QMP 7.1 D/F

Channabasaveshwara Institute of Technology
(Affiliated to VTU, Belgaum & Approved by AICTE, New Delhi)
(**NAAC Accredited & ISO 9001:2015 Certified Institution)**
NH 206 (B.H. Road), Gubbi, Tumkur – 572 216. Karnataka

Department of Electronics & Communication Engineering

LABVIEW PROGRAMMING BASICS LABORATORY- BEC358A

B.E - III Semester

Lab Manual 2024-25

Name : _____

USN : _____

Batch :_____Section : _____

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Department of Electronics & Communication Engineering

LABVIEW PROGRAMMING BASICS
LABORATORY- BEC358A

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INSTITUTE VISION

To create centres of excellence in education and to serve the society by enhancing the quality of life through value based professional leadership.

INSTITUTE MISSION

- To provide high quality technical and professionally relevant education in a diverse learning environment.
- To provide the values that prepare students to lead their lives with personal integrity, professional ethics and civic responsibility in a global society.
- To prepare the next generation of skilled professionals to successfully compete in the diverse global market.
- To promote a campus environment that welcomes and honors women and men of all races, creeds and cultures, values and intellectual curiosity, pursuit of knowledge and academic integrity and freedom.
- To offer a wide variety of off-campus education and training programmes to individuals and groups.
- To stimulate collaborative efforts with industry, universities, government and professional societies.
- To facilitate public understanding of technical issues and achieve excellence in the operations of the institute.

QUALITY POLICY

Our organization delights customers (students, parents and society) by providing value added quality education to meet the national and international requirements. We also provide necessary steps to train the students for placement and continue to improve our methods of education to the students through effective quality management system, quality policy and quality objectives.

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Vision

To create globally competent Electronics and Communication Engineering professionals with ethical and moral values for the betterment of the society

Mission

- To nurture the technical/professional/engineering and entrepreneurial skills for overall self and societal upliftment through co-curricular and extra-curricular events.
- To orient the Faculty/Student community towards the higher education, research and development activities.
- To create the Centres of Excellence in the field of electronics and communication in collaboration with industries/Universities by training the faculty through latest technologies.
- To impart quality technical education in the field of electronics and communication engineering to meet over the current/future global industry requirements.

Program Educational Objectives (PEO's)

After four Years of Graduation, our graduates are able to:

- Provide technical solutions to real world problems in the areas of electronics and communication by developing suitable systems.
- Pursue engineering career in Industry and/or pursue higher education and research.
- Acquire and follow best professional and ethical practices in Industry and Society.
- Communicate effectively and have the ability to work in team and to lead the team.

Program Specific Outcomes (PSO's)

At the time of graduation, our graduates are able to:

- **PSO1**: Build Analog and Digital Electronic systems for Multimedia Applications, VLSI and Embedded Systems in Interdisciplinary Research / Development.
- **PSO2**: Design and Develop Communication Systems as per Real Time Applications and Current Trends

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Karnataka.

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

SYLLABUS

LabVIEW Programming Basics			
Course Code	**BEC358A**	CIE Marks	50
Teaching Hours/Week (L: T:P: S)	0:0:2:0	SEE Marks	50
Credits	01	Exam Hours	100

Course objectives:

- Aware of variousfront panel controls and indicators.
- Connect and manipulate nodes and wires in the block diagram.
- Locatevarious toolbars and pull-down menus for the purpose of implementing specific functions.
- Locate and utilize the context help window.
- Familiar with LabVIEW and different applications using it.
- Run a Virtual Instrument (VI).

Sl.No	**VI Programs (using LabVIEW software) to realize the following:**
1	Basic arithmetic operations: addition, subtraction, multiplication and division
2	Boolean operations: AND, OR, XOR, NOT and NAND
3	Sum of 'n' numbers using 'for' loop
4	Factorial of a given number using 'for' loop
5	Determine square of a given number
6	Factorial of a given number using 'while 'loop
7	Sorting even numbers using 'while' loop in an array
8	Finding the array maximum and array minimum
	Demonstration Experiments (For CIE)
9	Build a Virtual Instrument that simulates a heating and cooling system. The system must be able to be controlled manually or automatically.
10	Build a Virtual Instrument that simulates a Basic Calculator (using formula node).
11	Build a Virtual Instrument that simulates a Water Level Detector.
12	Demonstrate how to create a basic VI which calculates the area and perimeter of a circle.

Course outcomes (Course Skill Set):

At the end of the course the student will be able to:

1. Use Lab VIEW to create data acquisition, analysis and display operations
2. Create user interfaces with charts, graph and buttons
3. Use the programming structures and data types that exist in Lab VIEW
4. Use various editing and debugging techniques

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks). A student shall bedeemed to have satisfied the academic requirements and earned the credits allotted to each course.

The student has to secure not less than 35% (18 Marks out of 50) in the semester-end examination(SEE).

Continuous Internal Evaluation (CIE):

CIE marks for the practical course is **50 Marks**.

The split-up of CIE marks for record/ journal and test are in the ratio **60:40**.

- Each experiment to be evaluated for conduction with observation sheet and record write-up .Rubrics for the evaluation of the journal/write-up for hardware/software experiments designed by the faculty who is handling the laboratory session and is made known to students at the beginning of the practical session.
- Record should contain all the specified experiments in the syllabus and each experiment write-up will beevaluated for 10 marks.
- Total marks scored by the students are scaled downed to 30 marks (60% of maximum marks).
- Weightage to be given for neatness and submission of record/write-up on time.
- Department shall conduct 02 tests for 100 marks, the first test shall be conducted after the 8^{th} week of the semesterand the second test shall be conducted after the 14^{th} week of the semester.
- In each test, test write-up, conduction of experiment, acceptable result, and procedural knowledge will carry a weightage of 60% and the rest 40% for viva-voce.
- The suitable rubrics can be designed to evaluate each student's performance and learning ability. Rubrics suggested in Annexure-II of Regulation book
- The average of 02 tests is scaled down to **20 marks** (40% of the maximum marks).

The Sum of scaled-down marks scored in the report write-up/journal and average marks of two tests is the total CIE marks scored by the student.

Semester End Evaluation (SEE):

SEE marksfor the practical course is 50 Marks.

SEE shall be conducted jointly by the two examiners of the same institute, examiners are appointedbythe University

All laboratory experiments are to beincludedfor practical examination.

(Rubrics) Breakup of marks and the instructions printed on the cover page of the answer script to be strictly adhered to by the examiners. **OR** based on the course requirement evaluation rubrics shall bedecided jointly by examiners.

Students can pick one question (experiment) from the questions lot prepared by the internal /external examiners jointly.

Evaluation of test write-up/ conduction procedure and result/viva will be conducted jointly by examiners.

General rubrics suggested for SEE are mentioned here, writeup-20%, Conduction procedure and result in -60%, Viva-voce 20% of maximum marks. SEE for practical shall be evaluated for 100 marks and scored marks shall be scaled down to 50 marks (however, based on course type, rubrics shall be decided by the examiners)

Change of experiment is allowed only once and 15% Marks allotted to the procedure part to be made zero.

The duration of SEE is 03 hours

Rubrics suggested in Annexure-II of Regulation book

Suggested Learning Resources:

1. Virtual Instrumentation using LABVIEW, Jovitha Jerome, PHI, 2011
2. Virtual Instrumentation using LABVIEW, Sanjay Gupta, Joseph John, TMH, McGraw Hill,SecondEdition, 2011.

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Department of Electronics and Communication Engineering

LABVIEW PROGRAMMING BASICS LABORATORY:

Course Objectives and Outcomes

COURSE OBJECTIVES:

The main objectives of this lab are,

- Aware of various front panel controls and indicators.
- Connect and manipulate nodes and wires in the block diagram.
- Locate various toolbars and pull-down menus for the purpose of implementing specific functions.
- Locate and utilize the context help window.
- Familiar with LabVIEW and different applications using it.
- Run a Virtual Instrument (VI).

COURSE OUTCOMES:

After completing this course the student could be able to:

- **Demonstrate** Lab VIEW to create data acquisition, analysis and display operations.
- **Describe** user interfaces with charts, graph and buttons.
- **Illustrate** programming structures and data types that exist in Lab VIEW.
- **Apply** various editing and debugging techniques.

'Instructions to the Candidates'

- Student should come with thorough preparation for the experiment to be conducted.
- Student should take prior permission from the concerned faculty before availing the leave.
- Student should come with proper dress code and to be present on time in the laboratory.
- Student will not be permitted to attend the laboratory unless they bring the practical record fully completed in all respects pertaining to the experiment conducted in the previous class.
- Student will not be permitted to attend the laboratory unless they bring the observation book fully completed in all respects pertaining to the experiment to be conducted in present class.
- Experiment should be started conducting only after the staff-in-charge has checked the circuit diagram.
- All the calculations should be made in the observation book. Specimen calculations for one set of readings have to be shown in the practical record.
- Wherever graphs to be drawn, A-4 size graphs only should be used and the same should be firmly attached in the practical record.
- Practical record and observation book should be neatly maintained.
- Student should obtain the signature of the staff-in-charge in the observation book after completing each experiment.
- Theory related to each experiment should be written in the practical record before procedure in your own words with appropriate references.

CONTENTS

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Sl. No	Name of the Experiment	Date			Manual Marks (Max. 20)	Record Marks (Max. 10)	Signature (Student)	Signature (Faculty)
		Conductionn	Repetitionn	Submission of Record				
1	Basic arithmetic operations: addition, subtraction, multiplication and division							
2	Boolean operations: AND, OR, XOR, NOT and NAND							
3	Sum of 'n' numbers using 'for' loop							
4	Factorial of a given number using 'for' loop							
5	Determine square of a given number							
6	Factorial of a given number using 'while 'loop							
7	Sorting even numbers using 'while' loop in an array							
8	Finding the array maximum and array minimum							
9	Build a Virtual Instrument that simulates a heating and cooling system							
10	Build a Virtual Instrument that simulates a Basic Calculator							
11	Build a Virtual Instrument that simulates a Water Level Detector							
12	Demonstrate how to create a basic VI which calculates the area and perimeter ofa circle							
Average								

INTRODUCTION to LABVIEW

LabVIEW :

LabVIEW is a program development environment, much like modern C or BASIC development environments, and National Instruments Lab Windows/CVI. However, LabVIEW is different from those applications in one important respect. Other programming systems use text-based languages to create lines of code, while LabVIEW uses a graphical programming language, G, to create programs in block diagram form.

LabVIEW, like C or BASIC, is a general-purpose programming system with extensive libraries of functions for any programming task. LabVIEW includes libraries for data acquisition, GPIB and serial instrument control, data analysis, data presentation, and data storage. LabVIEW also includes conventional program development tools, so you can set breakpoints, animate the execution to see how data passes through the program, and single-step through the program to make debugging and program development easier.

Virtual Instrument:

A virtual instrument (VI) is a program in the graphical programming language G. Virtual instrument front panels often have a user interface similar to physical instruments. G also has built-in functions that are similar to VIs, but do not have front panels or block diagrams as VIs do. Function icons always have a yellow background.

VIs is structured as follows:

- The interactive user interface of a VI is called the front panel, because it simulates the panel of a physical instrument. The front panel can contain knobs, push buttons, graphs, and other controls and indicators. You enter data using a mouse and keyboard, and then view the results on the computer screen.

- The VI receives instructions from a block diagram, which you construct in G. The block diagram is a pictorial solution to a programming problem. The block diagram is also the source code for the VI.

- VIs are hierarchical and modular. You can use them as top-level programs, or as subprograms within other programs. A VI within another VI is called a subVI. The icon and connector of a VI work like a graphical parameter list so that other VIs can pass data to a subVI.

G Programming:

G is the easy to use graphical data flow programming language on which LabVIEW is based. G simplifies scientific computation, process monitoring and control, and test and measurement applications, and you also can use it for a wide variety of other applications.

Part I, Introduction to G Programming, covers the functionality of G that you need to get started with most LabVIEW applications. The basic concepts of G that are covered in this manual are described in the following list.

VIs—Virtual instruments (VIs) have three main parts: the front panel, the block diagram, and the icon/connector. The front panel specifies the user interface of the VI. The block diagram consists of the executable code that you create using nodes, terminals, and wires. With the icon/connector, you can use a VI as a subVI in the block diagram of another VI.

Loops and Charts—G has two structures to repeat execution of a sub-diagram—the While Loop and the For Loop. Both structures are resizable boxes. You place the subdiagram to be repeated inside the border of the loop structure. The While Loop executes as long as the value at the conditional terminal is TRUE. The For Loop executes a set number of times. Charts are used to display real-time trend information to the operator.

Case and Sequence Structures—The Case structure is a conditional branching control structure, which executes a subdiagram based on certain input. A Sequence structure is a program control structure that executes its subdiagrams in numeric order. For more information about Case or Sequence structures, refer to Chapter 4, Case and Sequence Structures and the Formula Node.

Attribute Nodes—Attribute nodes are special block diagram nodes that you can use to control the appearance and functional characteristics of controls and indicators. For more information about attribute nodes, refer to Chapter 27, Front Panel Object Attributes.

Arrays, Clusters and Graphs—An array is a resizable collection of data elements of the same type. A cluster is a statically sized collection of data elements of the same or different types. Graphs commonly are used to display data. For more information about arrays, clusters, and graphs, refer to Chapter 5, Arrays, Clusters, and Graphs.

Organization of the LabVIEW System(Windows):

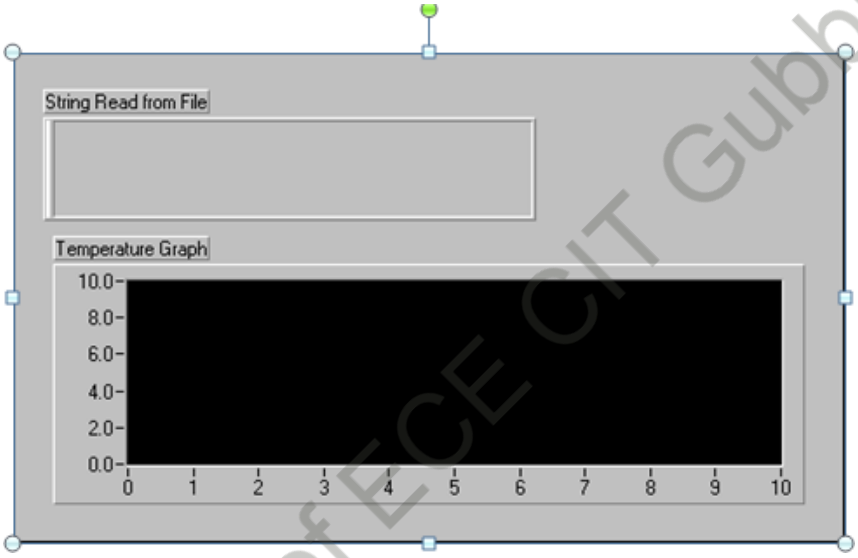
LabVIEW directory should contain the following files.

- LABVIEW.EXE—This is the LabVIEW program. Launch this program to start LabVIEW.
- vi.lib directory—Contains libraries of VIs that are included with LabVIEW, including GPIB, analysis, and data acquisition (DAQ) VIs. Most of these are available from the Functions palette.
- examples directory—Contains numerous subdirectories of examples. This directory also contains a VI called readme.vi that serves as a guide to the examples.
- serpdrv and daqdrv—These files serve as part of LabVIEW's interface to the serial port, and DAQ communication, respectively. These files must be in the same directory as vi.lib.
- resource directory
  - labview.rsc, lvstring.rsc, and lvicon.rsc—Data files used by the LabVIEW application
  - (Windows 3.1) lvdevice.dll—This file provides timing services to LabVIEW and must be in the same directory as vi.lib for LabVIEW to run.
  - (Windows 3.1) lvimage.dll—This file allows LabVIEW to load images created using a variety of graphics programs.
  - labview50.tlb—This file is a type library to enable LabVIEW to act as an ActiveX server.
  - ole_container.dll—This file enables LabVIEW to display and update ActiveX containers.
  - lvwutil32.dll—This file is used by the Solution Wizard, which builds DAQ and Instrument I/O examples based on your criteria.
  - lvjpeg.dll and lvpng.dll—These files provide support to display JPEG and PNG graphics in HTML files when you print VI documentation to an HTML file.
- Cintools directory—Contains files necessary to build Code Interface Nodes (CINs), which are a means to link C code to LabVIEW VIs.
- visarc file—Serves as part of LabVIEW's interface to VISA (Virtual Instrument Software Architecture). VISA provides a single interface library for controlling VXI, GPIB, and Serial instruments.
- labview.ini—Contains the configuration options for LabVIEW.
- Project directory—Contains files which become items in the LabVIEW Project menu.
- menus directory— Contains files used to configure the structure of the Controls and Functions palettes.

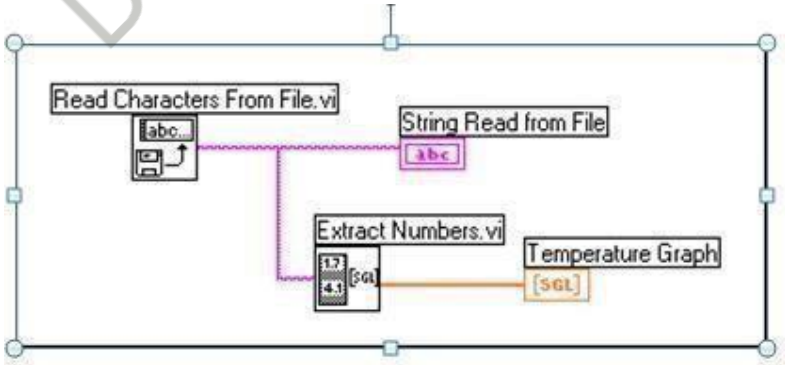
- Instr.lib directory—Contains instrument drivers used to control VXI, GPIB, and Serial instruments. When you install National Instruments instrument drivers, place them in this directory because they will be added to the Functions palette.
- Help directory—Contains complete online documentation as well as the Search Examples help file, which aids in locating examples common to your application.
- Tutorial directory—Contains files that are necessary to run the online tutorial, an interactive tutorial covering the basic concepts of the LabVIEW environment.
- Activity directory—Is a location where you can save the VIs you create while completing the activities in this manual.
- User.lib directory—Is a location where you can save commonly used VIs that you have created. The VIs in this directory will be displayed in the Functions palette.
- Wizard directory—This directory creates the Solution Wizard option in the File menu. You can use this directory to add items to the File menu.

Steps to Run LabVIEW Software:

- Open a new front panel and build the front panel shown in the following illustration.



- The front panel contains a string indicator and a waveform graph. The String Read from File indicator displays the comma delimited temperature data from the file you wrote in the previous activity. The graph displays the temperature curve.
- Build the block diagram as shown in the following illustration



- The Read Characters From File VI (Functions»File I/O) reads the data from the file and outputs the information in a string. If no path name is specified, a file dialog box prompts you to enter a file name.
- You must know how the data was stored in a file in order to read the data back out. If you know how long a file is, you can use the Read Characters From File VI to determine the known number of characters to read.
- The Extract Numbers VI (Examples\General\strings.llb) takes an ASCII string containing numbers separated by commas, line feeds, or other non-numeric characters and converts them to an array of numerics.
- Return to the front panel and run the VI. Select the data file you just wrote to disk when the file dialog box prompts you. You should see the same data values displayed in the graph as you saw in the Write Temperature to File VI example.
- Save the VI, name it Temperature from File.vi, and close the VI.

PART-A

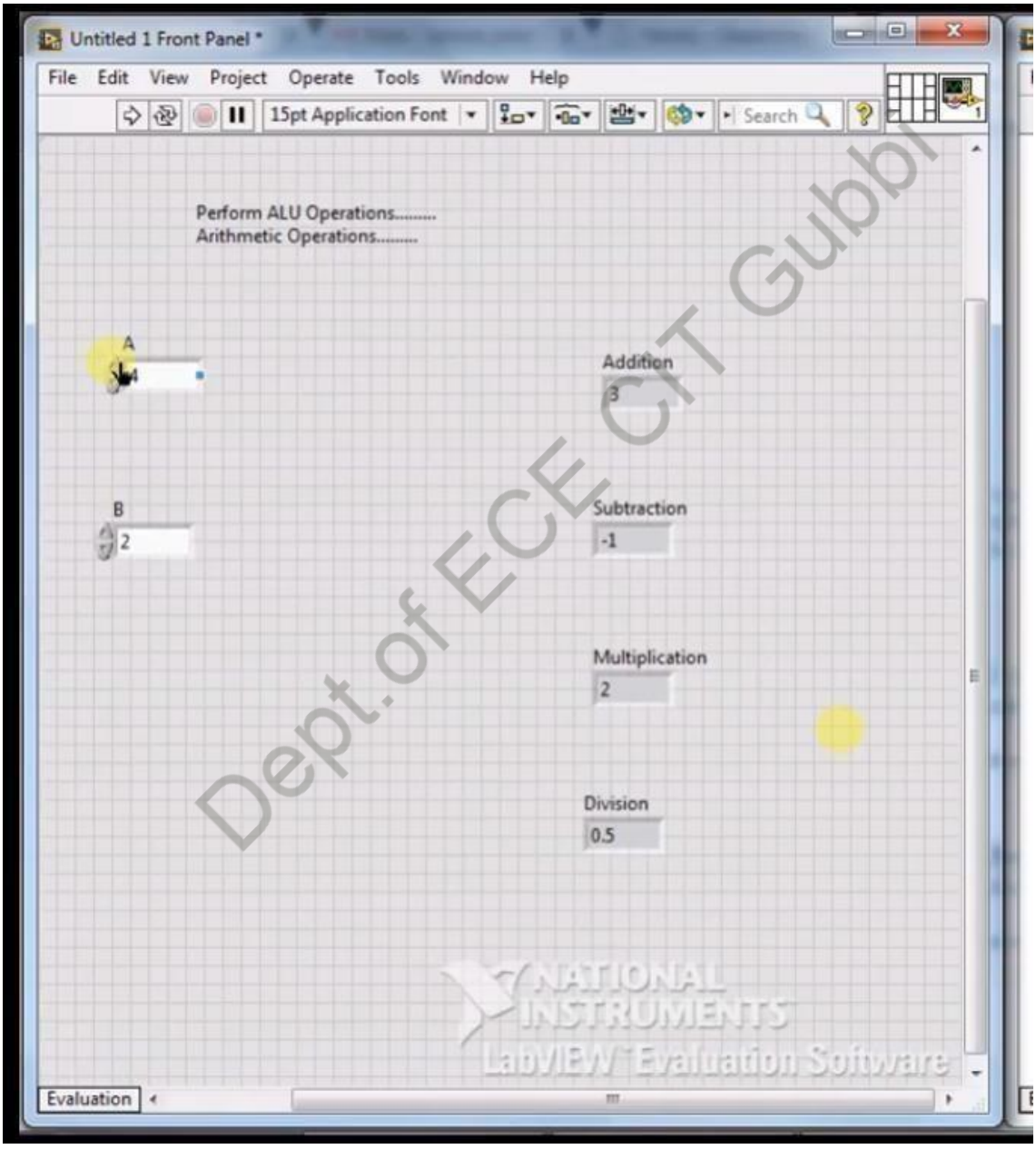
Experiment No. 1 **Date:**

Basic Arithmetic Operations

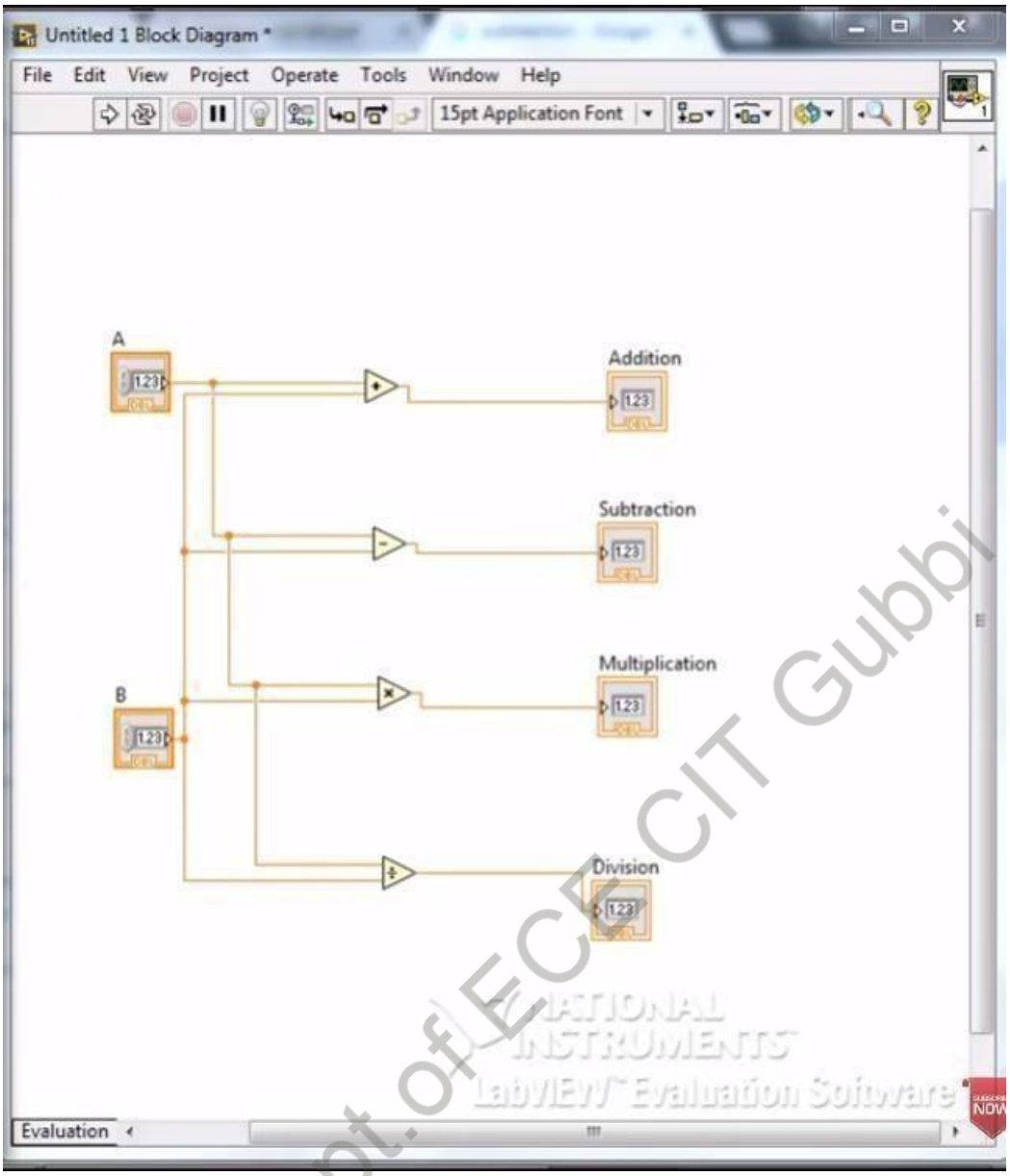
Aim:

To realize Basic arithmetic operations: addition, subtraction, multiplication and division.

Front Panel Window:



Block Diagram Window:



Procedure:

1) Select the components as shown in the front panel window
2) Make the connections as shown in the block diagram window
3) Give the input to input port
4) Check the output and verify the output conditions.

Result:

Let Inputs are A=5 and B=15

Output:

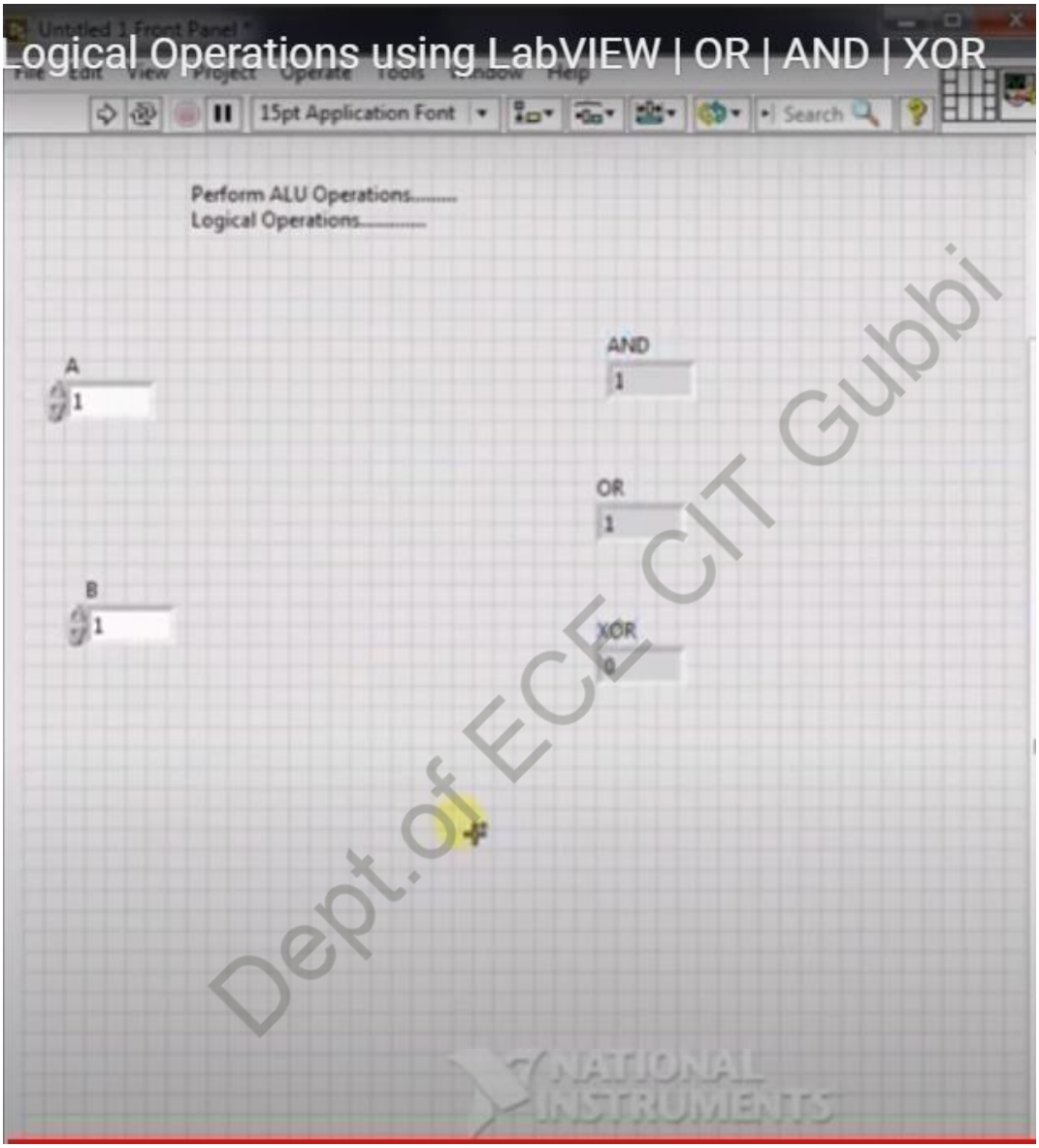
Experiment No. 2 **Date:**

Boolean Operations

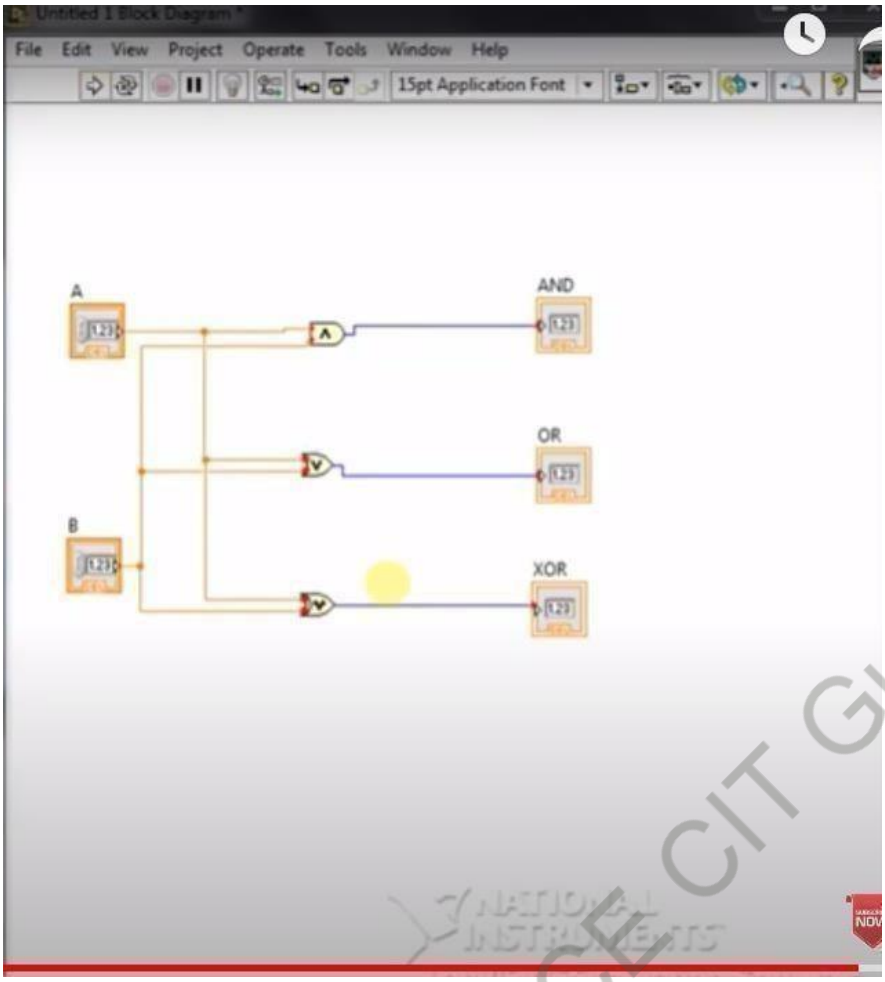
Aim:

To realize Boolean operations: AND, OR, XOR, NOT and NAND.

Front Panel Window:



Block Diagram Window:



Procedure:

1) Select the components as shown in the front panel window.
2) Make the connections as shown in the block diagram window.
3) Give the input to input port.
4) Check the output and verify the truth table.

Result:

Let

Inputs are A=1 and B=1

Output:

AND=

OR=

XOR=

NOT=

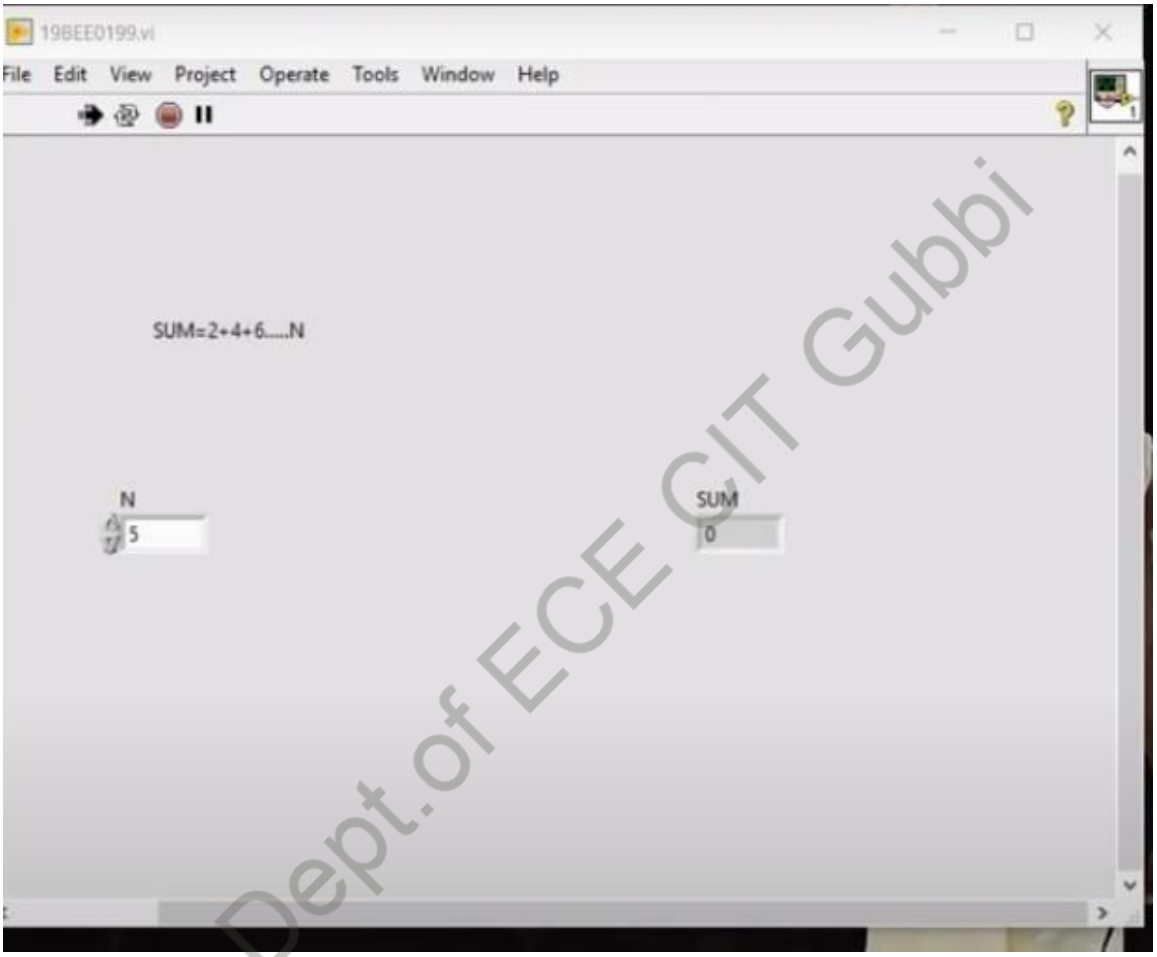
NAND=

Experiment No. 3 **Date:**

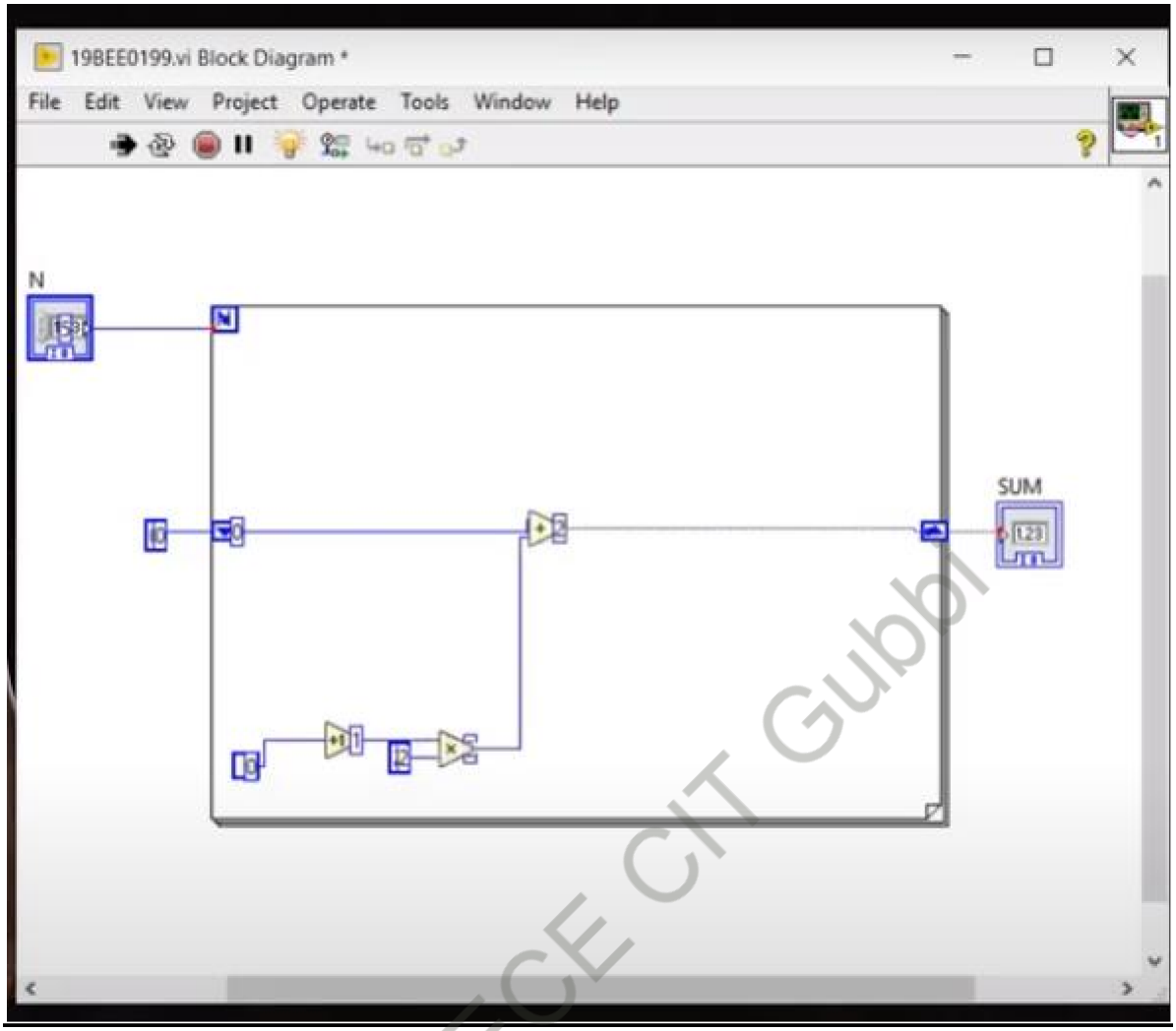
Sum of 'n' Numbers

Aim: To realize Sum of 'n' numbers using 'for' loop.

Front Panel Window:



Block Diagram Window:



Procedure:

1) Select the components as shown in the front panel window.
2) Make the connections as shown in the block diagram window.
3) Give the input to input port.(for example N=5).
4) Check the output and verify the output.

Result:

N=5

Output=

Experiment No. 4 **Date:**

Factorial of given number

Aim: To realize Factorial of a given number using 'for' loop.

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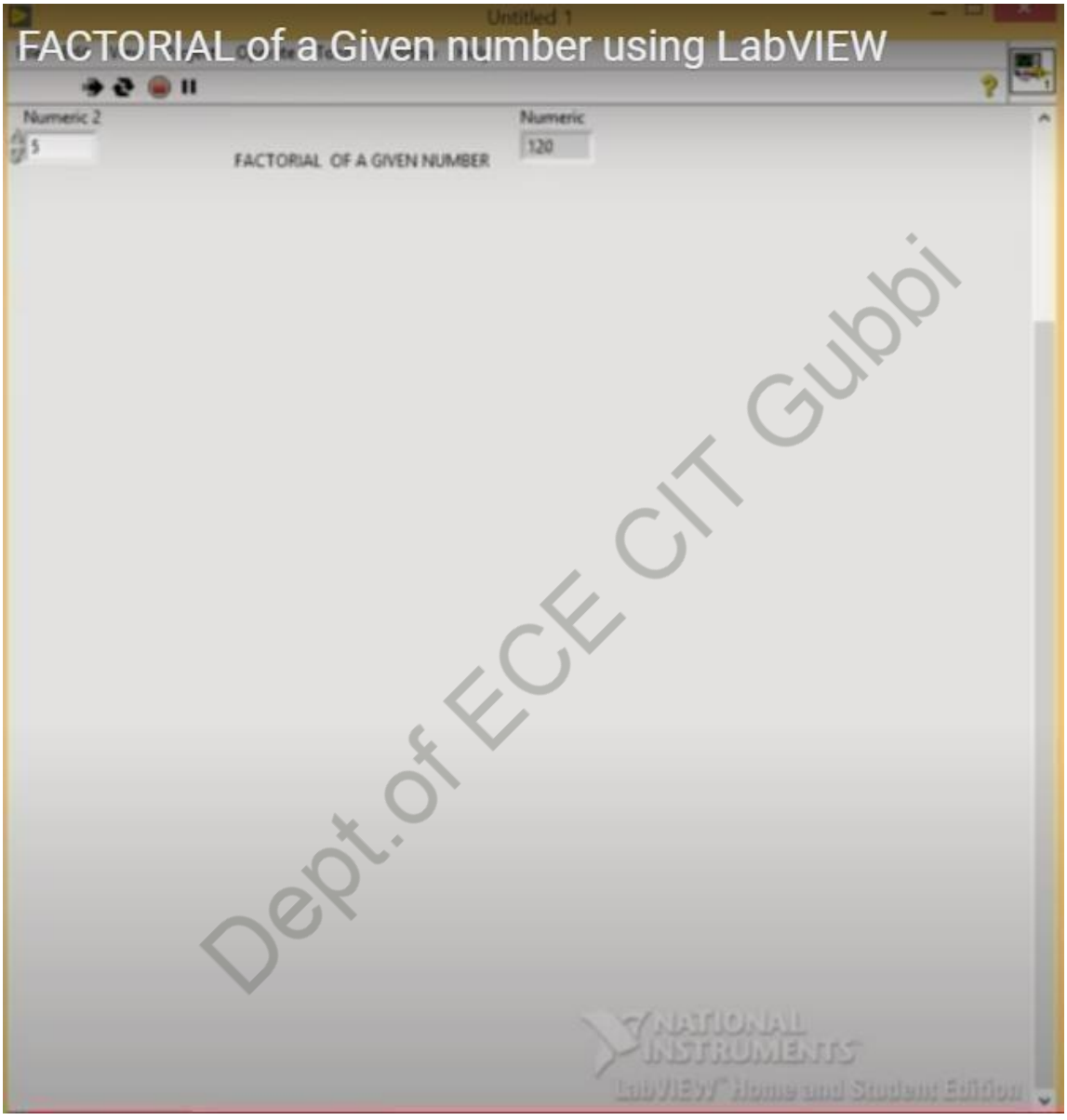
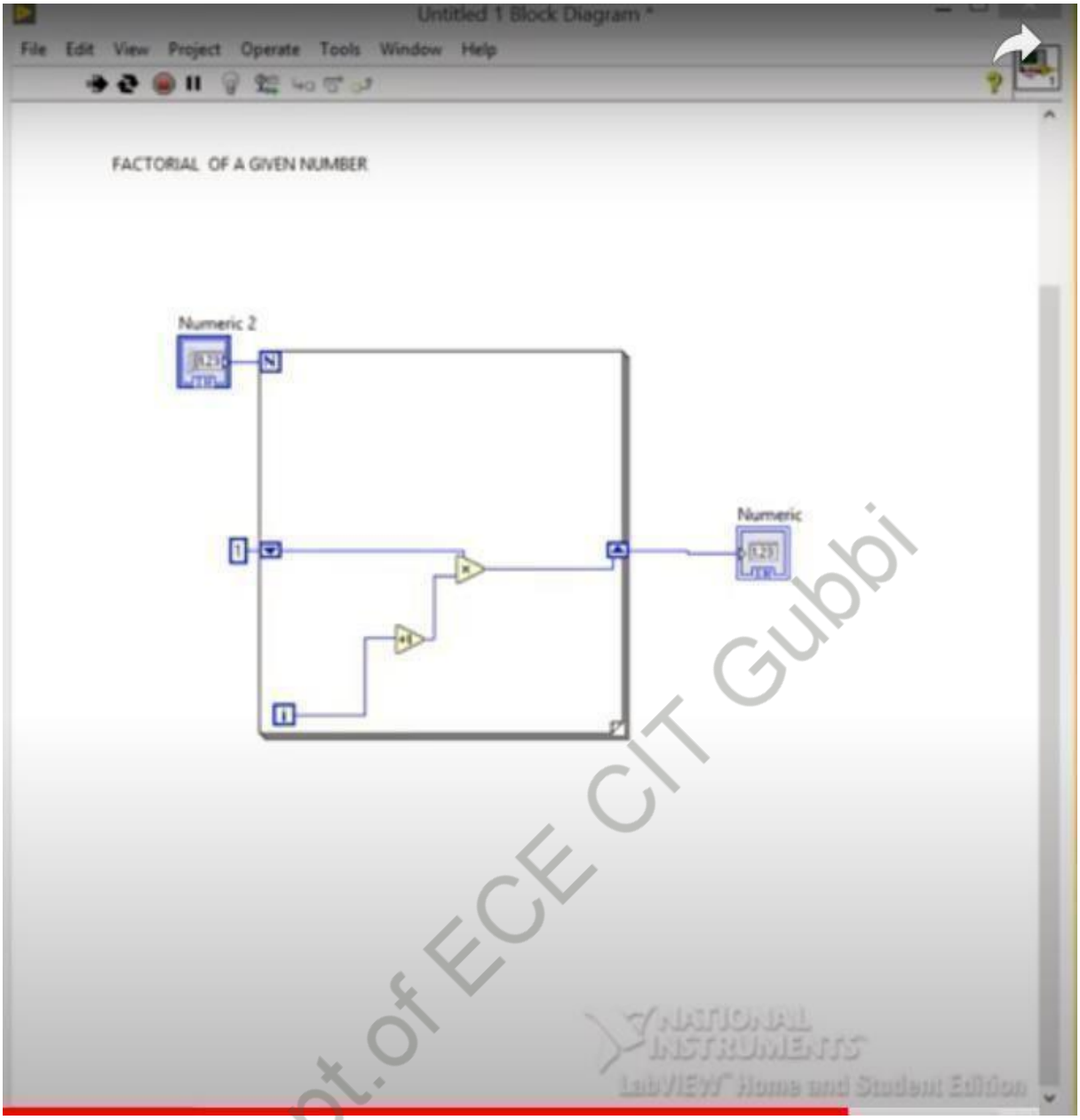
Front Panel Window:



Block Diagram Window:



Procedure:

1) Select the components as shown in the front panel window.
2) Make the connections as shown in the block diagram window.
3) Give the input to input port.(for example N=5)
4) Check the output and verify the output.

Result:

Let

N=5

Output=

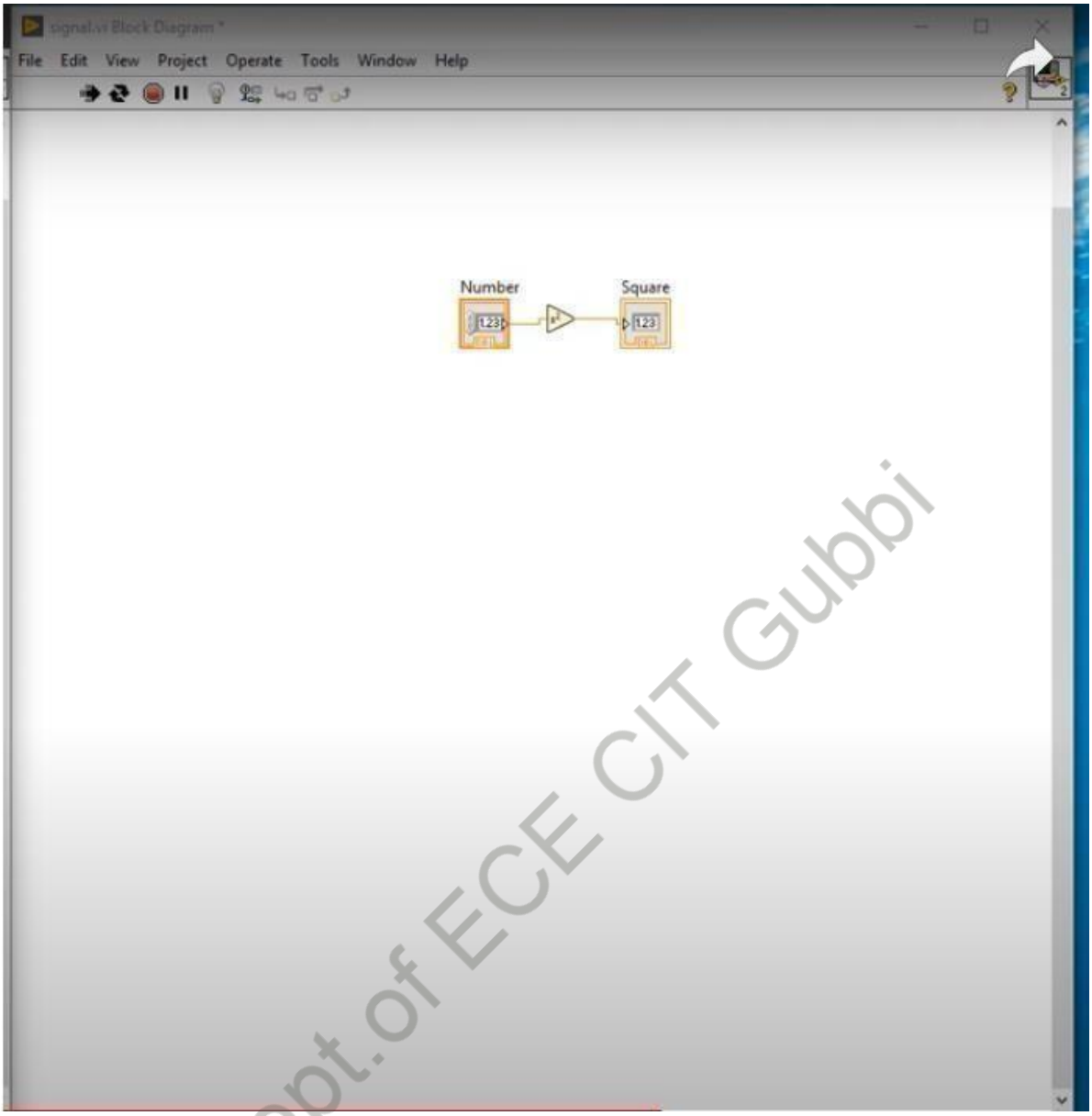
Experiment No. 5 **Date:**

Square of a Given Number

Aim: To realize square of a given number.

Front Panel Window:

Block Diagram Window:



Procedure:

1) Select the components as shown in the front panel window.
2) Make the connections as shown in the block diagram window.
3) Give the input to input port.(for example Number=10)
4) Check the output and verify the output.

Result:

Number=10

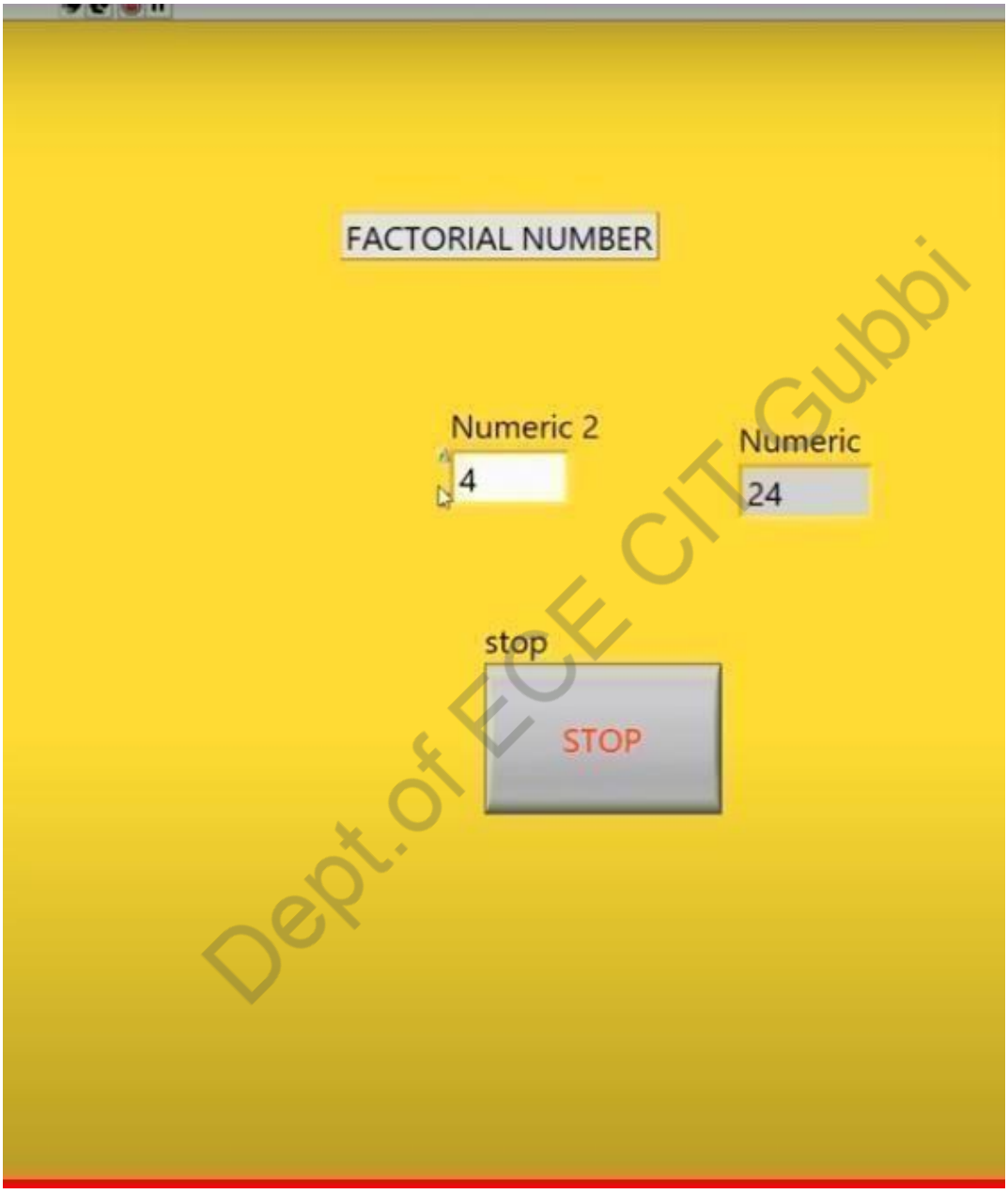
Output=

Experiment No. 6 **Date:**

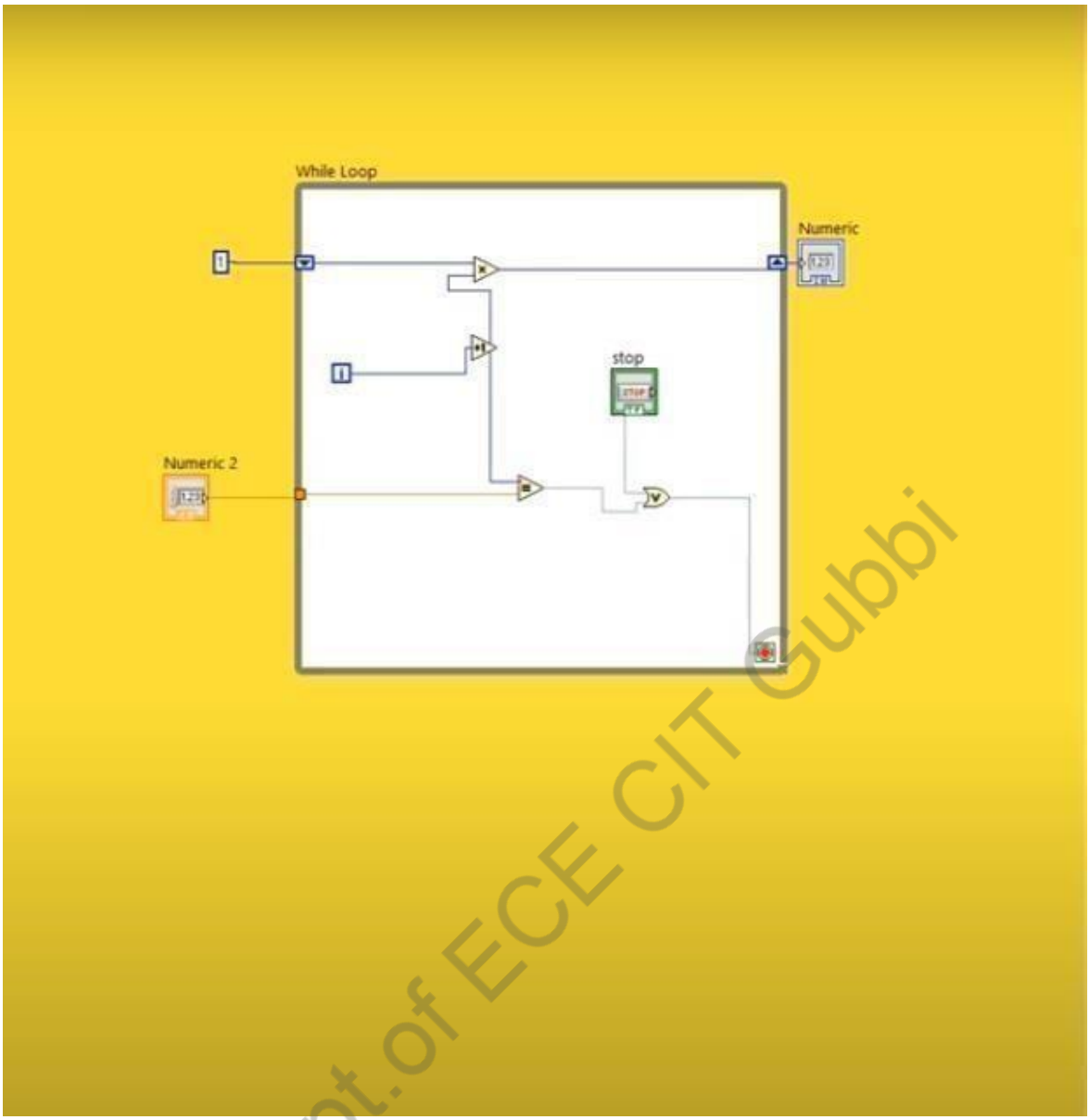
Factorial of given number

Aim: To realize Factorial of given number using while loop.

Front Panel Window:



Block Diagram Window:



Procedure:

1) Select the components as shown in the front panel window.
2) Make the connections as shown in the block diagram window.
3) Give the input to input port.(for example Number=4)
4) Check the output and verify the output.

Result:

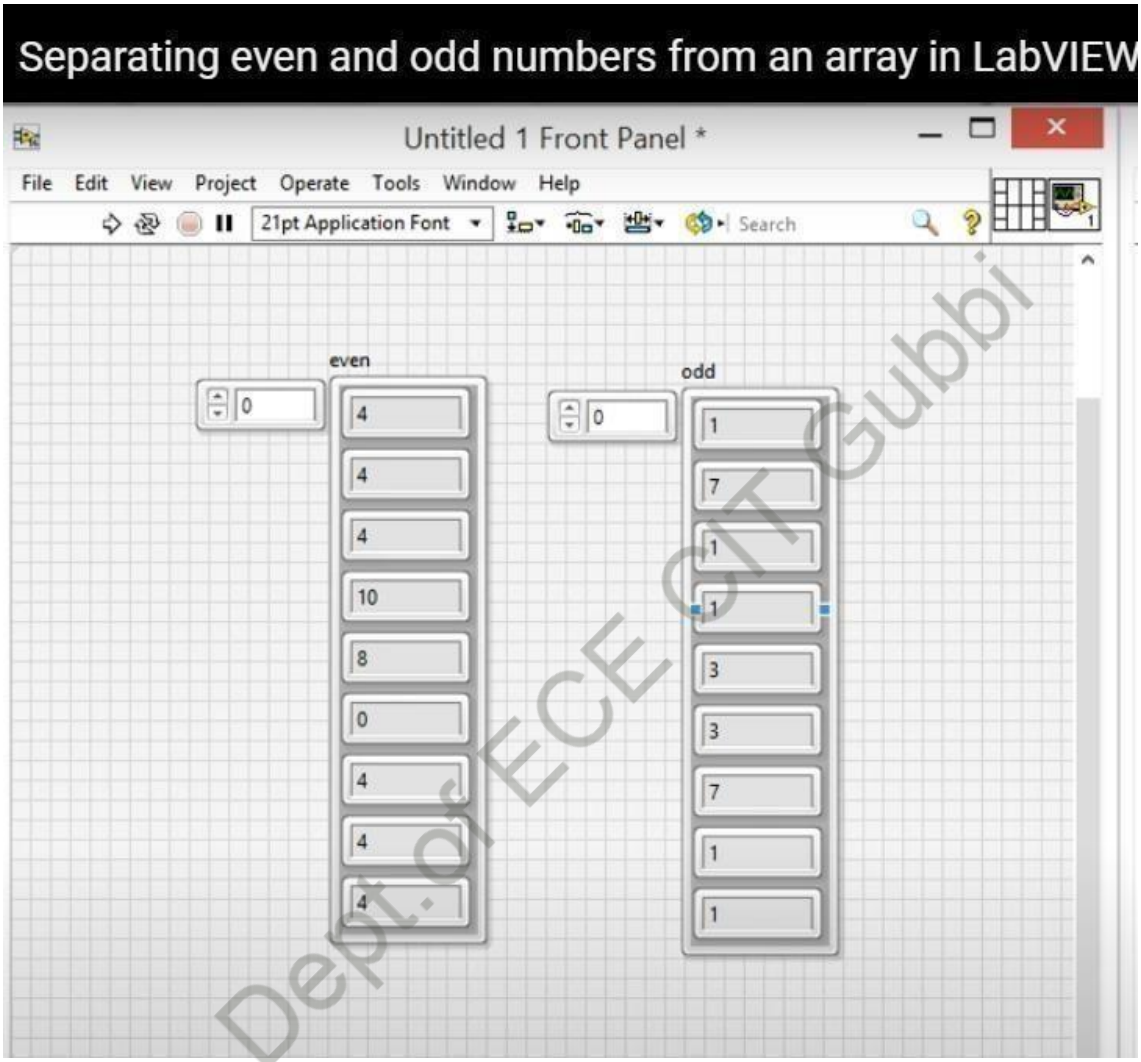
Factorial Number=4!
Output=

Experiment No. 7 **Date:**

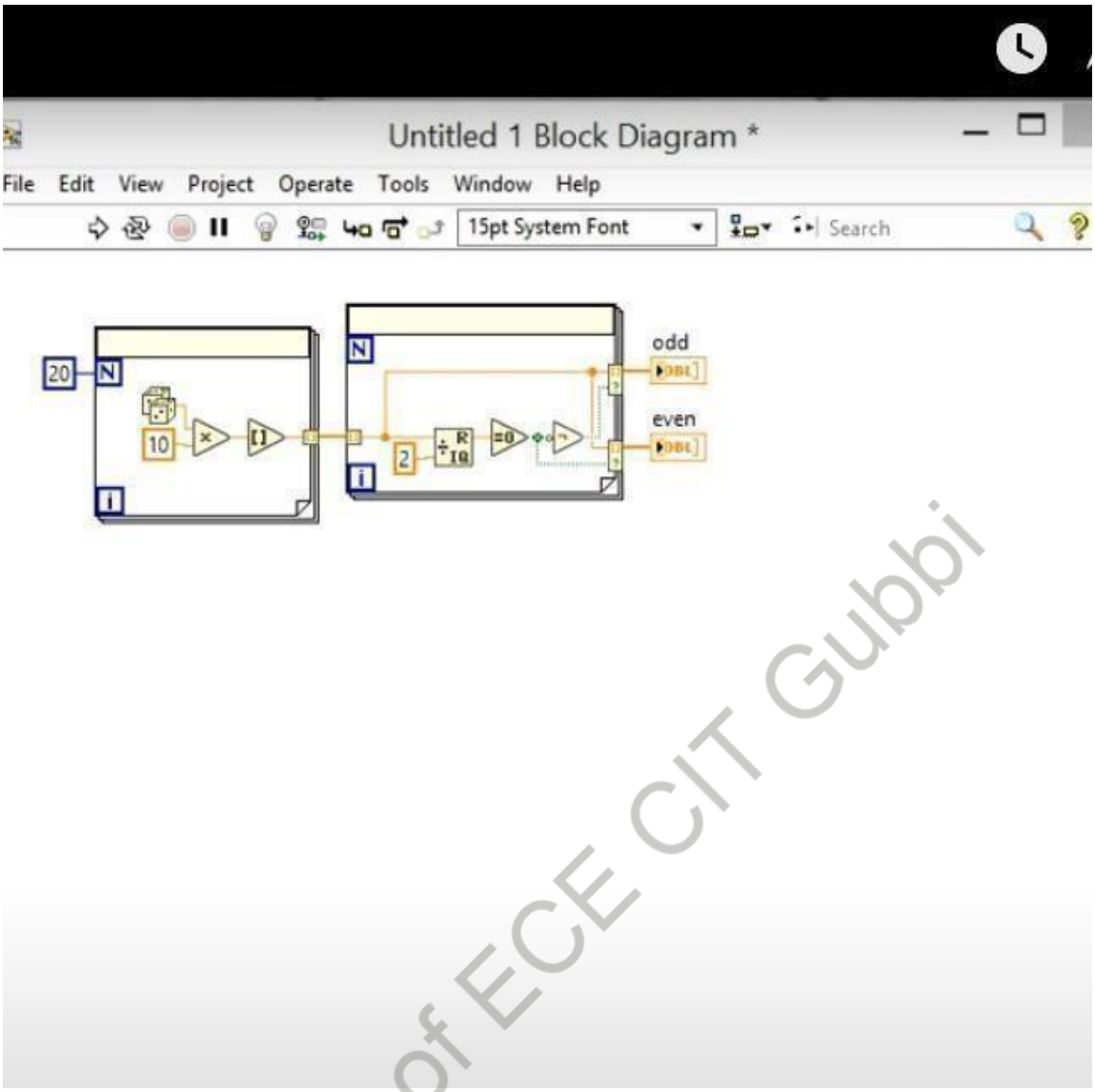
Sorting even and odd numbers

Aim: To sorting even and odd numbers using 'while' loop in an array.

Front Panel Window:



Block Diagram Window:



Result:

Array Even Number=

Odd Number=

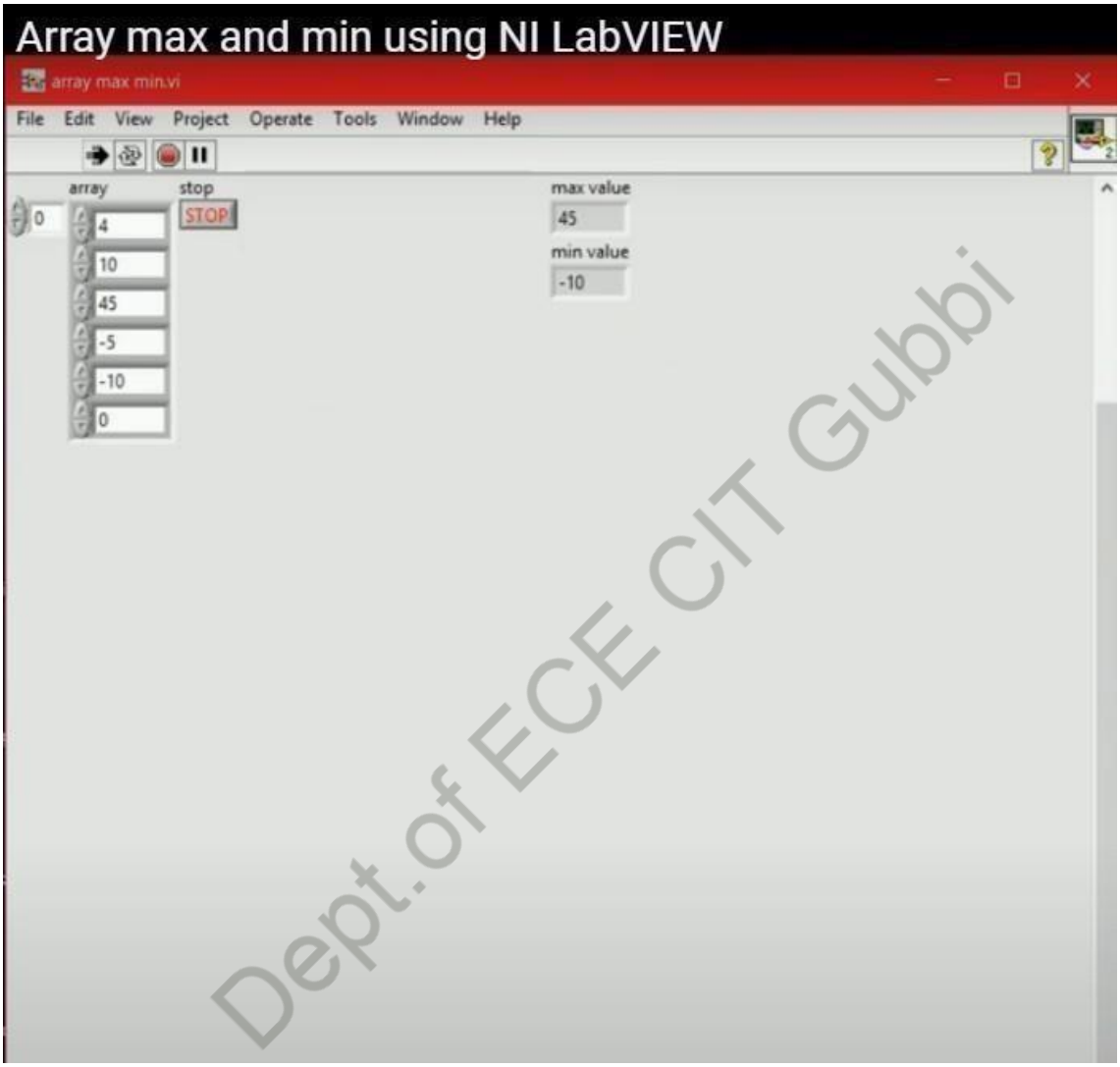
10
5
25
8
7
9
11
2

Experiment No. 8 **Date:**

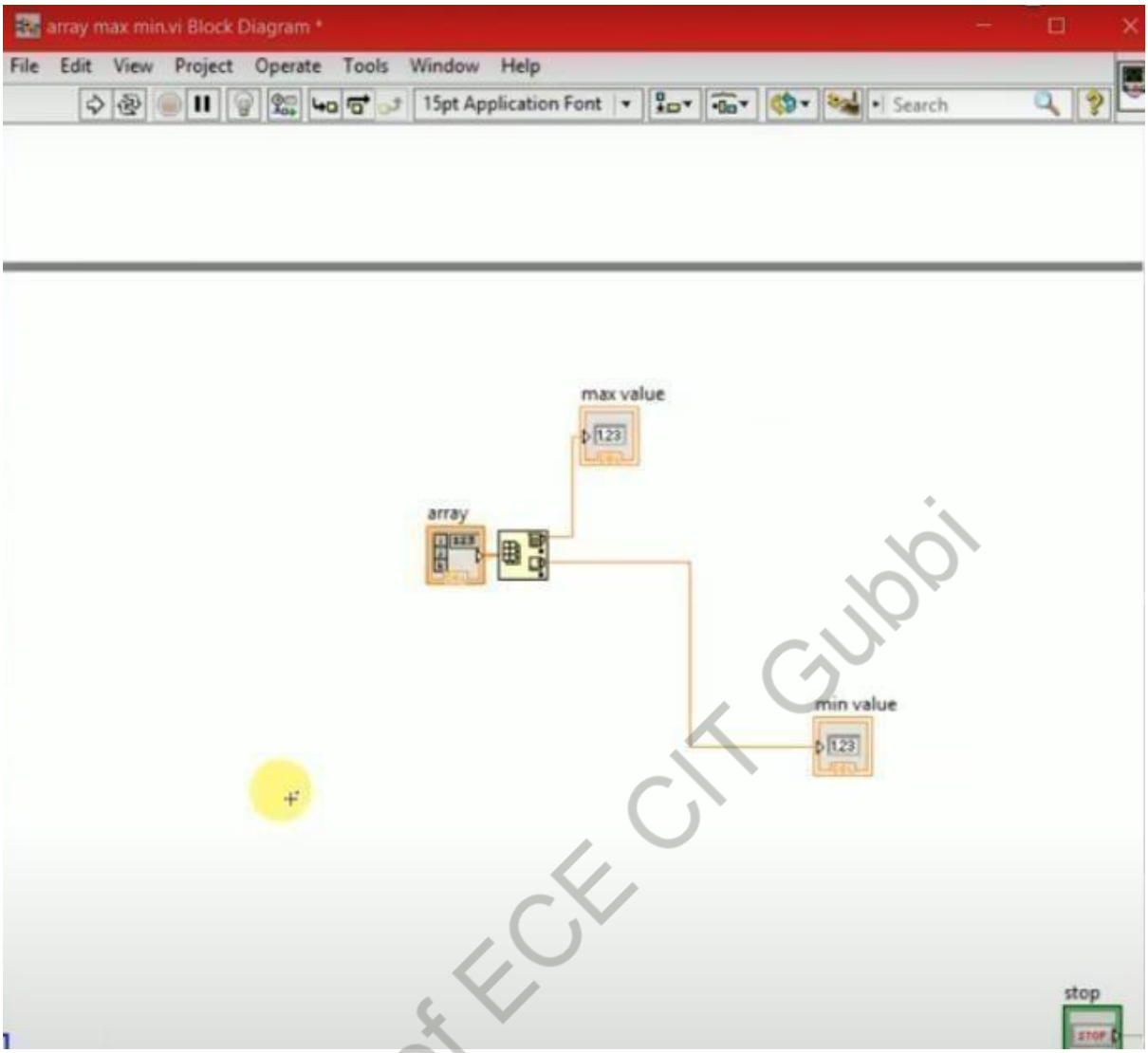
Array maximum and Array minimum

Aim: To finding the array maximum and array minimum.

Front Panel Window:



Block Diagram Window:



Result:

Array Maximum=
Array Minimum=

Array

50
15
5
6
4
9
19
1

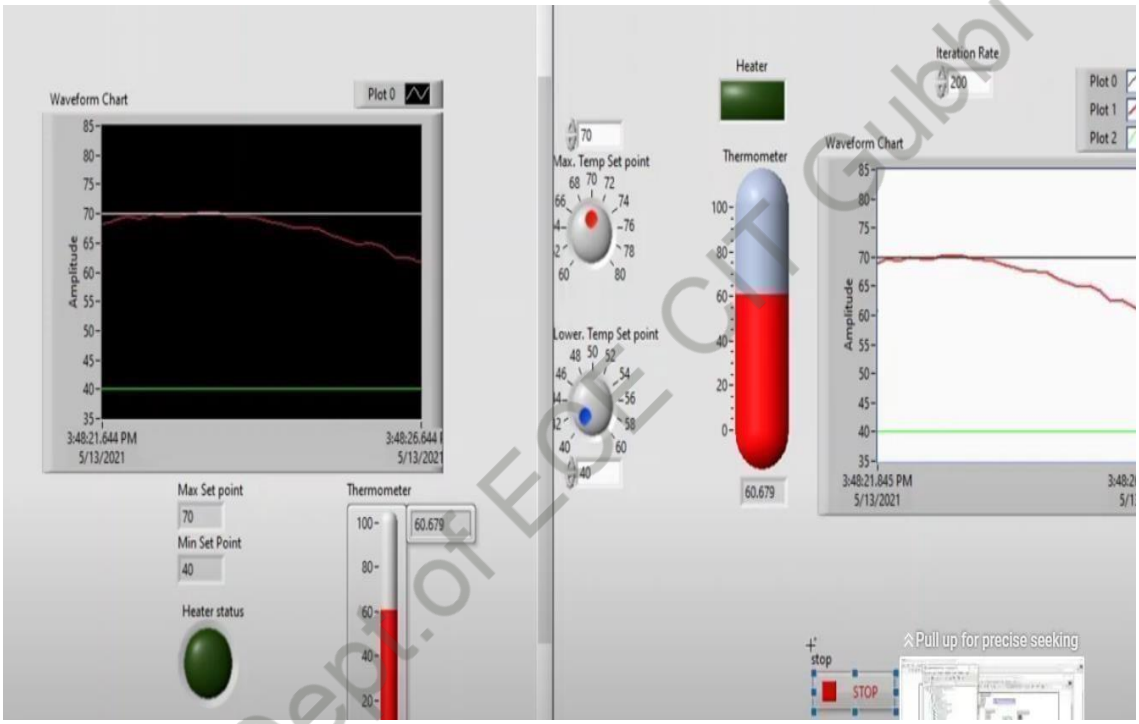
PART-B

Experiment No. 9 **Date:**

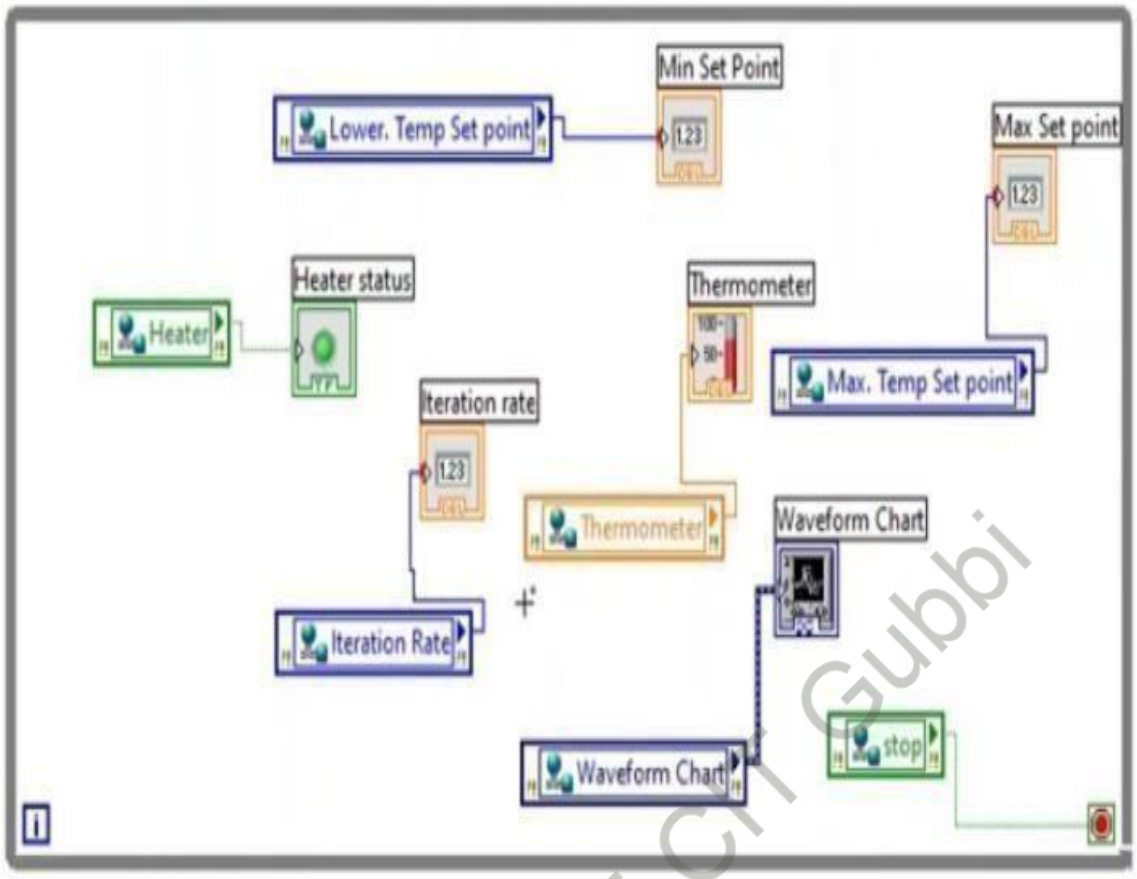
Heating and Cooling System

Aim: To Build a Virtual Instrument that simulates a heating and cooling system.

Front Panel Window:



Block Diagram Window:



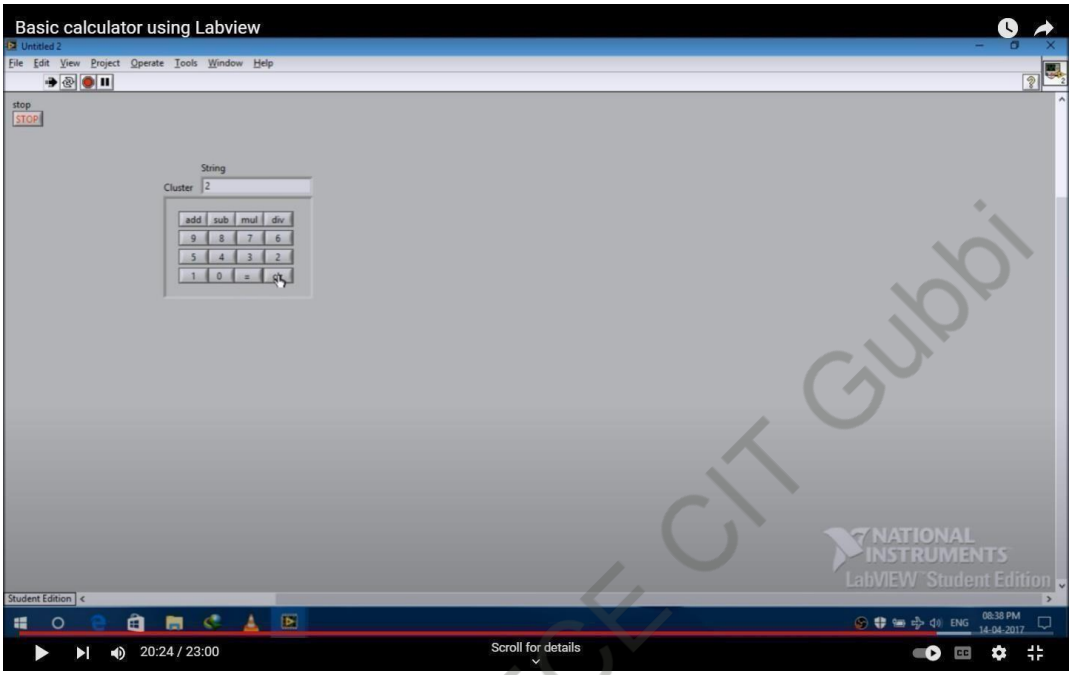
Result:

Experiment No. 10 **Date:**

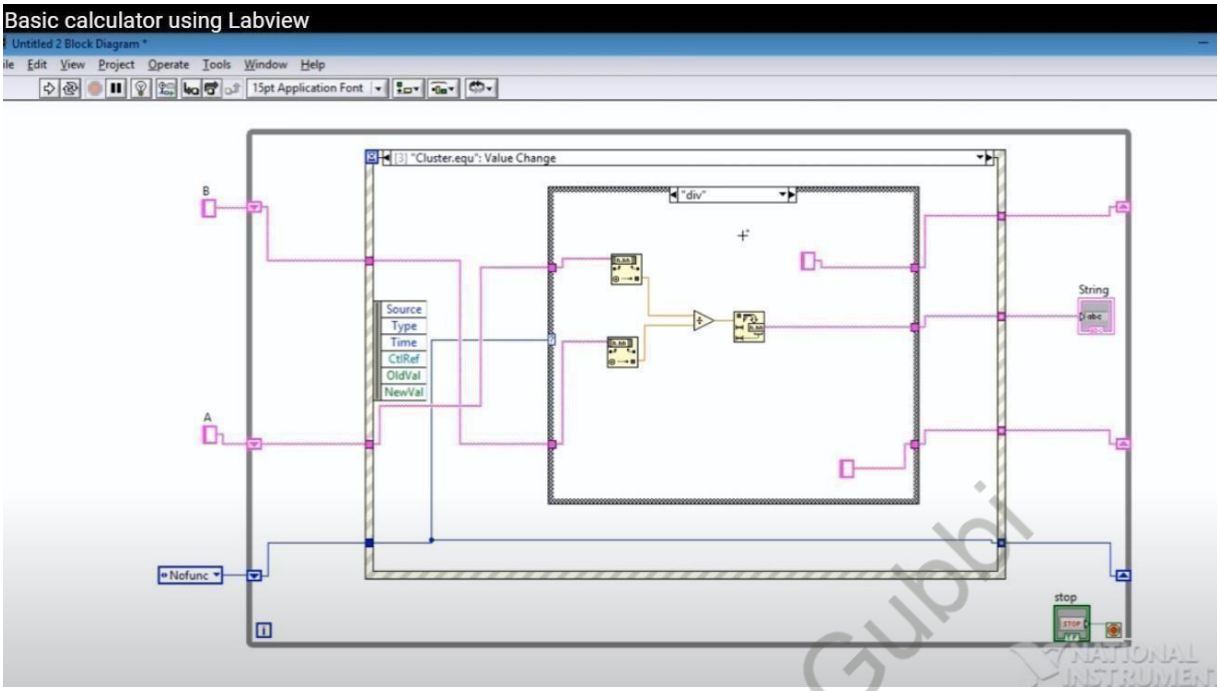
Basic Calculator

Aim: To Build a Virtual Instrument that simulates a Basic Calculator.

Front Panel Window:



Block Diagram Window:



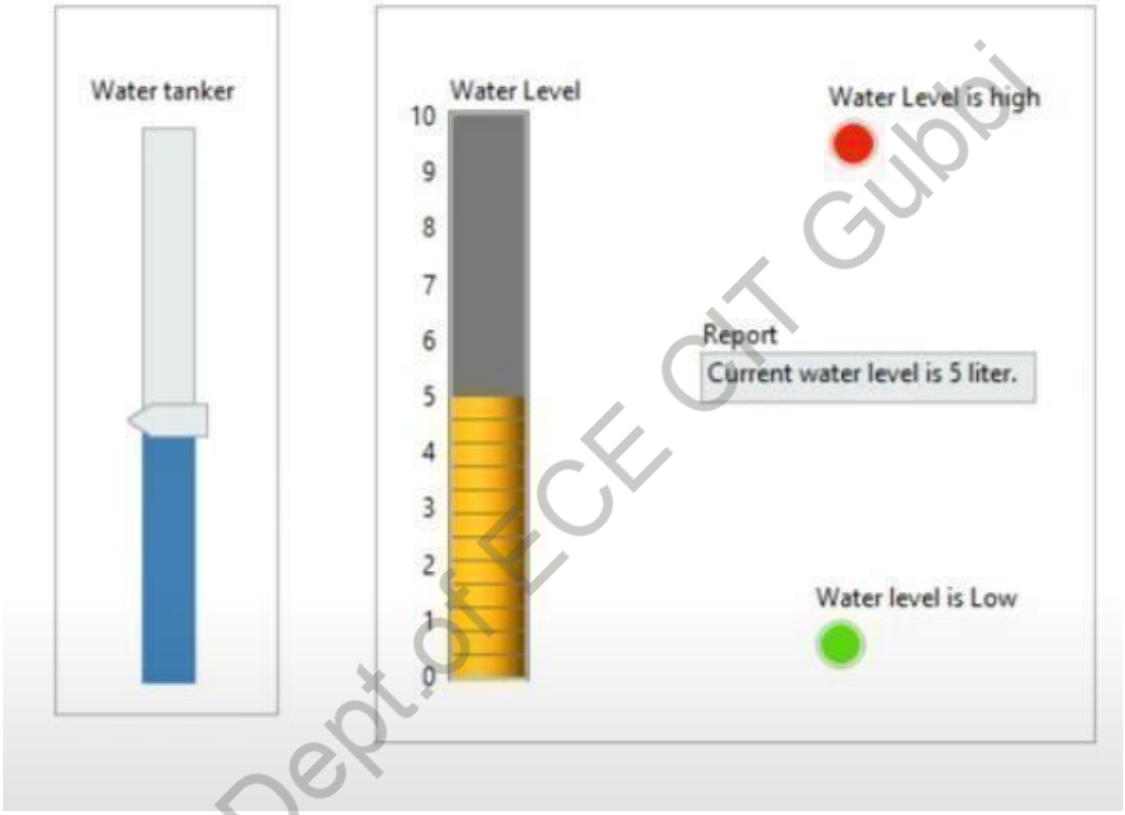
Result:

Experiment No. 11 **Date:**

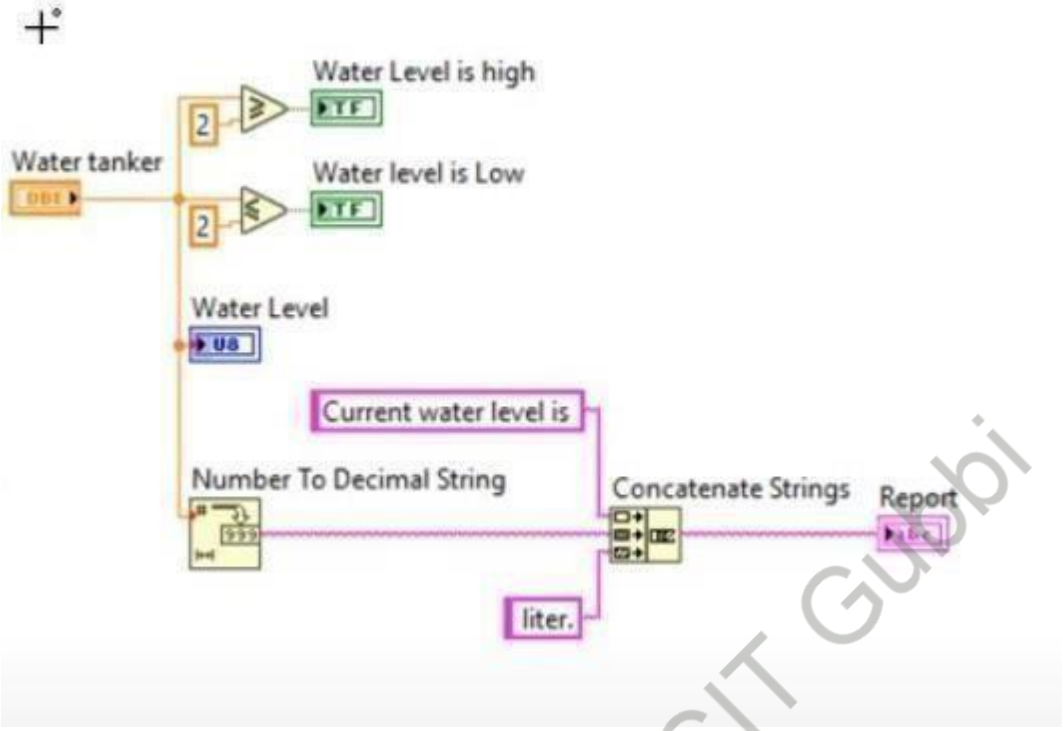
Water Level Detector

Aim: To Build a Virtual Instrument that simulates a Water Level Detector.

Front Panel Window:



Block Diagram Window:



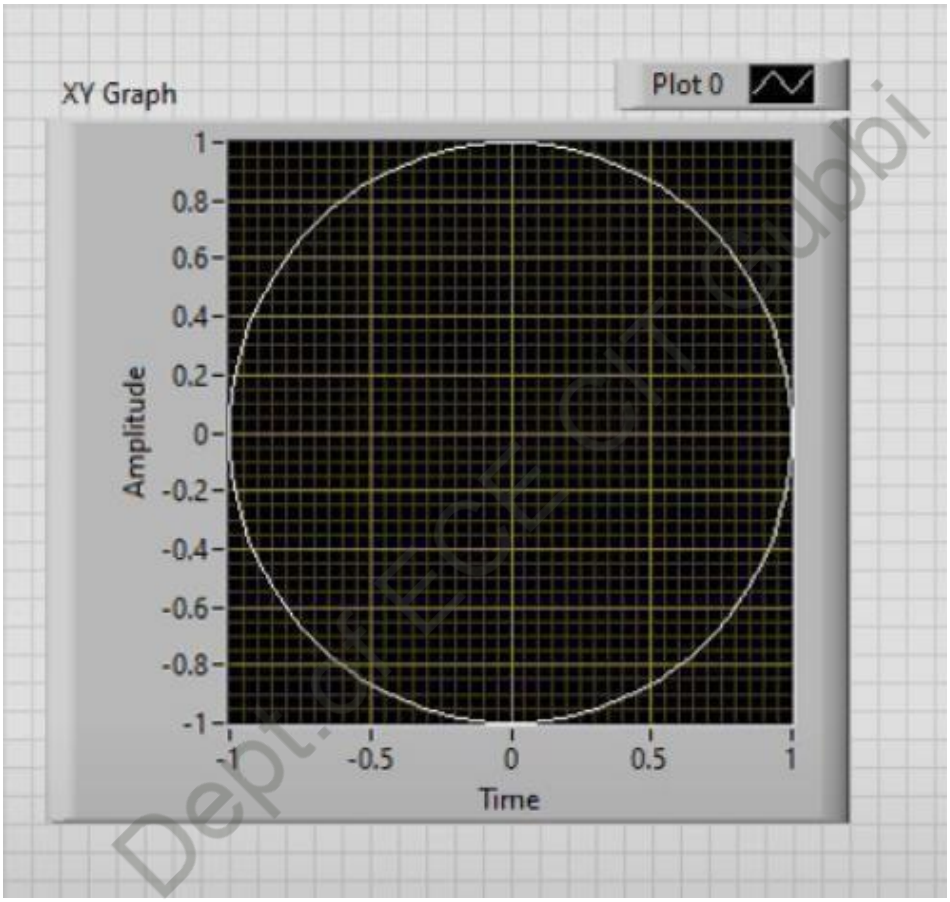
Result:

Experiment No. 12 **Date:**

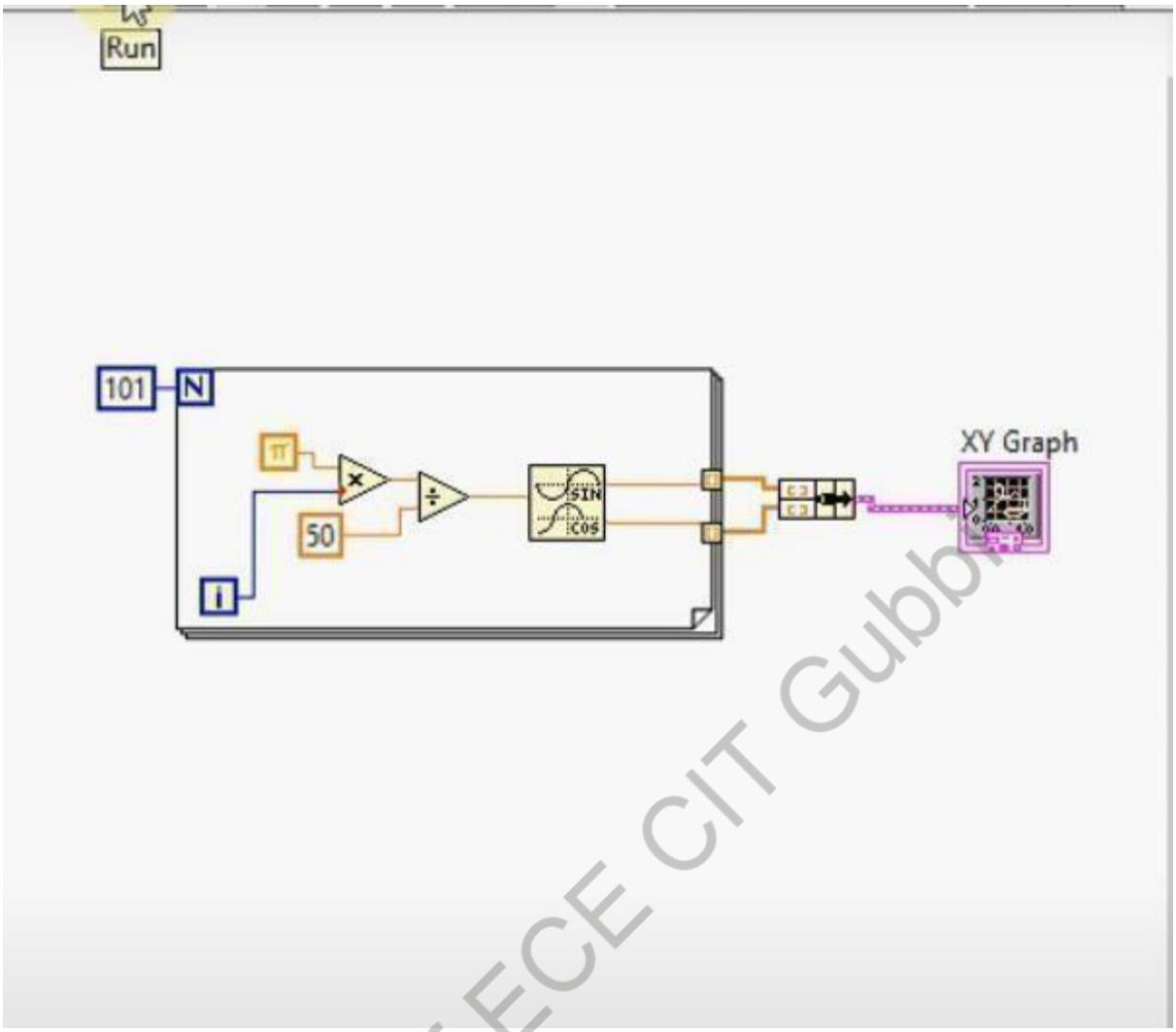
Area and Perimeter of a Circle.

Aim: To create a basic Virtual Instrument to calculates the area and perimeter of a circle.

Front Panel Window:



Block Diagram Window:



Result:

VIVA QUESTIONS

1. What is LabVIEW?
2. What is the Abbreviation of LabVIEW?
3. Why do we need LabVIEW?
4. What are the advantages of LabVIEW?
5. Name the types of panels used in LabVIEW?
6. What is the block diagrampanel?
7. What is the Front Panel?
8. Name the building block of LabVIEW?
9. Which company is the vendor of LabVIEW software?
10. What is VirtualInstrument in LabVIEW?
11. What is a binary variable?
12. What is Boolean algebra?
13. What are the basic operations in Boolean algebra?
14. What is NAND, NOR, X-OR, and X-NOR operations in Boolean algebra?
15. Write the Boolean algebraic laws.
16. What do you mean by an Array?
17. How to create an Array?
18. Advantages and disadvantages of Array?
19. Can we change the size of an array at run time?
20. What is the default value of Array?
21. Explain what is a combinational circuit?
22. Explain what is a flip-flop?
23. What are logic gates?
24. What is a logic circuit?
25. What is an AND gate?
26. What is an inverter?
27. What is a NAND gate?
28. What do you mean by an active-LOW input gate?
29. What is a Formula Node in LabView?
30. Define gates?
31. Define IC?
32. Is Labview A Compiled Programming Language?
33. How Do I Make Use Of External Libraries In Labview?
34. What Is The Difference Between Local Variable And Global Variable In LabVIEW?
35. Features of LabVIEW?
36. What are the benefits of LabVIEW?
37. How do you define a state machine?
38. What is a Shift Register?
39. What Are The Building Blocks Of LabVIEW Language?
40. What are the two main visual interfaces of LabVIEW?

QUESTION BANK

1. Realize a Basic arithmetic operation: addition, subtraction, multiplication and division using LabVIEW.
2. Realize Boolean operations: AND, OR, XOR, NOT and NAND using LabVIEW.
3. Find out the Sumof 'n' numbers using 'for' loop using LabVIEW.
4. Find out the Factorial of a given number using 'for' loop using LabVIEW.
5. Determine square of a given number using LabVIEW.
6. Find out the Factorial of a given number using 'while 'loop using LabVIEW.
7. Determine by Sorting even numbers using 'while' loop in an array using LabVIEW.
8. Finding the array maximum and array minimum using LabVIEW.
9. Build a Virtual Instrument that simulates a heating and cooling system. The system must be able to be controlled manuallyor automatically.
10. Build a Virtual Instrument that simulates a Basic Calculator (using formula node).
11. Build a Virtual Instrument that simulates a Water Level Detector.
12. Demonstrate how to create a basic VI which calculates the area and perimeter of a circle.