LABVIEW EXPERIMENTS

EXPERIMENT – 1

ARITHMETIC OPERATIONS

AIM:

To perform arithmetic operations using LabVIEW.

APPARATUS REQUIRED:

1. LabVIEW Software

THEORY:

Arithmetic operations are fundamental mathematical operations used to manipulate and calculate numerical values. The basic arithmetic operations include addition, subtraction, multiplication, and division. These operations are the building blocks for more complex mathematical computations.

The addition operation combines two or more numbers to produce a sum.

The subtraction operation finds the difference between two numbers.

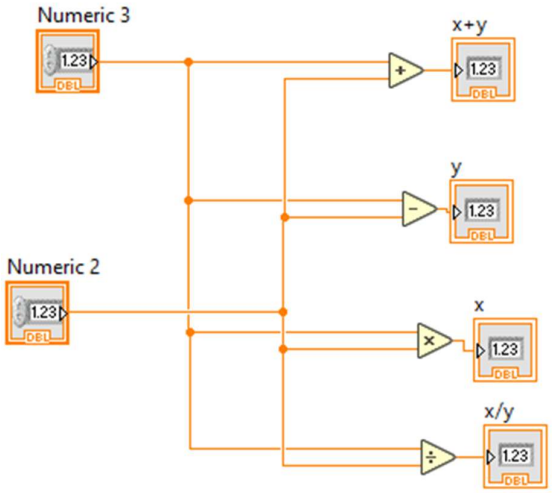
The multiplication operation involves repeated addition and combines two numbers to produce a product.

The division operation splits a quantity into equal parts and determines how many times one number is contained within another.

PROCEDURE:

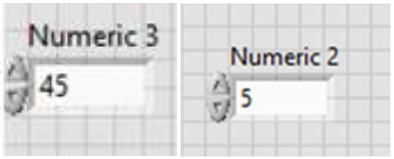
1. Start the Lab view and select the blank VI.
2. Create front and block diagram panel.
3. Numeric controls are given as inputs and numeric indicators are given as output they are selected by right clicking on the front panel.
4. Different arithmetic operators such as addition, subtraction, multiplication and division are generated in block diagram panel.
5. Using wiring operation inputs and outputs are connected to the respective operators in the block diagram panel.
6. Input values are given in the front panel and the program is executed. Hence the output is generated.

BLOCK DIAGRAMS:

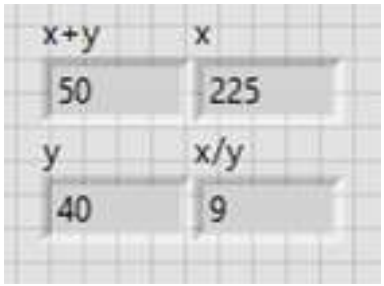


FRONT PANEL:

INPUT:



OUTPUT:



RESULT :

Thus the arithmetic operations were performed and the result is verified using lab view.

EXPERIMENT – 2

BOOLEAN OPERATIONS

AIM:

To perform Boolean operation in LabVIEW program.

APPARATUS REQUIRED:

1. LabVIEW Software.

THEORY:

Boolean operations are fundamental operations in Boolean algebra, a branch of algebra dealing with variables that can take on one of two values: true or false, often denoted as 1 or 0. Boolean algebra is named after mathematician and logician George Boole, who developed it in the mid-19th century. Boolean algebra is widely used in computer science and digital electronics for designing and analyzing circuits and algorithms.

The AND operation is denoted by the symbol ∧. It takes two Boolean operands and returns true if both operands are true, and false otherwise.

The OR operation is denoted by the symbol ∨. It takes two Boolean operands and returns true if either operand is true, and false otherwise.

The NOT operation is denoted by the symbol ¬. It takes one Boolean operand and returns the opposite value.

The XOR gate, also known as the exclusive OR gate, is a digital logic gate that produces an output of 1 only if the two inputs are different. If the two inputs are the same, then the output is 0. The XOR gate is represented by the symbol ⊕.

The XNOR gate, also known as the exclusive NOR gate, is a digital logic gate that produces an output of 1 only if the two inputs are the same. If the two inputs are different, then the output is 0. The XNOR gate is represented by the symbol ⊗.

The NAND gate is a digital logic gate that produces an output of 1 only if both inputs are 1. If either input is 0, then the output is 1

The NOR gate is a digital logic gate that produces an output of 1 only if both inputs are 0. If either input is 1, then the output is 0. The NOR gate is represented by the symbol $\bar{\vee}$.

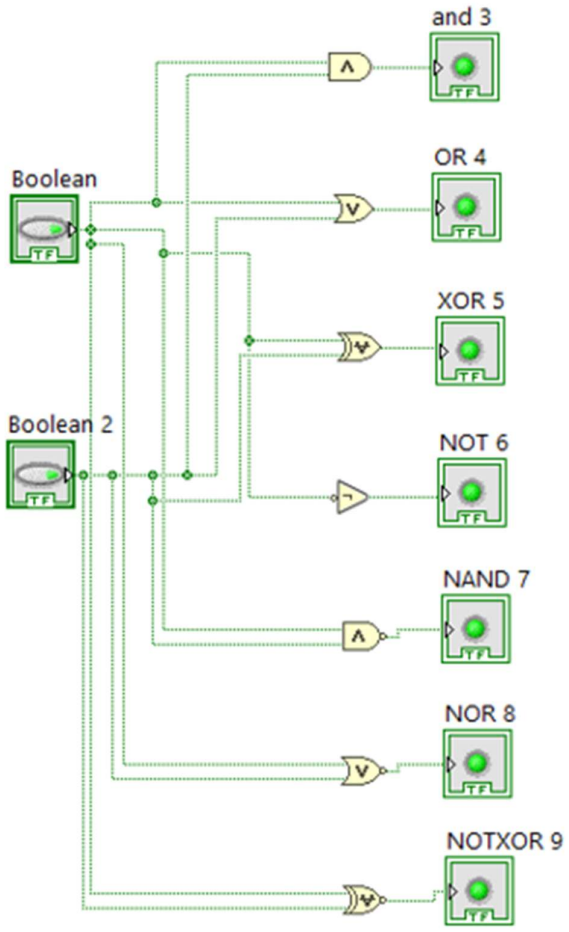
A	B	A NOT	A AND B	A OR B	A NOR B	A NAND B	A XOR B	A XNOR B
0	0	1	0	0	1	1	0	1
0	1	1	0	1	0	1	1	0
1	0	0	0	1	0	1	1	0
1	1	0	1	1	0	0	0	1

PROCEDURE:

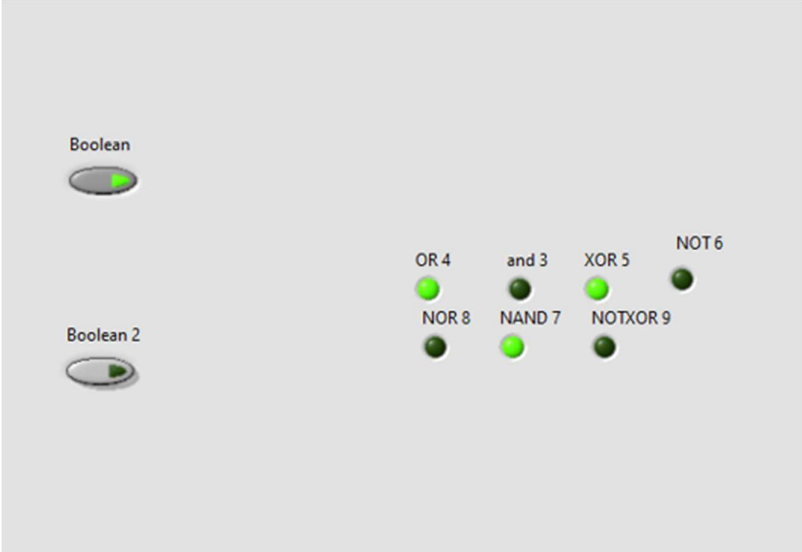
1. Open the LabVIEW software and create a blank VI.

2. Create front and block diagram panel.
3. To perform Boolean operation push buttons are taken as inputs and round LED as output.
4. Different Boolean operations such as AND, OR, XOR, NOT, NAND, NOR, NOTXOR are selected from the block diagram panel.
5. Boolean inputs and outputs are wired in the block diagram panel.
6. Logic values 0 & 1 are given in the front panel and the program is executed.

BLOCK DIAGRAM:



FRONT PANEL:



RESULT:

Thus, we performed Boolean operation through LabVIEW software.

EXPERIMENT – 3

SUM OF 'N' NATURAL NUMBERS USING FOR LOOP

AIM:

To find the sum of N natural numbers using for loop along with shift registers in LabVIEW program.

APPARATUS REQUIRED:

1. LabVIEW Software

THEORY:

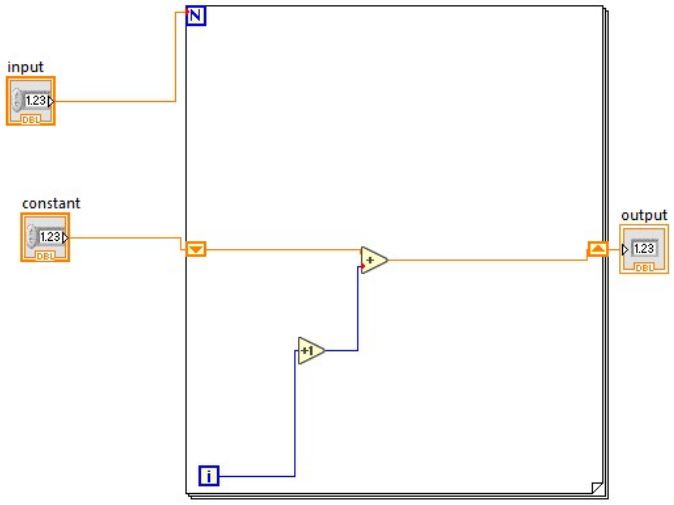
The sum of the first 'n' natural numbers, often denoted as S_N can be calculated using a formula

$$S_N = \frac{N(N+1)}{2}$$

PROCEDURE:

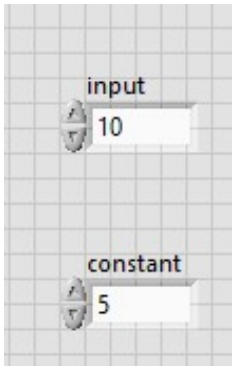
1. Open the LabVIEW software and create an blank VI
2. Right click on the block diagram panel, select program, go to structures and select a FOR loop.
3. Right click on the border of the FOR loop and select add shift register; borders are converted into shift register.
4. Using wiring operations required connections are given in the block diagram.
5. Inputs are given in the front panel and the program is executed.

BLOCK DIAGRAMS:

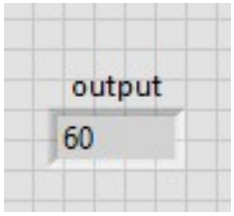


FRONT PANEL:

INPUT:



OUTPUT:



RESULT :

Thus the sum of ‘n’ natural numbers using FOR loop is performed in LabVIEW,

EXPERIMENT - 4

FACTORIAL CALCULATION OF 'N' USING FOR LOOP

AIM:

To calculate the factorial of a given integer 'n' using LabVIEW.

APPARATUS:

1. LabVIEW Software

THEORY:

The theory behind calculating the factorial of a number involves understanding the concept of factorial and how it's computed.

Factorial Concept:

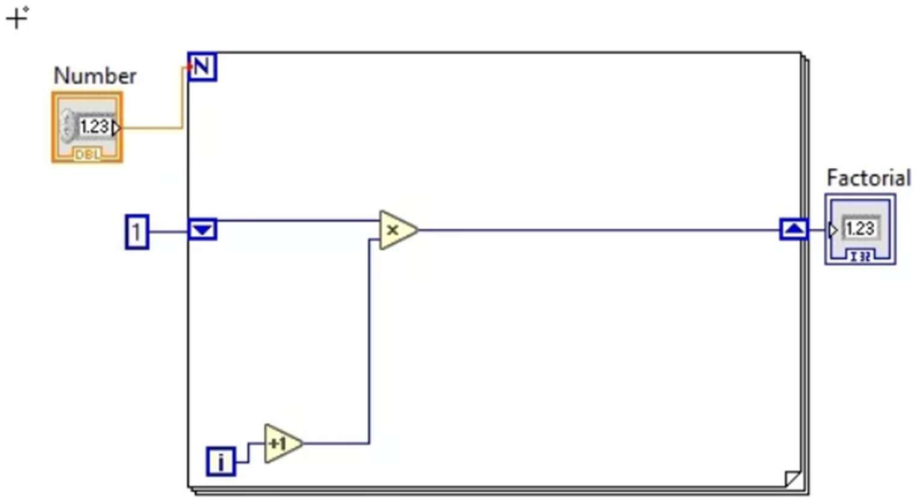
The factorial of a non-negative integer 'n', denoted as 'n!', is the product of all positive integers less than or equal to 'n'. For example:

- $5! = 5 \times 4 \times 3 \times 2 \times 1 = 120$
- $7! = 7 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1 = 5040$

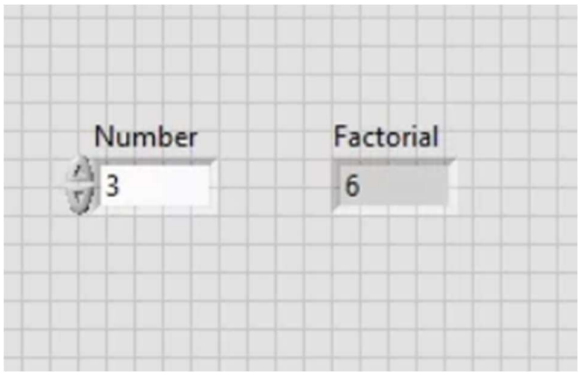
PROCEDURE:

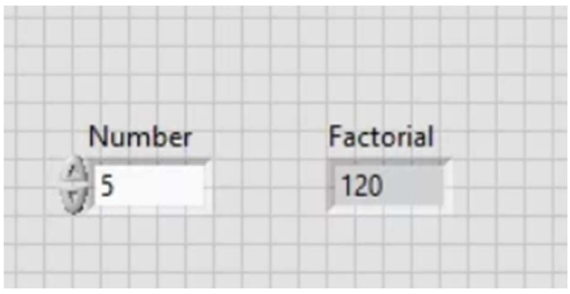
1. Open the LabVIEW software and create a blank VI
2. Right click on the block diagram panel, select program, go to structuresand select a FOR loop.
3. Right click on the border of the FOR loop and select add shift register,borders are converted into shift register.
4. Using wiring operations required connections are given in the block diagram.
5. Inputs are given in the front panel and the program is executed.

BLOCK DIAGRAM:



FRONT PANEL:





RESULT:

Thus the factorial of a given number is using FOR loop is performed in LabVIEW.

EXPERIMENT - 5

SUM OF 'N' NATURAL NUMBERS USING WHILE LOOP

AIM:

To find the sum of N natural numbers using while loop along with shift registers in LabVIEW program.

APPARATUS REQUIRED:

1. LabVIEW Software

THEORY:

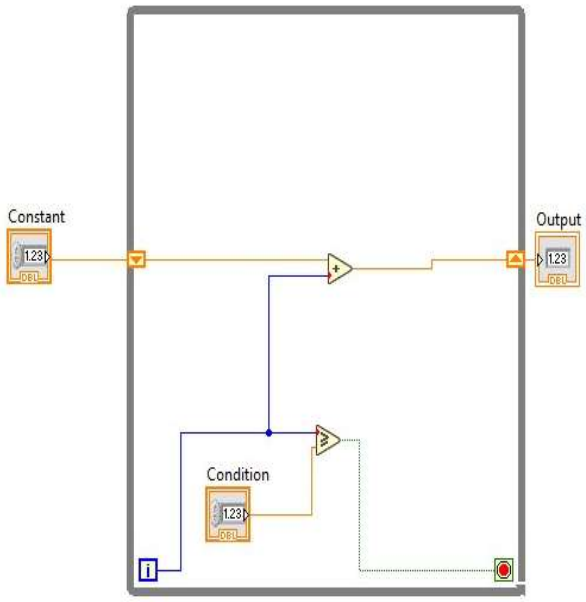
The sum of the first 'n' natural numbers, often denoted as S_N can be calculated using the formula

$$S_N = \frac{N(N+1)}{2}$$

PROCEDURE:

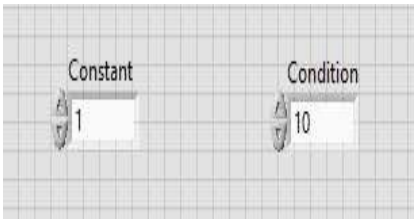
1. Open the LabVIEW software and create a blank VI
2. Right click on the block diagram panel, select the program, go to structures and select a WHILE loop.
3. Right click on the border of the WHILE loop and select add shift register, borders are converted into shift register.
4. Using wiring operations required connections are given in the block diagram.
5. Inputs are given in the front panel and the program is executed.

BLOCK DIAGRAMS:

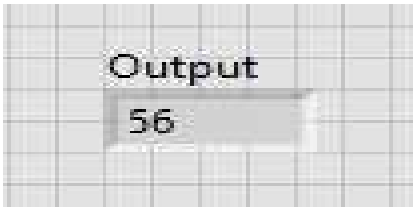


FRONT PANEL:

INPUT:



OUTPUT:



RESULT:

Thus the sum of ‘n’ natural numbers using WHILE loop is performed in LabVIEW.

EXPERIMENT - 6

FACTORIAL OF N NUMBER USING WHILE LOOP

AIM:

To calculate the factorial of a number using a while loop in LabVIEW.

APPARATUS:

1. LabVIEW software

THEORY

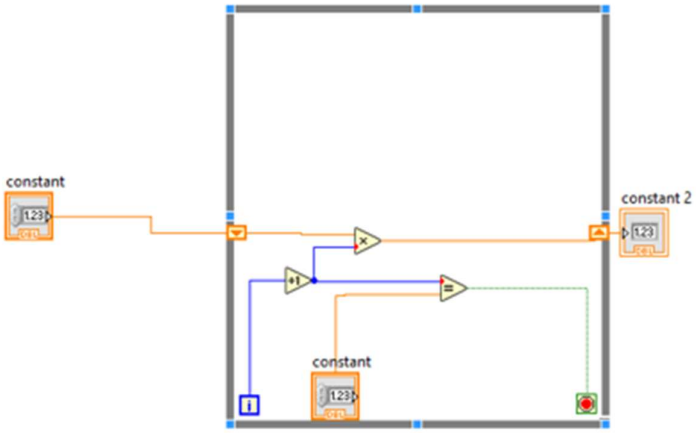
The factorial of a non-negative integer n is the product of all positive integers from 1 to n. It is denoted by n!.

For example, 5! = 1 × 2 × 3 × 4 × 5 = 120.

PROCEDURE:

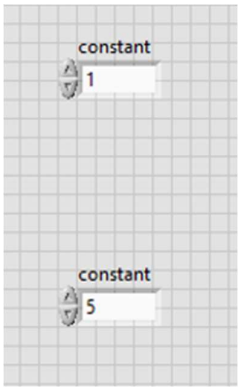
1. Open LabVIEW and create a new VI.
2. Right click on the block diagram panel, select program, and go to structuresand select a WHILE loops.
3. Right click on the border of the WHILE loop and select add shift register; borders are converted into shift register.
4. Using wiring operations required connections are given in the block diagram.
5. Inputs are given in the front panel and the program is executed.

BLOCK DIAGRAM:

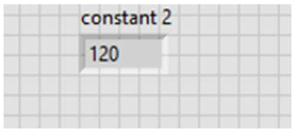


FRONT PANEL:

INPUT:



OUT PUT:



RESULT

The factorial of the number has been calculated using Lab view

EXPERIMENT – 7

3 - INPUT BOOLEAN OPERATIONS

AIM:

To implement a 3 input AND, OR and NAND using two input logic gates.

APPARATUS REQUIRED:

1. LabVIEW software

THEORY:

AND:

Three input AND gates performs the logic AND Operation, the output is true or 1 only when all the three inputs of the gate are true.

Y (output) = A. B. C

Truth Table:

A	B	C	Output
0	0	0	0
0	0	1	0
0	1	0	0
0	1	1	0
1	0	0	0
1	0	1	0
1	1	0	0
1	1	1	1

OR:

Three input OR gates performs the logic OR Operation for three binary inputs, the output is true or 1, when at least only one of the inputs is true or 1.

Y (output) = A+B+C

Truth Table:

A	B	C	Output
0	0	0	0
0	0	1	1
0	1	0	1
0	1	1	1
1	0	0	1
1	0	1	1
1	1	0	1
1	1	1	1

NAND:

Three input NAND gates performs the logic NAND Operation for three binary inputs, the output is false (0) only when all three inputs are true, else it is true.

Y (output) = $\overline{A.B.C}$

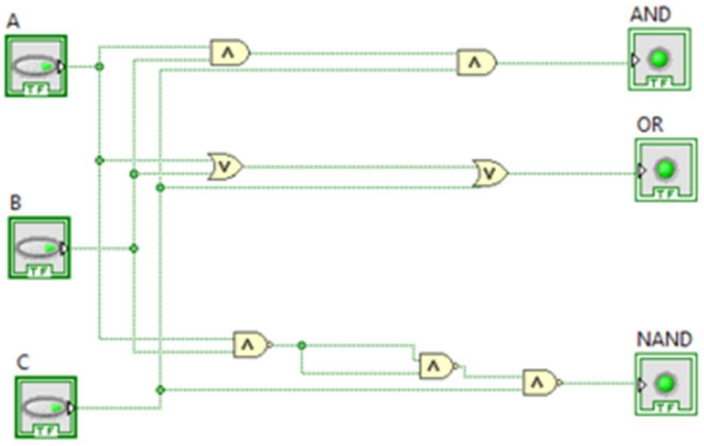
Truth Table:

A	B	C	Output
0	0	0	1
0	0	1	1
0	1	0	1
0	1	1	1
1	0	0	1
1	0	1	1
1	1	0	1
1	1	1	0

PROCEDURE:

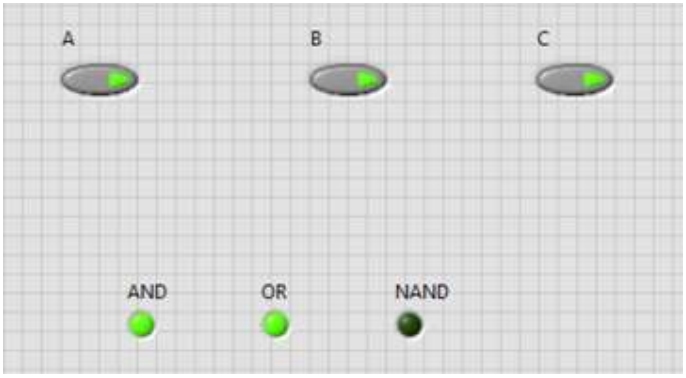
1. Start a new VI and in the front panel add three push buttons for three inputs A, B and C
2. Add two AND gates for performing the logical AND Operation for three inputs, A and B are given as the input for Gate 1 and the resultant output and the C are given as the input for Gate 3.
3. Step 2 is repeated using OR Gate for three inputs
4. Add three NAND Gates for the implementation of three NAND gates, A and B are given as the input for gate 1, the resultant is duplicated for the input of gate 2 and this output along with C are fed as the input for gate 3.

BLOCK DIAGRAM:



FRONT PANEL

OUTPUT:



RESULT:

Thus, we performed 3 - Input Boolean operation through LabVIEW software.

EXPERIMENT – 8

SIGNAL GENERATION AND FILTERING

AIM:

To design a LABVIEW circuit to generate a basic signal with noise and filter it using PSD Filter.

APPARATUS REQUIRED:

1. LabVIEW Software

THEORY:

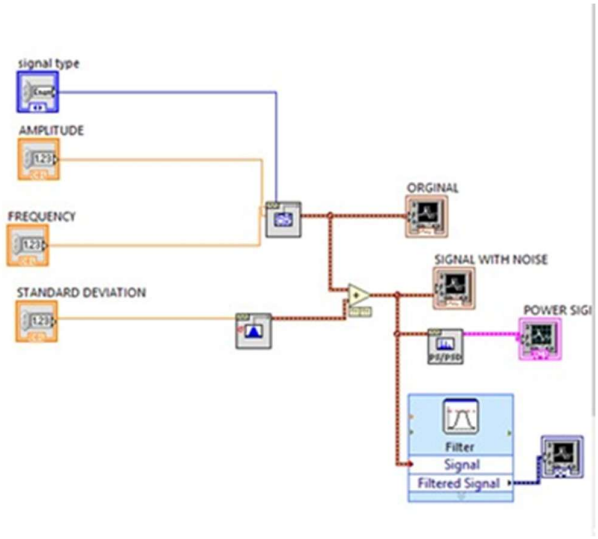
PSD stands for power spectral density which is defined as the measure of the distribution of the power across frequencies. In LabVIEW PSD block is used for analysing the frequency of the signal, it takes time domain signal as its input from any physical measurement, a generated signal or any time domain signal. This block uses Fast Fourier Transform to convert time-domain signal into frequency domain. The signal then undergoes normalization. The resolution of the frequency signal is determined by the length of the input signal and the sampling rate.

Gaussian noise or white noise is statistical noise with probability distribution that is defined by the mean and its standard deviation.

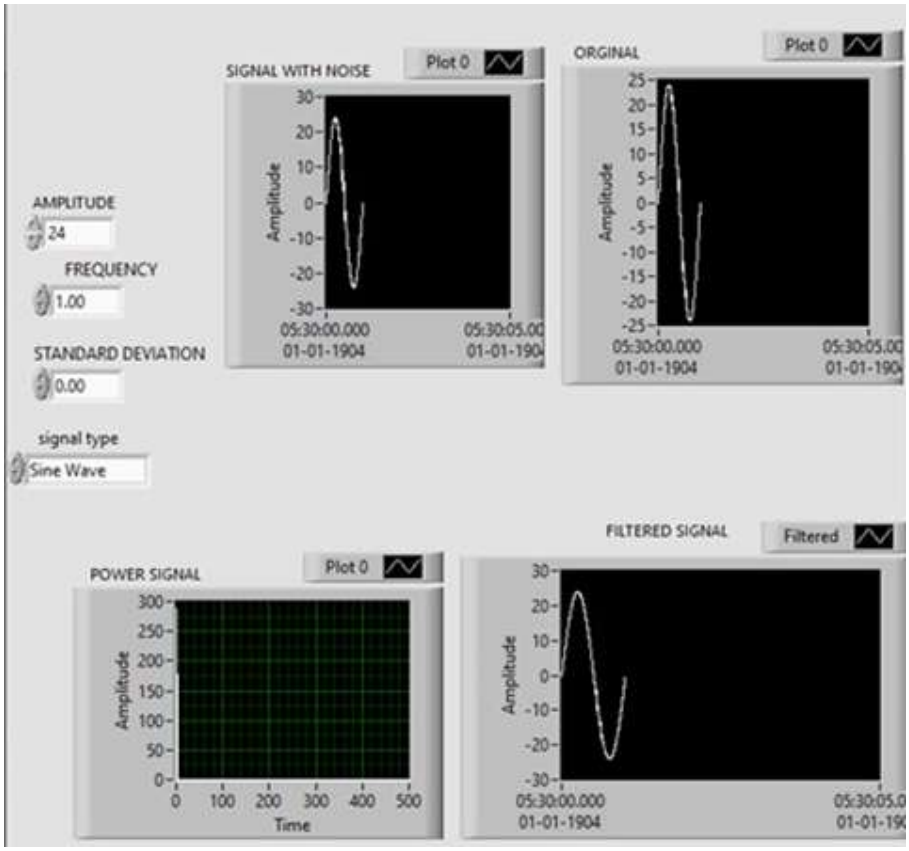
PROCEDURE:

1. In block diagram panel add a basic waveform generation block, with numerical controllers for Signal type, Frequency, Amplitude and Standard deviation.
2. Using addition block add the generated signal along with white noise and observe the signal using Waveform graph.
3. Add PSD block and waveform filter blocks to resultant signal with white noise to observe the PSD output with and without noise

BLOCK DIAGRAM:



FRONT PANEL:



RESULT:

Hence, we filter out original signal by using bandpass filter in LabVIEW program.

EXPERIMENT – 9

TEMPERATURE UNIT CONVERSION

AIM:

To perform temperature unit conversion to ^{0}C to ^{0}F and vice-versa.

APPARATUS REQUIRED:

1. LabVIEW Software.

THEORY:

Temperature is a measure of the hotness or coldness of an object or substance. There are several temperature scales used around the world, with the most common ones being Celsius (℃), Fahrenheit (°F), and Kelvin (K).

Celsius (℃): The Celsius scale is commonly used in most countries and is based on the freezing point of water at 0℃and the boiling point of water at 100℃, under normal atmospheric pressure.

Fahrenheit (°F): The Fahrenheit scale is primarily used in the United States and some other countries. It has the freezing point of water at 32°Fand the boiling point at 212°F, under normal atmospheric pressure.

Kelvin (K): The Kelvin scale is often used in scientific and engineering applications, especially in physics and chemistry. It is an absolute temperature scale with zero Kelvin (0 K) representing absolute zero, the lowest possible temperature where molecular motion ceases.

The conversion formulas between these temperature units are as follows:

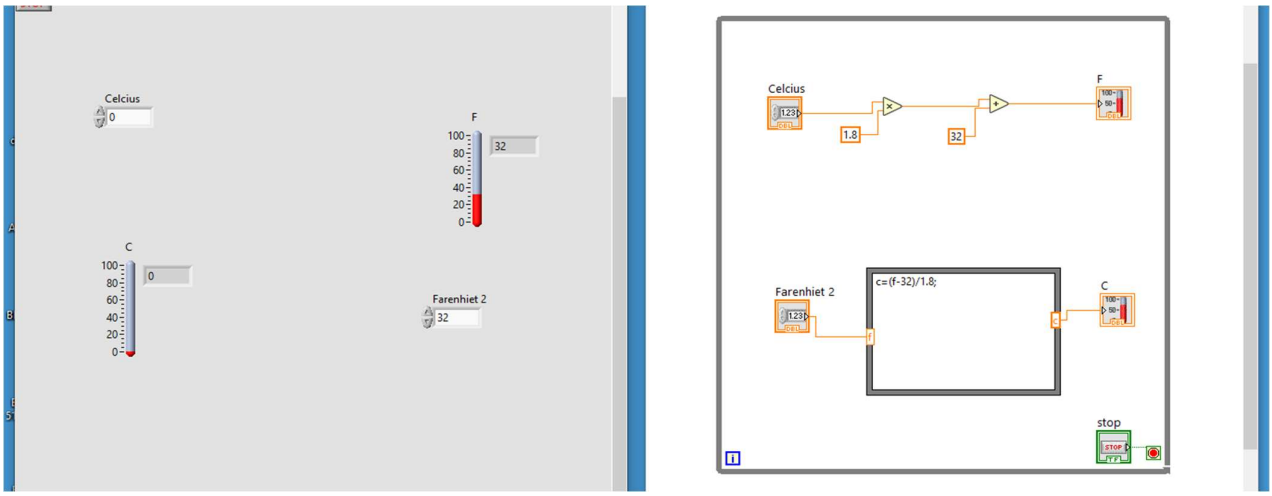
- Celsius to Fahrenheit: °F = $\frac{9}{5} * (℃ + 32)$
- Fahrenheit to Celsius: ℃ = $\frac{5}{9} * (°\mathrm{F} - 32)$
- Celsius to Kelvin: K = ℃ + 273.15
- Kelvin to Celsius: ℃ = $K - 273.15$
- Fahrenheit to Kelvin: $K = \frac{5}{9} * (°\mathrm{F} - 32) + 273.15$
- Kelvin to Fahrenheit: °F = $\frac{9}{5} * (K - 273.15) + 32$

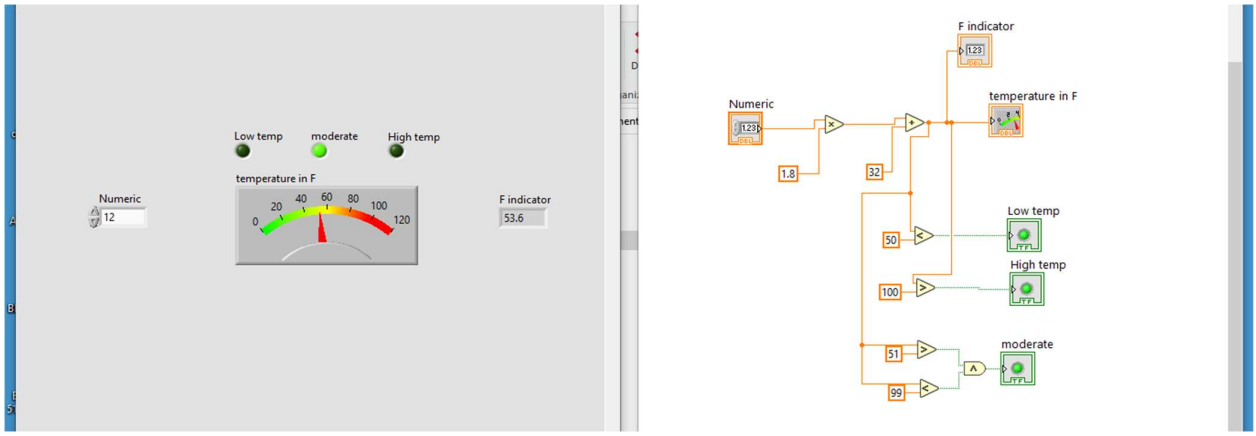
PROCEDURE:

1. Open the LabVIEW software and create a blank VI.
2. Right click on the block diagram panel, open numerical section and insert two numeric control, one for ^{0}C and another for ^{0}F
3. Similarly insert two thermometer block. One for ^{0}C and another for ^{0}F.
4. On block diagram panel insert one while loop.
5. Insert a formula node inside while loop.
6. Now connect ^{0}C numeric control to multiplier and then an adder, adder output connect to ^{0}F thermometer block.
7. Connect ^{0}F numeric control to formula block i/p and o/p of the formula block connect to ^{0}C thermometer.

8. In another blank VI add comparators and LED to indicate different level of temperature.

BLOCK DIAGRAM WITH OUTPUT:





RESULT:

Thus we performed temperature unit conversion through LabVIEW software.

EXPERIMENT-10
TWO SIGNAL FILTERING

AIM :

To design a data acquisition circuit for two signal filtering by using LabVIEW software

APPARATUS REQUIRED :

1. LabVIEW

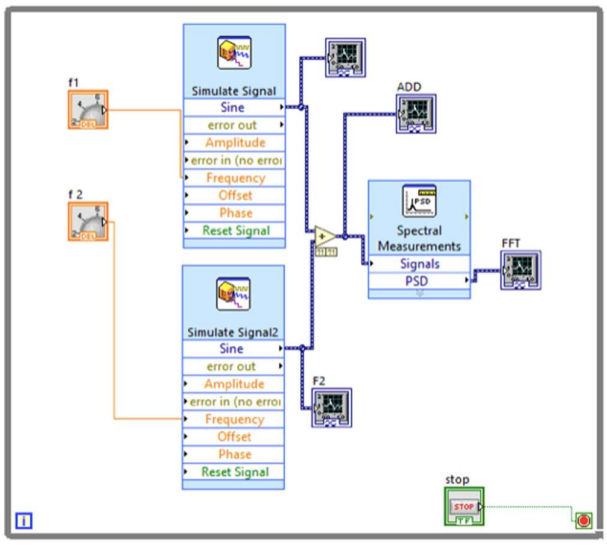
THEORY :

Filter is a device or process that removes some unwanted components or features from a signal**.** Filtering is a class of signal processing, the defining feature of filters being the complete or partial suppression of some aspect of the signal. Most often, this means removing some frequencies or frequency bands..The circuit contains a filter designed to selectively allow certain frequencies to pass through while attenuating others. The type of filter will depend on the specific requirements of the application. You can display the signal in a graph, or numeric indicator, send it to a hardware device, or write it to a file.

PROCEDURE. :

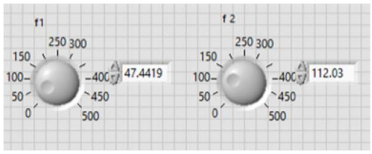
1. Open a lab view software with a new file .
2. Open a while loop with the stop button .
3. Connect the two different signal generator with the controller knobs.
4. Sine wave and the frequency given as input to the filter.
5. Two signal are adding with the filter help of adder .
6. Connect the filter and get the output in indicator graph .

BLOCK DIAGRAM:

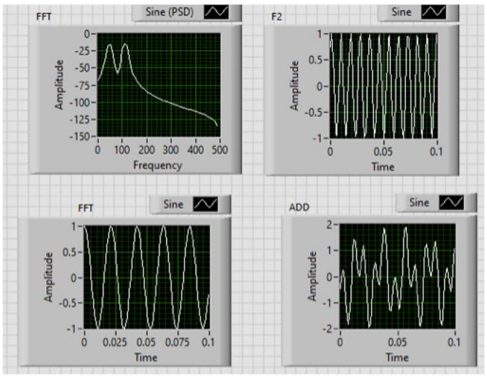


FRONT PANEL:

INPUT:



OUTPUT:



RESULT :

The circuit for filtering signals has been successfully developed after adding the two signals, filtering was carried out. Graphical representation was used to capture the output.

EXPERIMENT – 11

WATER LEVEL DETECTION IN WATER TANKS

AIM:

To design a water level detection system in a water tank and indicate its level using LabVIEW.

APPARATUS REQUIRED:

1. LabVIEW Software.

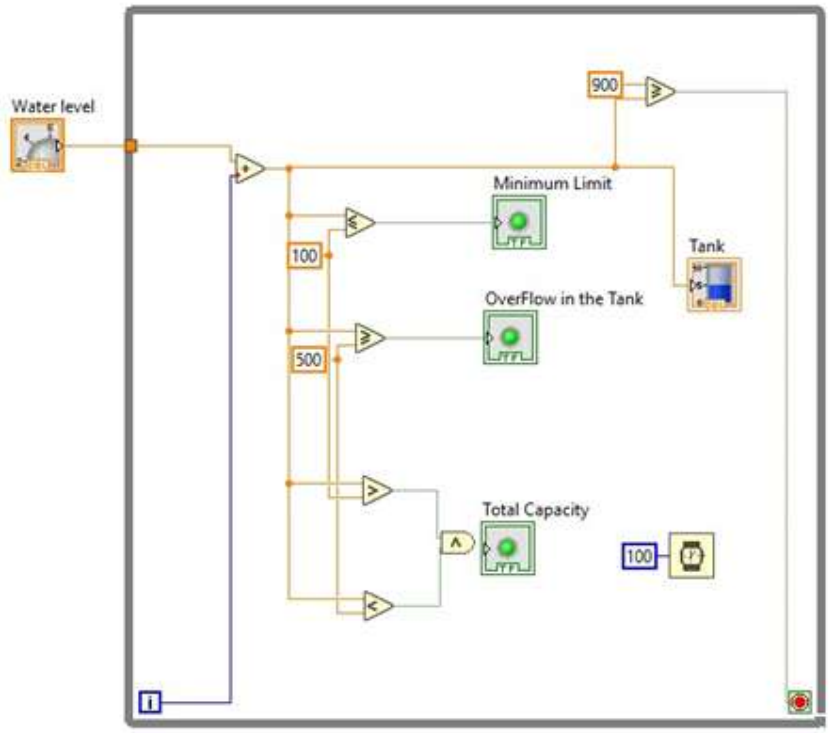
THEORY:

Water level detection in tanks uses sensors like ultrasonic, float switches, pressure, or capacitive sensors to measure water levels. These sensors generate signals, processed for data. The choice depends on accuracy, tank size, and environmental conditions. Data is calibrated against known levels for monitoring, control, or automation of water storage and distribution processes.

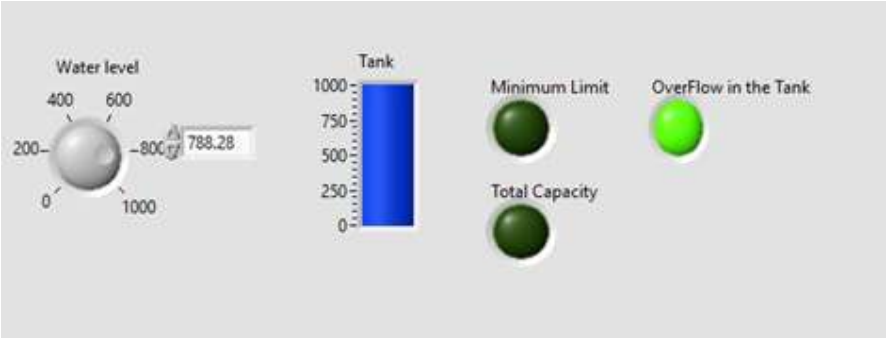
PROCEDURE:

1. Create a while loop structure in the block diagram panel, that runs until the maximum limit of the tank is obtained.
2. Minimum limit indicator is designed when the water level of the tank is less than 100, for overflow its500.
3. Both the limits are added to compared to obtain the total capacity.

BLOCK DIAGRAM:



FRONT PANEL:



RESULT:

Hence, we have designed a water level detection system in a water tank and indicate its level using LABVIEW.

EXPERIMENT – 12

MERGING OF TWO SIGNALS

AIM:

To perform merging of two signals in LabVIEW program.

APPARATUS REQUIRED:

1. LabVIEW Software.

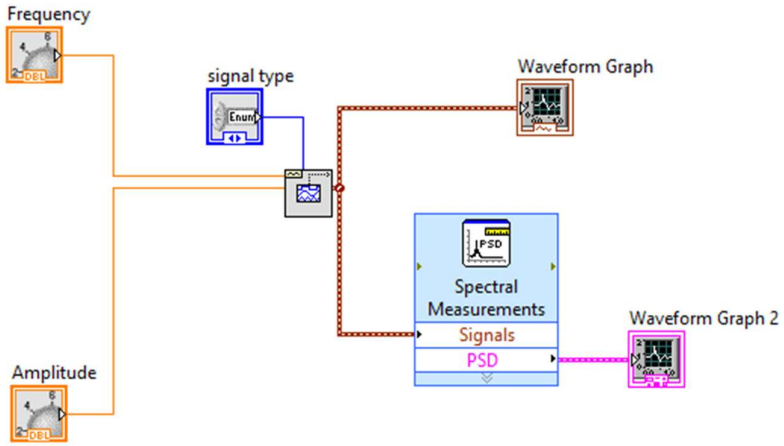
THEORY:

The merging of signals, often encountered in signal processing, involves the combination or integration of multiple input signals into a unified output signal. This process can be achieved through various methods, such as addition, convolution, or other mathematical operations, depending on the specific application. The goal is to synthesize a composite signal that captures relevant information from the individual input signals, providing a more comprehensive representation or response. Merging signals is fundamental in fields like telecommunications, audio processing, and control systems, where combining different sources of information optimally enhances the overall system performance or understanding of the underlying data. The choice of merging technique depends on the characteristics of the signals involved and the desired outcome of the signal processing task.

PROCEDURE:

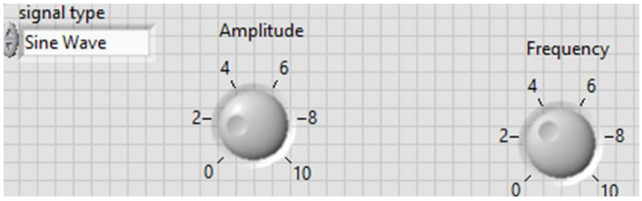
1. Open the LabVIEW software and create an blank VI.
2. Right click on the block diagram panel, select Signal processing, go to Waveform Generation and select the basic function generation.
3. Connect the Input signals to the given pin of the basic function generation block.
4. Consecutively to check its amplitude and frequency create a knob in the front panel and connect its wirings to the block in the block diagram panel.
5. To display the output, right click on the front panel, select Graph, go to Waveform Graph and connect the signal out pin of the block to the Waveform Graph.

BLOCK DIAGRAM:

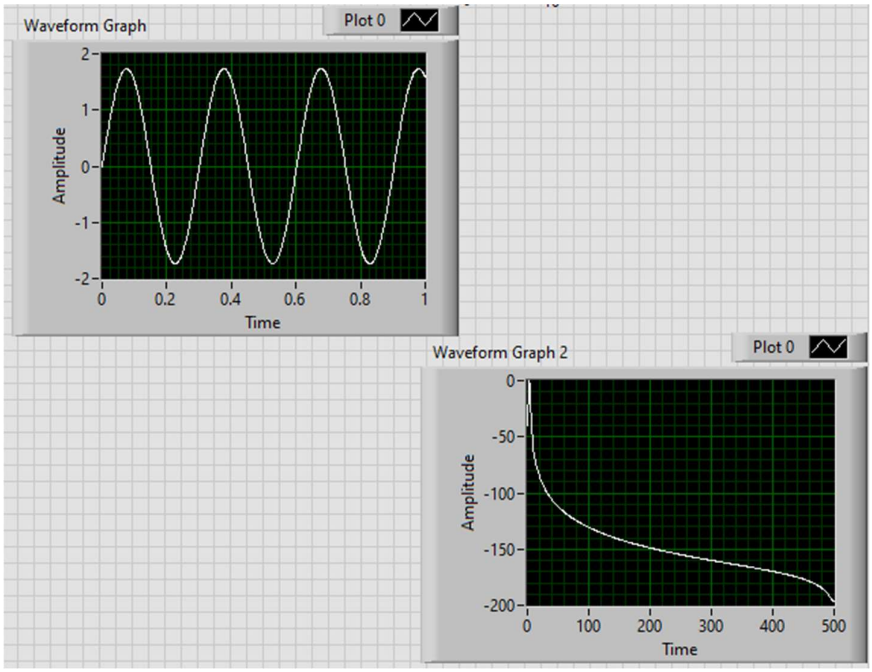


FRONT PANEL:

INPUT:



OUTPUT:



RESULT:

Thus we performed merging of signals through LabVIEW software.