H006
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Signal Processing Lab

Subject- Virtual Instrumentation

EXPERIMENT NO. 3

Aim: Develop a VI which is used to find the nature of roots of quadratic equation using Sub VI. Sub VI consist of 3 input coefficient and output will be root1, root2, and the types of roots.

Software Used : PC with software (NI LabVIEW)

Theory :

A SubVI (short for "subvirtual instrument") is a programming construct in LabVIEW that allows you to encapsulate a section of code into a separate module that can be called by other parts of the program. In other words, it's a way to break up a large, complex program into smaller, more manageable pieces.
A SubVI looks similar to a standard VI (virtual instrument) in LabVIEW, but it has a few key differences:

1. Inputs and outputs: A SubVI has its own set of inputs and outputs that can be specified by the user. These inputs and outputs allow the SubVI to communicate with the rest of the program.
2. Icon and connector pane: A SubVI has its own unique icon and connector pane, which determine the appearance of the SubVI on the block diagram and the data types of the inputs and outputs.
3. Hierarchy: A SubVI can be called by other VIs or SubVIs within the program, creating a hierarchical structure.

A case structure is a programming construct in LabVIEW that allows the execution of different code blocks depending on the value of a specified condition. The condition is typically a Boolean value, which evaluates to either "True" or "False". When the condition is evaluated as "True", the code block associated with that condition is executed. If the condition is "False", then the code block associated with the "False" case is executed.

In LabVIEW, a case structure is represented graphically as a box with multiple sections, each section corresponding to a specific condition. To create a case structure, you can right-click on the block diagram and select "Structures" from the context menu, then choose "Case Structure".

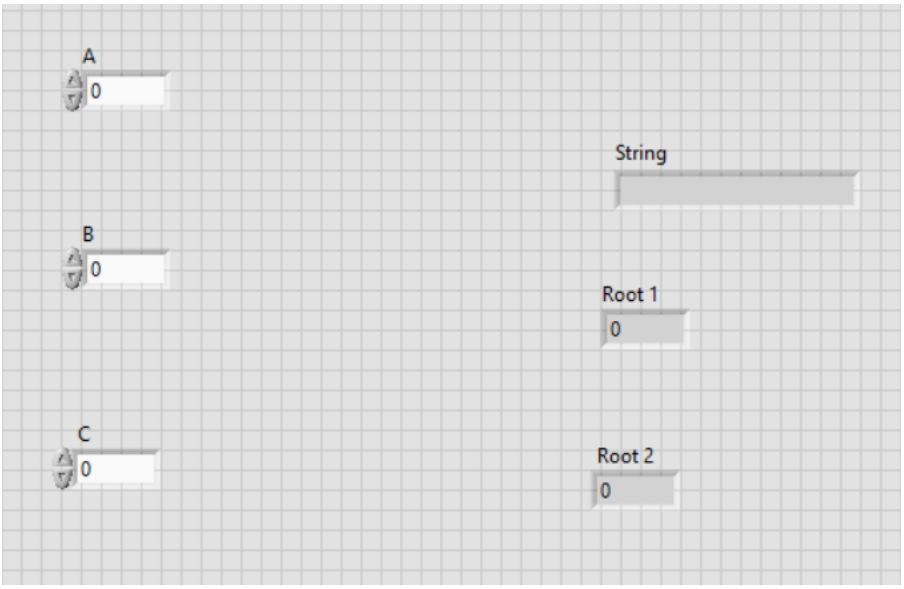
In this experiment we create a LabVIEW program that calculates the roots of a quadratic equation of the form "ax^2 + bx + c = 0", and then determines the nature of those roots (real, imaginary, or complex). We used a case structure to handle the different scenarios for the nature of the roots.
Here's how:

1. First, create a user interface that allows the user to enter the values of "a", "b", and "c" for the quadratic equation.
2. Use LabVIEW's built-in functions to calculate the roots of the quadratic equation using the quadratic formula:

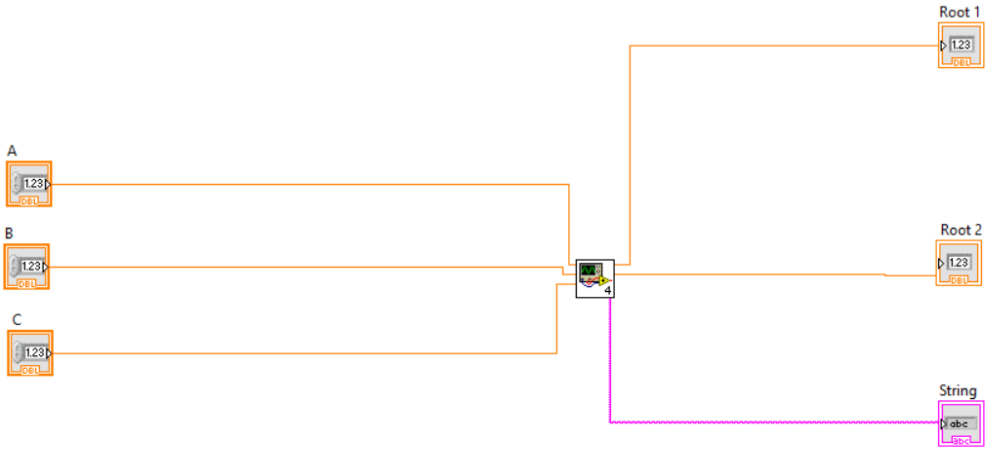
x1 = (-b + sqrt(b^2 - 4ac)) / 2a
x2 = (-b - sqrt(b^2 - 4ac)) / 2a

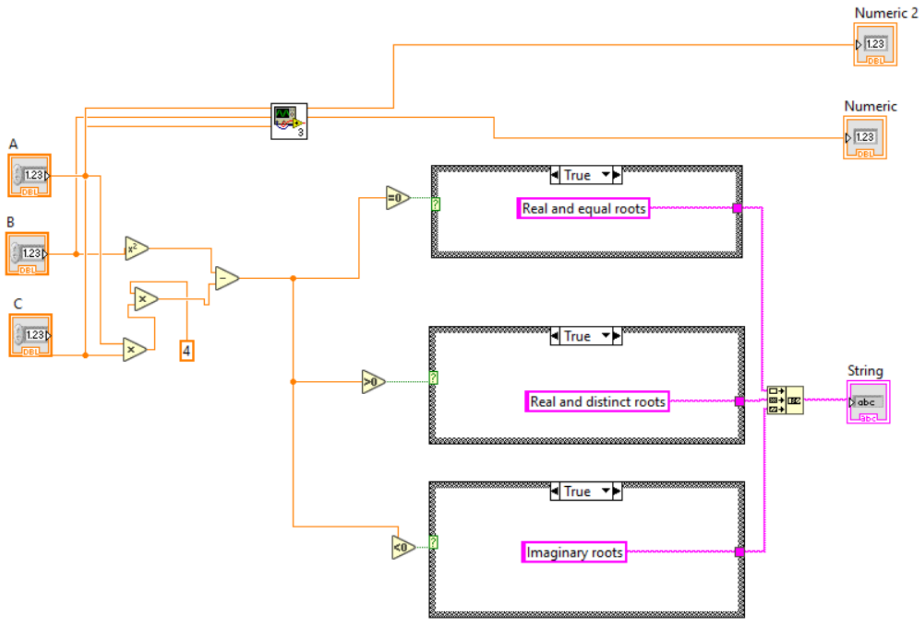
3. Next, use a case structure to determine the nature of the roots. The condition for the case structure is based on the value of the discriminant "D", which is defined as "b^2 - 4ac". The discriminant determines the nature of the roots as follows:
    - If D > 0, the roots are real and distinct.
    - If D = 0, the roots are real and equal.
    - If D < 0, the roots are complex and conjugate.
4. Inside each case of the case structure, use LabVIEW's built-in functions to display the nature of the roots to the user. For example, if the roots are real and distinct, you might display a message such as "The roots are real and distinct." If the roots are complex and conjugate, you might display a message such as "The roots are complex and conjugate.

Front Panel:

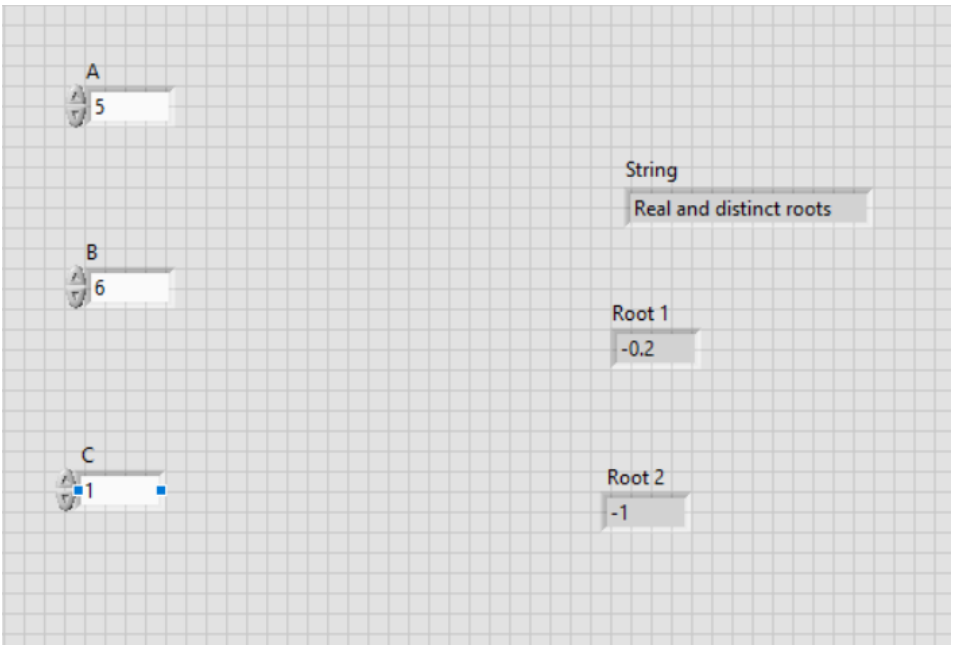


Block Diagram:





Output :



Conclusion:
The experiment was carried out successfully in LabVIEW