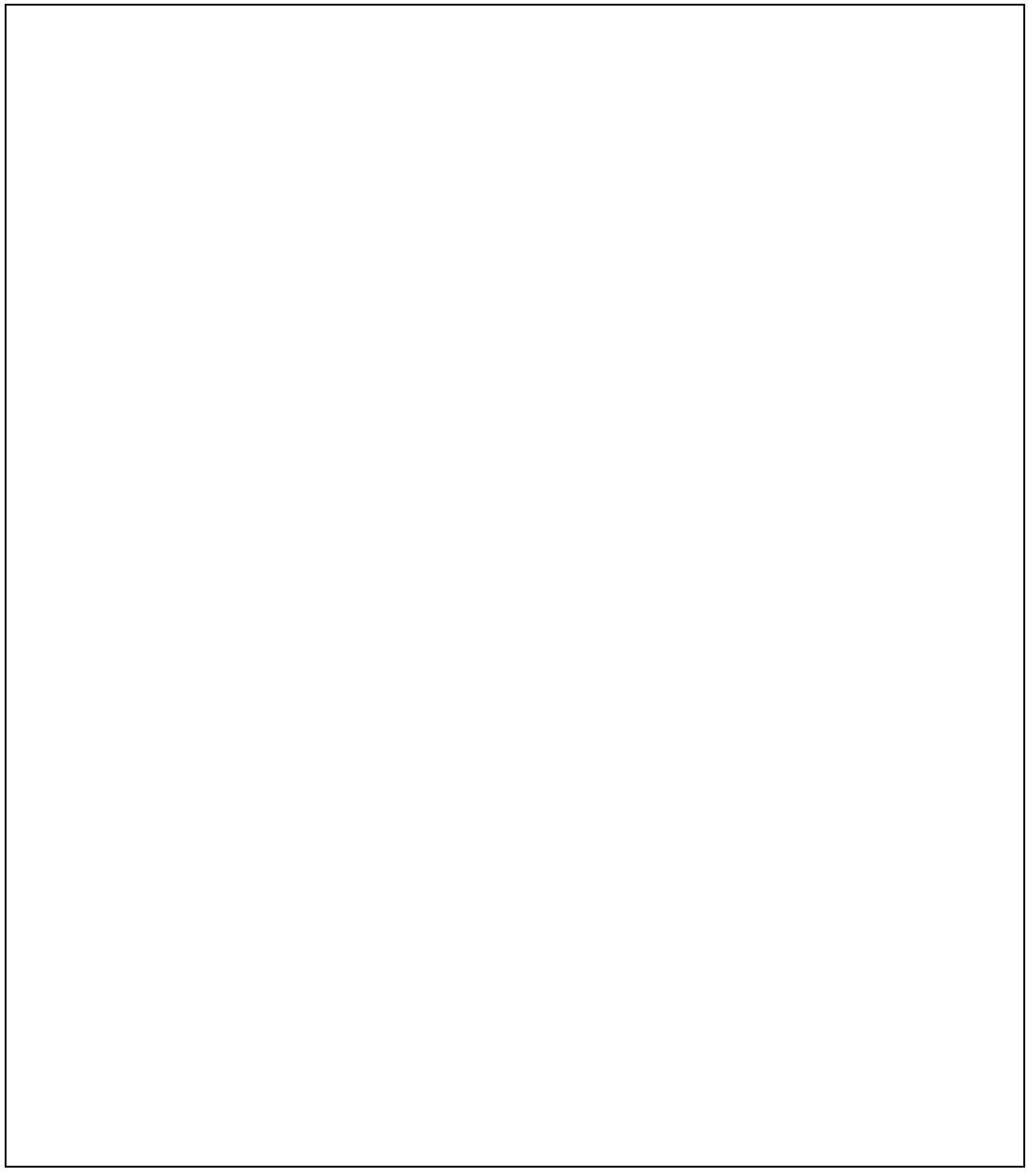
K. Procedure to be followed/Source code:

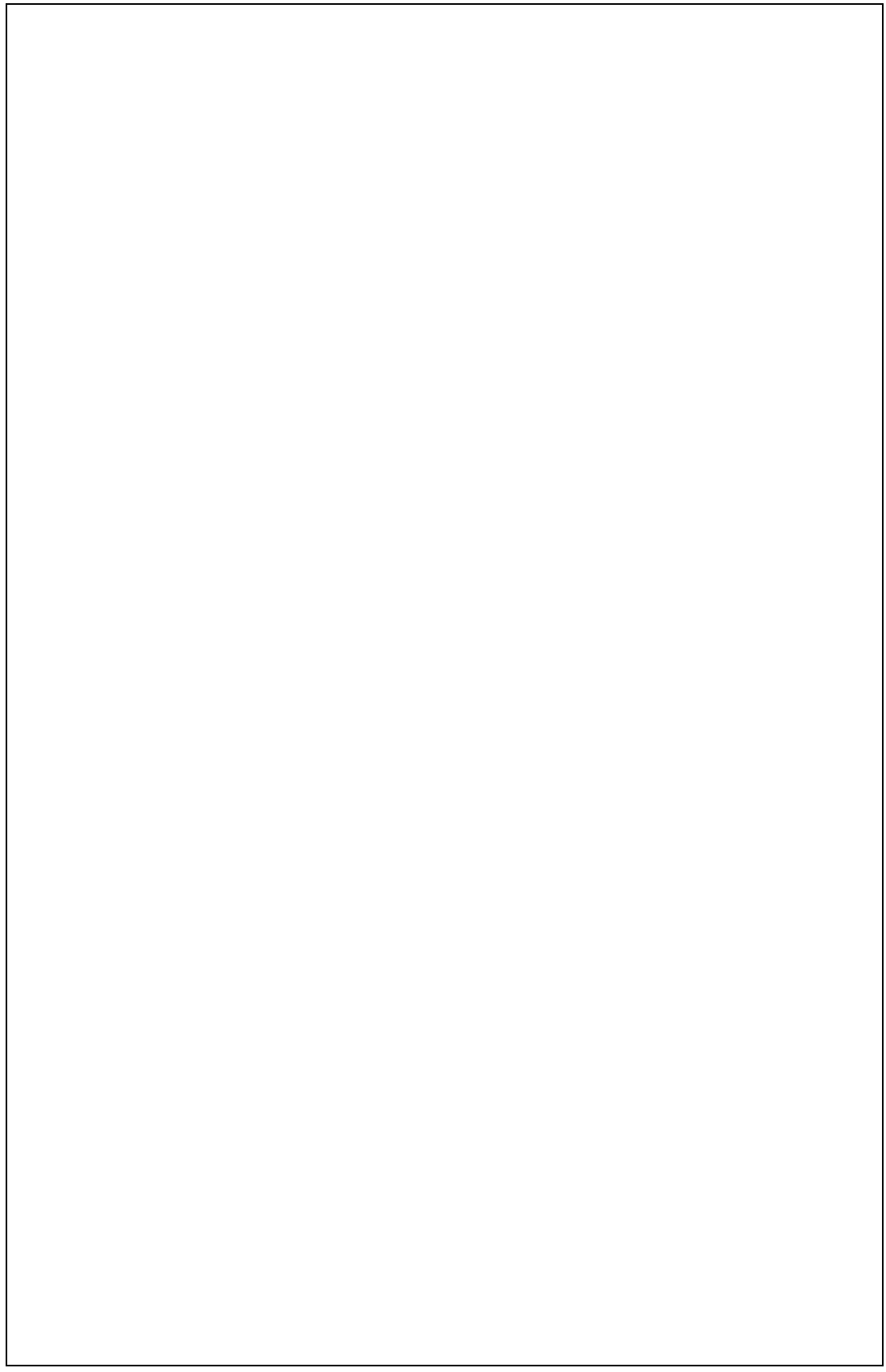
a. For Program -1 :
   - Read the three numbers “num1”, “num2”, “num3” from the user.
   - Initialize the maximum variable with the first number.
   - Compare the second number with the current maximum using if statement.
   - Compare the third number with the current maximum using if statement.
   - Display the maximum numbers.

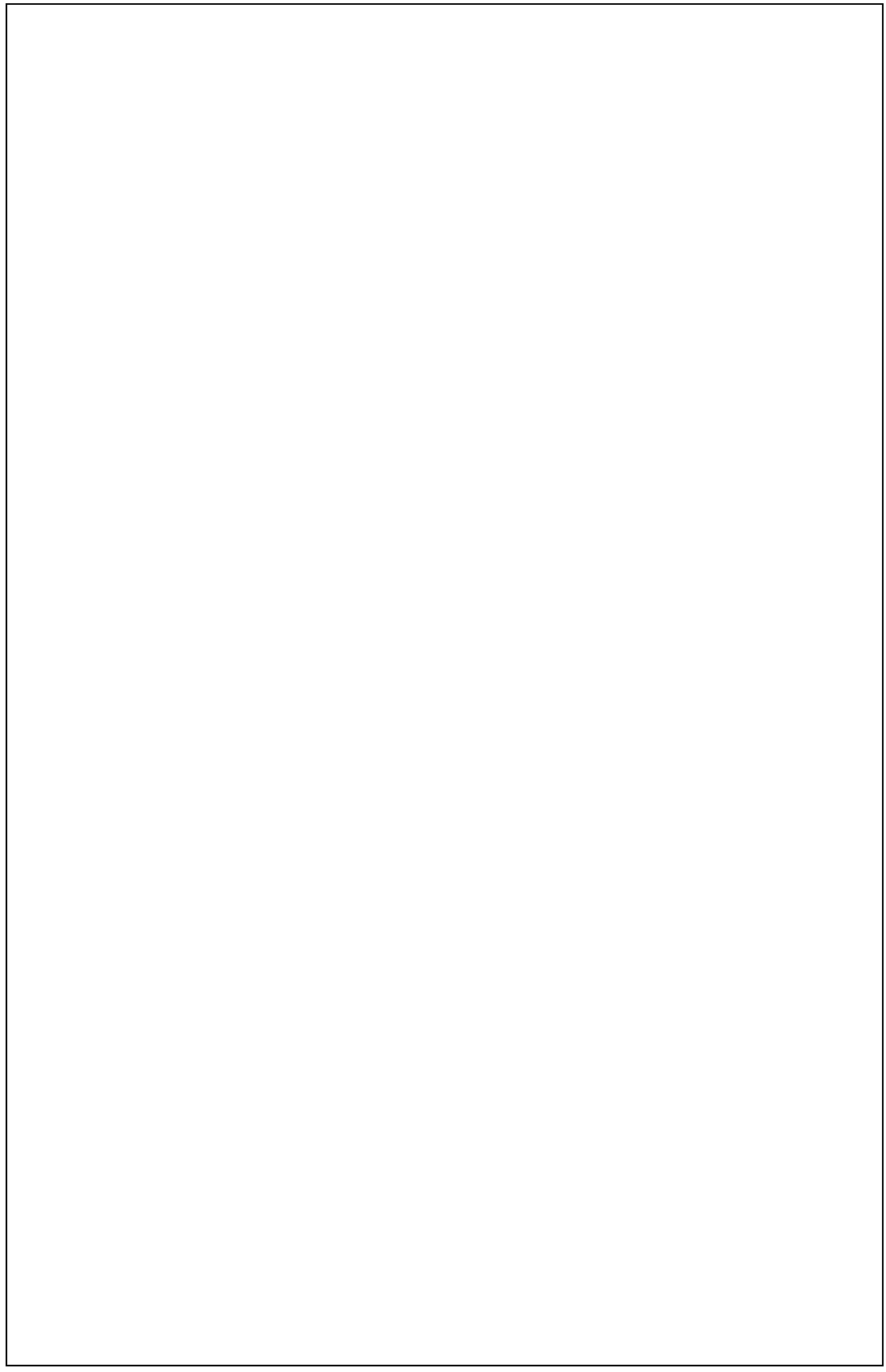
b. For Program -2 :
   - Ask user to enter count of numbers and store it in “count”.
   - Initialize one variable “sum” to 0.
   - Read the N (count) numbers from user and calculate the sum using For loop.
   - Find average of all five numbers as “sum/count” and display the sum

and average.

c. For Program -3 :
   - Ask user to enter any 5 digit number and store it in “number”.
   - Check if the entered number is 5 digit or not (optional) using if.
   - Initialize one variable “reversed_number” as 0.
   - Using while loop :
     Check if number >0 , then find
     reminder = number % 10
     reversed_number = (reversed_number * 10 + reminder)
     number = number/10
   - Display the reversed_number.







L. Observations and Calculations/Input-Output:

Input:

For Program -1: Three numbers “num1”, “num2”, “num3”
For Program -2: Count of number and numbers
For Program -3: Any 5 digit number.

Observations/Output:

For Program -1 : Maximum number
For Program -2 : Sum and average of numbers
For Program -3 : Reversed 5 digit number.

M. Interpretation of Results:

NA

N. Conclusion:

NA

O. Practical related Quiz.

1) Write syntax of switch statement in Linux.

2) Describe Until loop.

3) Write syntax of while loop in Linux.

P. References / Suggestions:

1) https://www.tutorialspoint.com/unix/unix-loop-control.htm
2) https://www.geeksforgeeks.org/conditional-statements-shell-script/
3) https://linuxhint.com/bash_conditional_statement/
4) https://www.javatpoint.com/bash-for-loop

Q. Graph:

NA

R. Assessment-Rubrics:

Criteria	M	Rubrics
Practical Correctness (R1)	2	**Poor (0):** Significant Problems while performing the program/practical.
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Submission within time limit (R5)	2	**Poor (0):** No submission till one weekafter given time limit.
		Average (1): Submission within one week after given time limit.
		Excellent (2): Submission in given time limit.

Marks:

R1	R2	R3	R4	R5	Total

Signature with Date

Linux Operating System

4331602

Lab manual is prepared by

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