EXPERIMENT – 4

PARTICIPANT SELECTION IN COMPETITION USING MULTIPLEXER

Aim: Participant selection in competitions using multiplexer.

Two judges of the Indian Idol competition need the help of digital logic to display whether the participant must stay or leave the competition without displaying their votes. The selection criteria are as follows.

1) At least one judge should vote positively.
2) Same type of votes cancels each other.

Components Required: AND, OR, NOT Gates, 4:1 Multiplexer

Pre-lab:

1. Define a Multiplexer.

A multiplexer (MUX) is a digital switch that selects one of several analog or digital input signals and forwards the selected input into a single line.

2. Explain the Functionality of a 4:1 Multiplexer.

A 4:1 multiplexer has four input lines, and it selects one of these inputs to pass to the output based on the combination of the select lines. It essentially functions as a single-pole, four-throw switch. The selection of the input is controlled by the value of two select lines (S0 and S1).

3. Identify the Inputs and Outputs of a 4:1 Multiplexer.

A 4:1 multiplexer has: Four input lines (D0, D1, D2, D3), Two select lines (S0, S1)
One output line (O).

4. What logic gates are required to implement a 4:1 Multiplexer using logic gates?

A 4:1 multiplexer can be implemented using AND, OR, NOT gates.

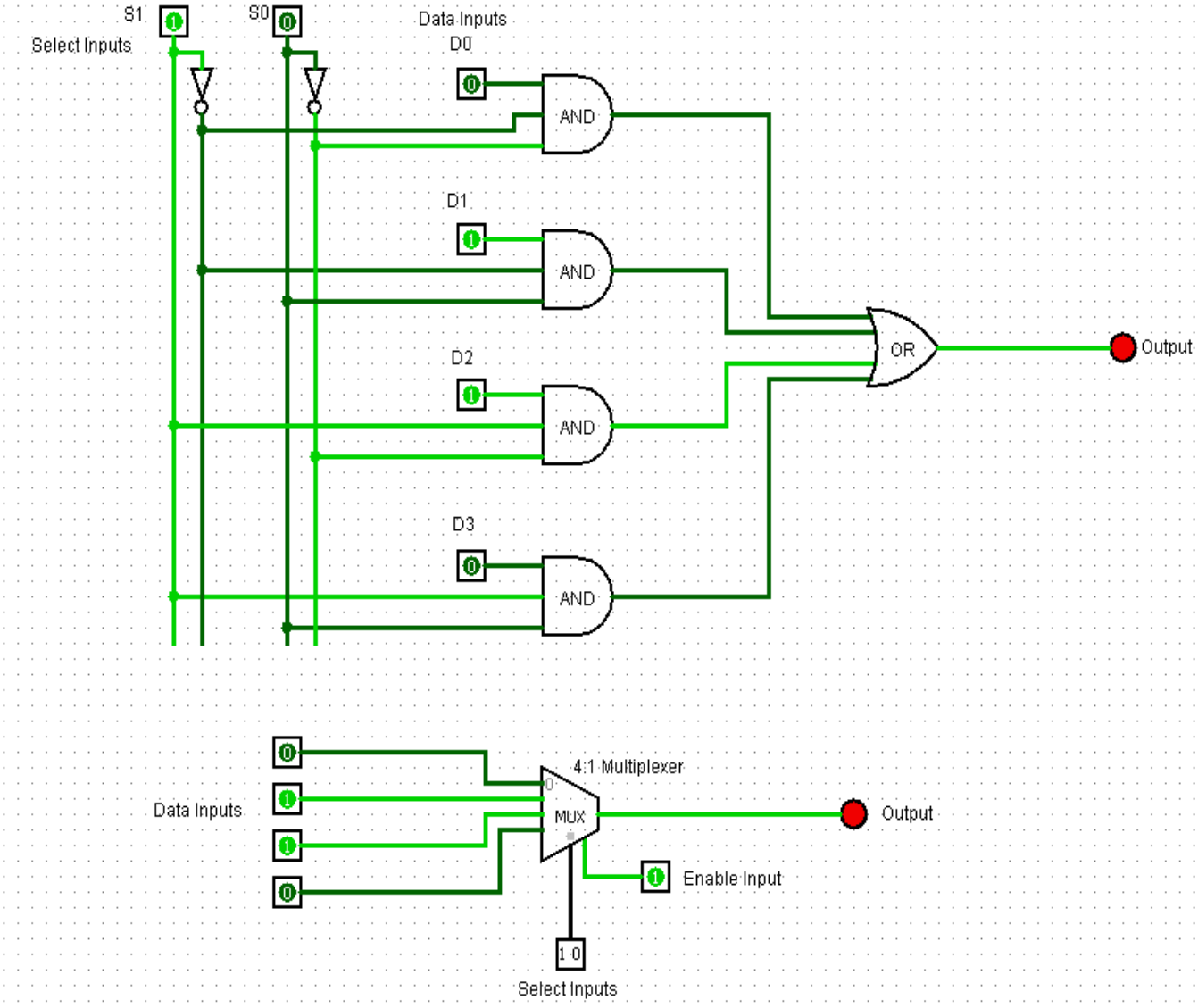
Theory:

1. There will be 4 possibilities based on the voting of two judges (say A & B).
2. If the 2 judges vote positively or negatively for the participant, then the participant should leave the competition i.e., if 00 or 11 then output should be zero.
3. If both the judges vote compliment to each other, then the participant stays in the competition i.e., if 01 or 10 then output should be one.
4. Since one of the combinations will occur at a time based on the voting we can switch the output using a multiplexer.
5. The circuit diagram is shown below for the given conditions.

Truth Table:

A	B	Required Decision	Mux Output	LED Status
0	0	Leave	0	OFF
0	1	Stay	1	ON
1	0	Stay	1	ON
1	1	Leave	0	OFF

Circuit Diagram:



Procedure:

1. Collect the required gates to construct the multiplexer as shown in Fig.
2. Connect the gates as per the given circuit diagram.
3. Keep the data Inputs "D0 = 0, D1 = 1, D2 = 1, D3 = 0"
4. Change the selection lines as "00, 01, 10, 11" and observe the output for each combination as shown in truth table.
5. Repeat the experiment using 4:1 multiplexer module as shown in figure.

Viva Questions and answers:

1. What are the Applications of Multiplexers in Digital Systems?

Multiplexers are widely used in:

- Data routing and signal selection
- Communication systems for channel selection
- Arithmetic and logic units (ALUs) in processors for operation selection
- Time division multiplexing for signal transmission

2. How do the Select Lines Determine the Output of a Multiplexer?

The select lines act as a binary code that determines which input line is connected to the output. Each combination of select lines selects one of the inputs to be connected to the output.

For a 4:1 MUX:

- 00 selects D0,
- 01 selects D1,
- 10 selects D2,
- 11 selects D3.

3. Explain the Difference Between a Multiplexer and a Demultiplexer.

A multiplexer combines multiple inputs into one output, controlled by select lines, effectively "selecting" which input to pass through. A demultiplexer does the opposite; it takes a single input

and distributes it to one of several outputs, based on select lines. While a multiplexer selects from many inputs, a demultiplexer distributes a single input to one of many outputs. They are mirror images in functionality, used for routing signals in digital circuits.

Result: Student is able to design a 4:1 multiplexer using logic gates.