AE251A: Experiments in Aerospace Engineering

Lab – 2   Date: Mar 12, 2019

Save your work in your own directory

1. Build a VI using the *while loop* that displays random numbers (0-5) into three Waveform Charts (strip, scope, sweep). Incorporate appropriate Boolean switch to stop the loop. Use the wait function for loop delay. Try various features of waveform charts: legend, palette, digital display, scroll bar, and buffer. Also try different mechanical action for the Boolean switch.

2. Build a VI using while loop that continuously measures temperature (use the *Acquire temperature.vi* available in the Lab – 2 library) every 50ms and displays the data on a waveform chart. Incorporate appropriate logic such that the loop stops after collecting 100 data points. Also plot all the data points in a waveform graph whose x-axis is time in second.

3. Create a VI to find the sum of $2^3 + 3^3 + \ldots + 20^3$.

4. Build a VI to compute Factorial of N. Test your VI with N = 0, 1, 10, and 20. Your VI must calculate Factorial of 20 accurately. You can check your answer using calculator (in scientific mode) available in the computer. (You may try While Loop with a Shift register)

5. In a board game a pair of dice (one is 6 sided and the other is 12 sided) is rolled. You win when there is a matching number or the sum of the numbers rolled is equal to 18. In this problem we would like to build a VI that will do the following:

   i)   Rolls the pair of dice every 100ms and displays the numbers rolled

   ii) A digital indicator displays the number of times dice rolled

   iii) An LED glows when you win

   iv) An digital indicator displays the number of wins

   v)   Program stops after exactly 10 wins.

   (Hints: a 6-sided dice may be simulated using a random number (between 0 and 6) and rounding to next higher integer (1 to 6). You may need to use a loop, comparison, and Boolean function (Boolean to (0, 1))

6. Using formula loop compute y for the following two functions:

$$y = \sin(x)/x \text{ and}$$

$$y = \sin(x^2)/x$$

   where x varies from 0 to 10 in step of 0.05. Also, plot *y vs. x* in a single XY graph for both the functions.

7. Build a VI that functions like a calculator. The front panel should have digital controls to input two numbers and a digital indicator to display the result of the operation (Add, Subtract, Multiply or Divide) that the VI performs on the two numbers. For specifying the operation to be performed use:

   a) a numeric control (try unsigned integer, text ring, and listbox as control),

   b) a Boolean control.

8. Use of Array functions

For the 1D array as shown, do the followings using array functions:

Input array

	-3	12	15	7	9	-10	5	-22

a) Number of elements in the array

b) Extract, insert, replace or delete an element

c) Reverse the array

d) Find the Maximum and minimum values of the array along with the indexes

e) Organize array elements in ascending or descending order

f) Sort the Input Array into two separate 1D arrays containing positive values and negative values in the order they appear in the input array.

9. Use of Array functions

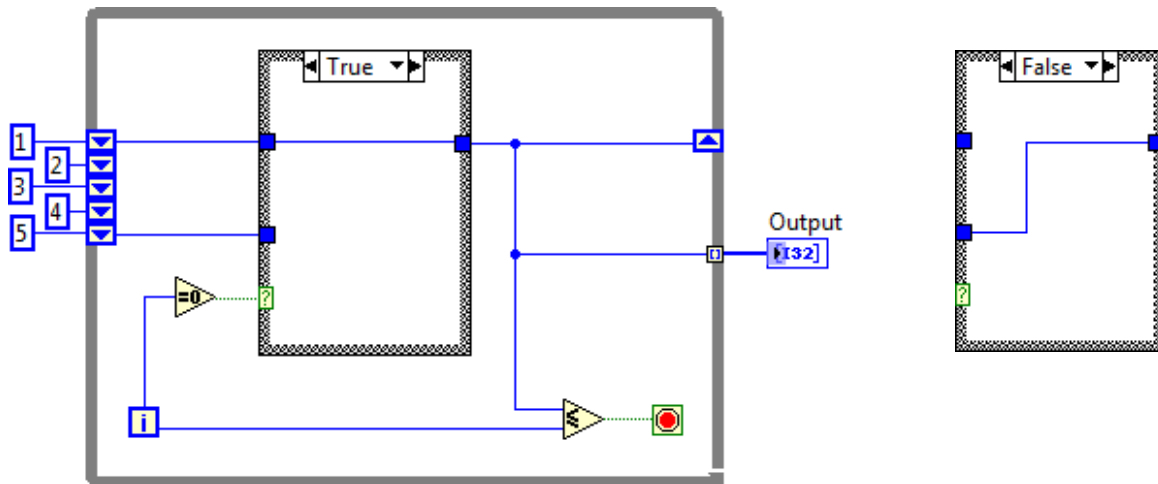For the 2D array as shown, do the followings using array functions:
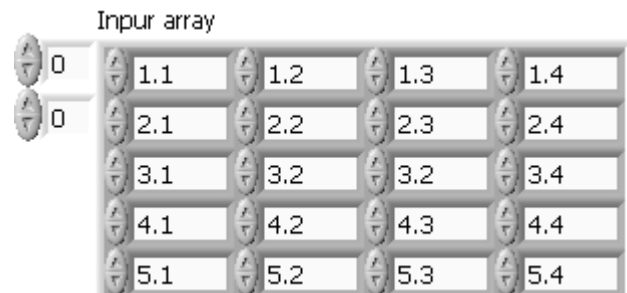
a) Size of the array

b) Extract or replace an element

c) Extract, insert, replace or delete a row or a column

d) Transpose the array

Inpur array

1.1	1.2	1.3	1.4
2.1	2.2	2.3	2.4
3.1	3.2	3.2	3.4
4.1	4.2	4.3	4.4
5.1	5.2	5.3	5.4

TRY THE FOLLOWING PROBLEMS WITHOUT USING LABVIEW
USE ONLY PEN AND PAPER

1. In this problem write down the values of Output array 1 & Output array 2. Justify your answer.
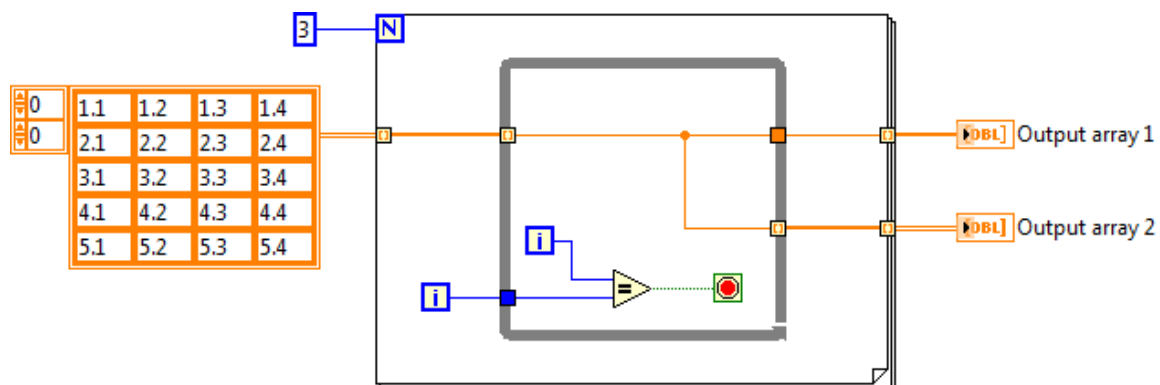
2. In the VI shown below, the shift register elements are initialized with different values. What will be the output after the execution of the loop? Answer with justification.

3. In the VI shown below, the shift register elements are initialized with different values. What will be the output after the execution of the loop? Answer with justification.