Development of Virtual lab :Round 1 (R1) Pedagogy - Template (Worksheet)

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Discipline to which the Lab belongs: Electronics Engineering
Name of the Lab: Basic Electronics VLab
Name of experiment : Logic Gates

(only one Experiment per worksheet. for submitting more than one experiments, please fill up another worksheet)**:**

Kindly Refer these documents before filling the worksheet

1. **Coursework (MOOC) on Pedagogy , Storyboard , Lab Manual : http://bit.ly/Vlabs-MOOC**
2. **Additional Documentation booklet for reference. http://vlabs.iitb.ac.in/vlabs-dev/document.php**
3. **Sample Git Repository. https://github.com/Web-planner/Electronic-Simulator.git**

1.1 FOCUS AREA: Electronics Engineering Virtual Lab
1.2 Logic gates simulator

1.2 About the Experiment:
A **logic simulator** is a computer program that allows designers and experimenters to conduct virtual tests of complex digital circuitry before working with any hardware. ... Some programs also offer animation, signal tracing, and alternative **logic-gate** interconnection options.

1.3 Learning Objectives: (write in the table below)
Write Learning Objectives that can be achieved using virtual labs and the respective cognitive level, & action verbs.

The objective for this lab is to understand the fundamentals of logic gates and its use in implementing basic Boolean functions.

4. **Simulator Interactions**

A **logic simulator** is a computer program that allows designers and experimenters to conduct virtual tests of complex digital circuitry before working with any hardware. The user **can** interact with the program to find a component arrangement that will perform a desired task.

5. Formula And Equations.

- # Logic Gates

1.. OR Gate

- Logic gates are electronic circuits that implement the basic functions of Boolean Algebra. There is a symbol for each gate

Z = A + B

A	B	Z
0	0	0
0	1	1
1	0	1
1	1	1

- Logic levels (0 or 1) are represented by means of a voltage level.
  - High voltage (5V, 3.3V, 2.5 V, etc.) is 1
  - Low voltage (0V) is 0

2. AND Gate

- Logic gates are electronic circuits that implement the basic functions of Boolean Algebra. There is a symbol for each gate

Z = A • B

A	B	Z
0	0	0
0	1	0
1	0	0
1	1	1

- Logic levels (0 or 1) are represented by means of a voltage level.
  - High voltage (5V, 3.3V, 2.5 V, etc.) is 1
  - Low voltage (0V) is 0

3 . **NOT Gate**

- Logic gates are electronic circuits that implement the basic functions of Boolean Algebra. There is a symbol for each gate

Z = A

A	Z
0	1
1	0

- Logic levels (0 or 1) are represented by means of a voltage level.
    - High voltage (5V, 3.3V, 2.5 V, etc.) is 1
    - Low voltage (0V) is 0

4.NAND Gate

- Logic gates are electronic circuits that implement the basic functions of Boolean Algebra. There is a symbol for each gate

Z = A • B = A + B

A	B	Z
0	0	1
0	1	1
1	0	1
1	1	0

- Logic levels (0 or 1) are represented by means of a voltage level.
    - High voltage (5V, 3.3V, 2.5 V, etc.) is 1
    - Low voltage (0V) is 0

5.NOR Gate

- Logic gates are electronic circuits that implement the basic functions of Boolean Algebra. There is a symbol for each gate

$Z = A + B = A \bullet B$

A	B	Z
0	0	1
0	1	0
1	0	0
1	1	0

- Logic levels (0 or 1) are represented by means of a voltage level.
  - High voltage (5V, 3.3V, 2.5 V, etc.) is 1
  - Low voltage (0V) is 0

6. XOR Gate

- Logic gates are electronic circuits that implement the basic functions of Boolean Algebra. There is a symbol for each gate

$Z = A \oplus B = A \bullet B + A \bullet B$

A	B	Z
0	0	0
0	1	1
1	0	1
1	1	0

- Logic levels (0 or 1) are represented by means of a voltage level.
  - High voltage (5V, 3.3V, 2.5 V, etc.) is 1
  - Low voltage (0V) is 0

7 . XNOR Gate

- Logic gates are electronic circuits that implement the basic functions of Boolean Algebra. There is a symbol for each gate

$Z = A \oplus B = A \bullet B + A \bullet B$

A	B	Z
0	0	1
0	1	0
1	0	0
1	1	1

- Logic levels (0 or 1) are represented by means of a voltage level.
    - High voltage (5V, 3.3V, 2.5 V, etc.) is 1
    - Low voltage (0V) is 0