LabVIEW II Lab EE 2303

This lab will give a more detailed introduction of the LabVIEW software. This lab will not go into device communications which is what LabVIEW is primarily used for, but will give a more programming/logical approach to the G coding scheme. Using the ideas of random numbers, this lab will show you how to make a ‘coin flipping experiment’. Using this approach, you will then be asked to try something with 4 events, and not just 2.

Prelab

A pair of fair dice is rolled 10 times. Find the probability that “seven” will show at least once. Either express the solution in decimal form or keep in expanded form.

Answer: ________________

HAVE TA VERIFY THAT YOU HAVE THE PRELAB CORRECT (initials) ______

Part I: Step by step instructions

1. Open LabVIEW by finding it in the Start Menu or on the desktop. The shortcut should be National Instruments LabVIEW.

2. Create a new VI. This will open a new Front Panel window.

3. From the Controls Palette place three (3) digital indicators on the Front Panel. Name them “Number of Heads”, “Ratio”, and “Number of Flips Completed”. The digital indicators can be found under Controls → Numeric → Digital Indicator.

4. Change the precision on the “Number of Heads” and “Number of Flips Completed” to 0 bits. This is done by right clicking on the indicator and choosing Format & Precision and entering 0 into the Digits of Precision field.

5. Place a Digital Control on the Front Panel and name it “Number of Flips Wanted”. Change the precision to 0 bits the same way as before.

6. Arrange the indicators and control in the following matter as shown in Figure 1.
7. Switch to the Diagram Window by using the **Window → Show Diagram** command from the menus.

8. Draw a For Loop on the Diagram Window using the **Functions → Structures → For Loop**. Draw the loop structure large enough to fill most of the screen. This will allow room for the rest of the components.

9. Draw a Case structure in the middle of the For structure. This structure doesn’t need to be all that large. Keep the cases as “True” and “False”. Arrange the indicators and control as shown in Figure 2. Compare the Diagram window with that of the figure below.

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HAVE YOUR TA VERIFY YOUR WORK TO THIS POINT  (initials) __________
10. Add an addition block and a division block inside of the For Loop structure.

11. Change the case to “False” and add an addition block inside of the Case structure.

12. Right click on the edge of the For Loop structure with the Operate Value Tool from the Tools Palette and select *Add Shift Register*.

13. Now add a Random Number generator from the *Functions ➔ Numeric ➔ Random Number (0 – 1)*. Now add a Round to Nearest Integer box from the Functions Palette by *Functions ➔ Numeric ➔ Round to Nearest*.

14. Add a Comparison block to the Diagram Window inside the For Loop structure using the Functions Palette under *Functions ➔ Comparison ➔ Equal*?. This will allow us to compare two items. In this example it will be the number created to 0.
15. At this point it would be a good idea to add a time delay to the For Loop. Do this using the Functions Palette under **Functions → Time & Delay → Wait (ms)**. Move the parts so that they are comparable to Figure 3 below.

![Diagram after addition of the comparison block](image)

**Figure 3: Diagram after addition of the comparison block**

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16. At this point, create a constant on the Wait (ms) box on the left side with a value of 100, a constant on the upper half of the addition sign with a value of 1, a constant on the addition sign inside the case structure with a value of 1 and a constant on the Equal? box with a value of 0. Creating constants is done my right clicking and choosing **Create Constant** from the pop up menu. After this is done the diagram window will look like that of Figure 4.
17. Connect the left side shift register to the bottom side of the addition block inside the Case structure. Then wire the output of the addition sign to the right side shift register.

18. Change the case from “False” to “True” and wire the left side shift register to the right side shift register by going through the ‘tunnels’ on the Case structure.

19. Create a constant on the left side shift register and give it a value of 0. Make sure that the constant is outside of the For Loop structure.

20. Wire the simulation up as shown in Figure 5. This will complete the Diagram Window and the simulation will be ready to run.
21. Return to the Front Panel by using the Window → Show Front Panel command from the menus.

22. Choose a number of trials to run the simulation with and type this into the “Number of Flips Wanted” box using the Operate Value tool. Now you can simulate the program. Note the number of heads and the ratio values.

23. Fill out the table below using the values for “Number of Flips Wanted”. To make the simulation go faster change the value of the constant that is connected to the Wait (ms) block. Setting this constant to zero will result in no delay and cause the simulation to run much faster. Fill in the last Number of Flips on the table with number you select.
Table 1: Values for running the simulation

<table>
<thead>
<tr>
<th>Number of Flips</th>
<th>10</th>
<th>50</th>
<th>100</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Heads</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ratio</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

HAVE YOUR TA VERIFY YOUR WORK (initials) _________

**Assignment**

Create and simulate a program that will test and tally four (4) inputs. Make the ranges equally divided between 0 and 1. As a hint, the structure for the range of .25 to .5 is shown in Figure 6 below. Don’t pay attention to the broken wires in this simulation, and just remember that this is a hint, not a direct application of the simulation. For two of the ranges, you will need embedded cases, and in two you will not. But the entire simulation will be run inside of a For Loop.

**Figure 6: Hint for the Assignment of four events**

HAVE YOUR TA VERIFY YOUR WORK ON THIS PART (initials) ____________

Department of Electrical and Computer Engineering
Michigan Technological University
Fill in the table below with values of the number of simulations and ratios and choose a number of simulations in the last column.

Table 2: Values for simulation of Assignment

<table>
<thead>
<tr>
<th>Values</th>
<th>10</th>
<th>50</th>
<th>100</th>
</tr>
</thead>
<tbody>
<tr>
<td>‘Ones’</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ratio of ‘Ones’</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>‘Twos’</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ratio of ‘Twos’</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>‘Threes’</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ratio of ‘Threes’</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>‘Fours’</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ratio of ‘Fours’</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

HAVE YOUR TA VERIFY YOUR WORK     (initials) ________