Tutorial 1: Problem-solving using Computers.

Lab1: Familiarization with programming environment

      i) Basic Linux environment and its editors like Vi, Vim & Emacs etc.

      ii) Exposure to Turbo C, gcc

      iii) Writing simple programs using printf( ), scanf( )

i) <u>Basic Linux environment and its editors like Vi, Vim & Emacs etc.</u>

<u>Basic Linux environment</u>
<u>What is Linux?</u>

Linux is free and open-source software, with an operating system of its own. Linux stands for GNU + Linux. It is developed along with the source code of UNIX.

<u>Uses of Linux?</u>

- ✓ **Linux commands** are a type of UNIX commands.
- ✓ They are the basic tools used to interact with Linux on an individual level.
- ✓ Linux operating system is used on servers, desktops, and maybe even your smart phone.
- ✓ Linux commands are used to perform a variety of tasks, including displaying information about files and directories.

Basic Linux Commands which are most commonly used are as follows:

1. **Is** – Displays information about files in the current directory.
2. **pwd** – Displays the current working directory.
3. **mkdir** – Creates a directory.
4. **cd** – To navigate between different folders.
5. **rmdir** – Removes empty directories from the directory lists.
6. **cp** – Moves files from one directory to another.
7. **mv** – Rename and Replace the files
8. **rm** – Delete files
9. **cat** – Display file contents on terminal
10. **clear** – Clear terminal
11. **man** – Access manual for all Linux commands
12. **echo-** Display active processes on the terminal
13. **whoami-** Create or update passwords for existing users
14. **sort-** sort the file content

<u>vi Editor in LINUX</u>

- ✓ The default editor that comes with the UNIX operating system is called **vi** (visual editor).
- ✓ Using vi editor, we can edit an existing file or create a new file from scratch.
- ✓ We can also use this editor to just read a text file. The advanced version of the vi editor is the **vim** editor.

<u>How to open VI editor?</u>

To open vi editors, we just need to type the command mentioned below.

      vi [file_name]

Here, [file_name] = this is the file name we want to create or to open the pre-existing file.

1) Creating a new file with `file_name` = geethanjali

      vi Geethanjali

2) Opening a preexisted file with `file_name` = jayesh
    vi jayesh

Modes of Operation in the vi editor:
There are three modes of operation in vi:
1. **Command Mode:**

When vi starts up, it is in Command Mode. This mode is where vi interprets any characters we type as commands and thus does not display them in the window.
2. **Insert mode:**

This mode enables us to insert text into the file.
3. **Last Line Mode (Escape Mode):**

Line Mode is invoked by typing a colon [:], while vi is in Command Mode. The cursor will jump to the last line of the screen and vi will wait for a command.

Vim Editor

- ✓ Vi and Vim are both text editors used primarily in Unix-like operating systems.
- ✓ They both are powerful text editors known for their efficient text manipulation and keyboard-driven interface.
- ✓ Vim is an extended, enhanced, and improved version of Vi, and it includes all the functionality of Vi along with many additional features.

Here are some factors to consider while deciding whether to go with "vi" or "vim" before starting.

Installation and Configure vim in Our Linux System
To install vim on Debian based Linux like ubuntu run the command:
sudo apt-get install vim
To install vim on an arch-based distro run the following command:
sudopacman -S vim
Now vim will be installed on our system.
We can open vim by running vim command on the terminal.
vim

Introduction to Emacs Editor in Linux/Unix Systems:

- ✓ The Emacs is referred to a family of editors.
- ✓ The most commonly used version of Emacs editor is GNU Emacs.
- ✓ The main difference between text editors like vi, vim, nano, and the Emacs is that - it is faster, powerful, and simple in terms of usage because of its simple user interface.

Installing the Emacs Editor:

- • **Ubuntu / Debian:**   sudo apt-get install emacs
- • **Redhat / CentOS and Derivatives:**   yum install emacs

To use emacs editor, use command – "emacs [-option] [file name]" (without quotation marks) :
Example: emacs new.txt

ii). Exposure to Turbo C, gcc

- ✓ The most popular IDE for C language for beginners is Turbo C/C++. The full form of IDE is Integrated Development Environment.
- ✓ An IDE or **Integrated Development environment** is software, which has a code editor, along with the compiler of the programming language too, hence we do not need to install anything else.
- ✓ **Turbo C** is an IDE used for writing code in the C language. And we can also, compile and run our code using Turbo C itself.

    GCC
- ✓ GCC stands for GNU Compiler Collections which is used to compile mainly C and C++ language.
- ✓ The GCC is an open-source collection of compilers and libraries.

iii). Writing simple programs using printf(), scanf()

printf( ) : In 'C' programming, it is an output function. This function send the formatted output to the screen.

Example:
#include<stdio.h>
void main( )
{ printf("My name is Rajani"); }

Output:

My name is Rajani

scanff( ) : In 'C' programming, it is an input function. This function reads formatted input from the standard input device i.e., keyboard to the screen.

Example:
#include<stdio.h>
void main( )
{ int a;
printf("Read value for a:\n");
scanf("%d", &a);
printf("The value of a is = %d\n", a); }

Output:
Read value for a:
10
The value of a is =10

**Tutorial 2:** Problem-solving using Algorithms and Flow charts.
Lab1: Converting algorithms/flow charts into C Source code. Developing the algorithms/flowcharts for the following sample programs

       i) Sum and average of 3 numbers
      ii) Conversion of Fahrenheit to Celsius and vice versa
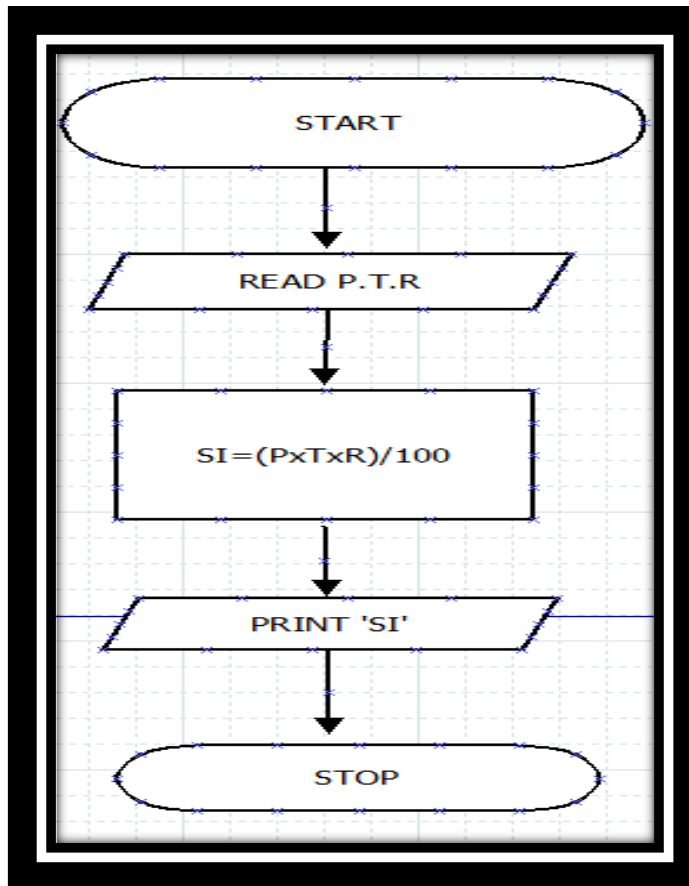   iii) Simple interest calculation

i) Sum and average of 3 numbers
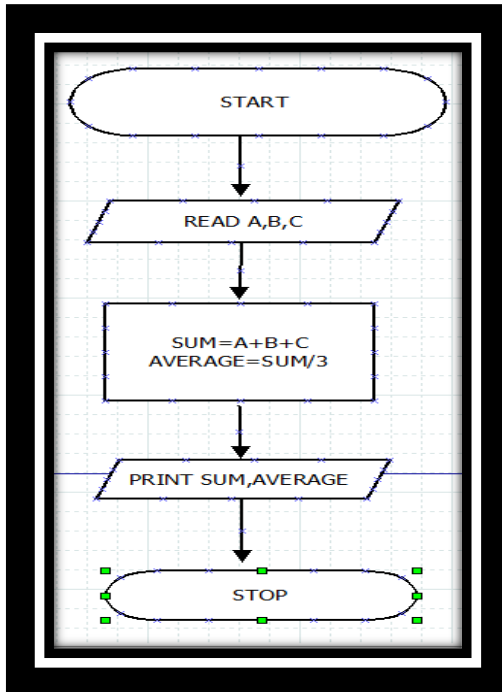
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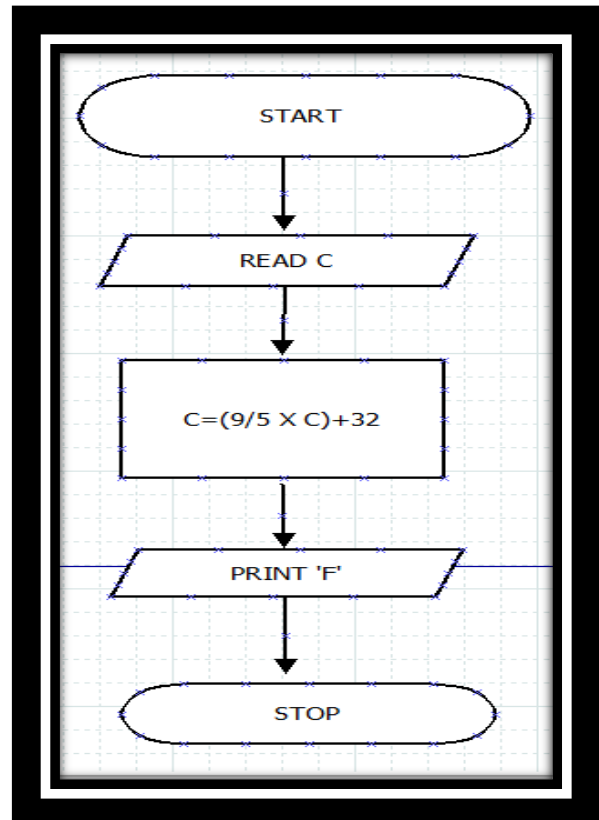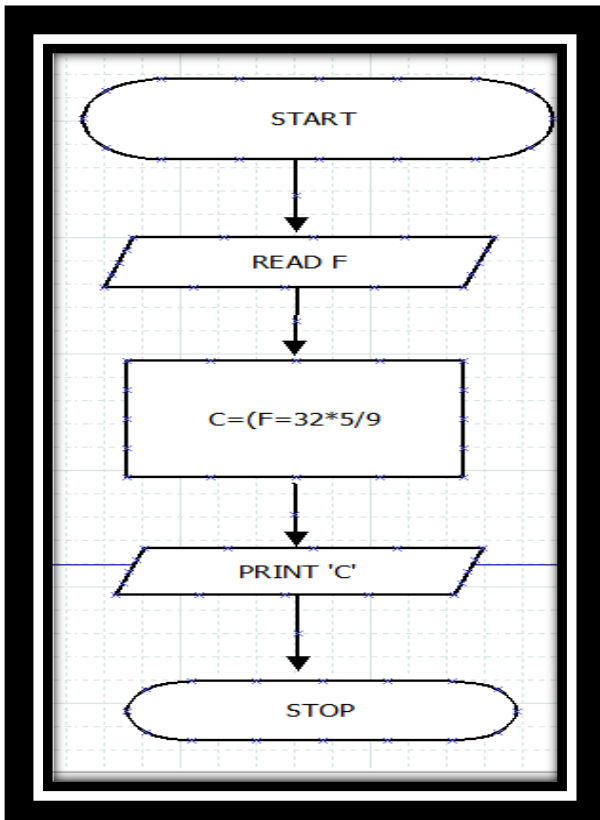
iii)   Simple interest calculation

WEEK 3

Tutorial 3: Variable types and type conversions

Lab 3: Simple computational problems using arithmetic expressions.

              i) Finding the square root of a given number

              ii) Finding compound interest

              iii) Area of a triangle using heron's formulae

              iv) Distance travelled by an object

i) Finding the square root of a given number

```
#include<stdio.h>
#include<math.h>
void main()
{
int n, result;
printf("\n enter value for n:");
scanf("%d", &n);
result = sqrt(n);   printf("\n square of %d : %d", n, result);   }
```

   Input & Output:

enter value for n:
25
square of 25 : 5

ii) Finding compound interest

```
#include<stdio.h>
#include<math.h>
void main()
{
    float p, r, t, CI;
printf("\n enter Principal amount :");
scanf("%f", &p);
printf("\n enter Rate of interest :");
scanf("%f", &r);
printf("\n enter Time duration :");
scanf("%f", &t);
    CI=p*((1+r/100), t);
printf("\n compound interest = %f", CI);
}
```

Input & Output
enter Principal amount :500
enter Rate of interest :100
enter Time duration :20
compound interest = 10000.000000

iii) Area of a triangle using heron's formulae

```
#include<stdio.h>
#include<math.h>
void main ()
{
    float a, b, c, s, area;
    printf("\n enter 3sides of a triangle:");
    scanf("%f %f %f", &a, &b, &c);
     s =(a+b+c)/2;
     area = sqrt(s*(s-a)*(s-b)*(s-c));
    printf("area of a triangle =%f", area);
}
```
Input & Output
enter 3sides of a triangle:3 4 5
area of a triangle =6.000000

iv) Distance travelled by an object
```
#include<stdio.h>
void main()
```

```c
{
    float u, a, s;
    int t;
    printf("\n enter initial velocity:\n");
    scanf("%f", &u);
    printf("\n enter acceleration :\n");
    scanf("%f", &a);
    printf("\n enter time :\n");
    scanf("%d", &t);
    s=u*t+(0.5*a*t*t);
    printf("\n distance travelled =%f", s);
```

Input & Output

enter initial velocity:30
enter acceleration :1
enter time :50
distance travelled =2750.000000

Week-4

Lab4: Simple computational problems using the operator' precedence and associativity

      i) Evaluate the following expressions.

              a. A+B*C+(D*E) + F*G

              b. A/B*C-B+A*D/3

              c. A+++B---A

              d. J= (i++) + (++i)

Code:-

a)   A+B*C+(D*E) + F*G

```c
#include<stdio.h>
Void main()
{
        Int A,B,C,D,E,F,G,opt;
        printf("\n Enter values of A,B,C,D,E,F,G :");
        scanf("%d%d%d%d%d%d%d",&A,&B,&C,&D,&E,&F,&G);
        opt=A+B*C+(D*E)+F*G;
        printf("The operation of given numbers is %d",opt);
}
```

Input &Output :-

Enter values of A,B,C,D,E,F,G :4 8 6 9 3 7 10
The operation of given numbers is 14

b) A/B*C-B+A*D/3

```c
#include<stdio.h>
Void main()
{
        intA,B,C,D,opt;
        printf("\n Enter the values of A,B,C,D:");
        scanf("%d%d%d%d",&A,&B,&C,&D);
        opt=A/B*C-B+A*D/3;
        printf("The value of the operation is %d",opt);
}
```
Input & Output:-

Enter the values of A,B,C,D:5 8 6 9
The value of the operation is 7

c) A+++B---A

Code:-

```c
#include<stdio.h>
Void main()
{
        intA,B,C,D,opt;
        printf("\n Enter the values of A,B,C,D:");
        scanf("%d%d%d%d",&A,&B,&C,&D);
        opt=A/B*C-B+A*D/3;
        printf("The value of the operation is %d",opt);
}
```
Input & Output:-

Enter the values of A,B,C,D:2 5 9 3
The value of the operation is -3

d) J= (i++) + (++i)
Code:-
```c
#include<stdio.h>
Void main()
{
        Int i, j;
        printf("\n Enter values of I and J:");
        scanf("%d%d",&i,&j);
        j=(i++)+(++i);
        printf("The value of the operation is %d ",j);
}
```
Input&output:-

Enter values of I and J:12 88
The value of the operation is 26

ii) Find the maximum of three numbers using conditional operator

Code:-

```
#include<stdio.h>
Void main()
{
        Int a,b,c;
        printf("Enter three numbers:");
        scanf("%d%d%d",&a,&b,&c);
        ((a>b)&&(a>c)?printf("a is big"):(b>c)?printf("b is big"):printf("c is big"));
}
```

Input & output:-

Enter three numbers: 12 45 100

c is big

iii) Take marks of 5 subjects in integers, and find the total, average in float

Code:-

```
#include<stdio.h>
Void main()
{
        int m1,m2,m3,m4,m5;
        float total,avg;
        printf("\n Enter the subject marks m1,m2,m3,m4,m5:");
        scanf("%d%d%d%d%d",&m1,&m2,&m3,&m4,&m5);
        total=m1+m2+m3+m4+m5;
        avg=total/5;
        printf("\n The total and average marks are %f and%f",total,avg);
}
```

Input & output:-

Enter the subject marks m1, m2, m3, m4, m5:45 40 35 25 15
The total and average marks are 160.000000 and 32.000000