

## EXPERIMENT – 13

### CHOICE BASED CONTROL OF VENDING MACHINE

**Aim:** To design a choice based vending machine with control mechanism using Logisim.

**Tools Required:** Logisim

**Components/devices can be used:** Logic Gates, D-Flip flops, Registers, Comparator.

**Need and purpose:**

A vending machine is an automated machine that provides items to consumers for purchase. Greatest application for vending machines is either food or drink or both. Snack and cold/hot drink is the best thing we ever get out of these machines. No big queues, no time consuming distance, no issue of unavailability at late night.

Ticket vending machine is another latest technological development which is used to sell tickets ahead of any specific event ranging from a local football game to a music concert to a drama show.

**Model Diagram / Table:**

S.no	Clock pulse	Inputs A B C D	Outputs			
			Coffee	Tea	Milk	HotWater
1		1 0 0 0	1	0	0	0
2		0 1 0 0	0	1	0	0
3		0 0 1 0	0	0	1	0
4		0 0 0 1	0	0	0	1

**Pre-Lab:****1. What is the purpose of designing a choice-based vending machine?**

Answer: The purpose of designing a choice-based vending machine is to allow users to select from multiple options and dispense the corresponding item based on their selection. This provides convenience and flexibility to users in choosing the desired product.

**2. What are the main components/devices involved in designing a choice-based vending machine using Logisim?**

Answer: The main components/devices involved in designing a choice-based vending machine using Logisim include logic gates (such as AND, OR, XOR), D-flip flops, registers, and comparators. These components are utilized to implement the control mechanism for selecting options and dispensing items accordingly.

**3. How does a D-flip flop contribute to the operation of a vending machine?**

Answer: A D-flip flop is a sequential logic device that stores one bit of data. In the context of a vending machine, D-flip flops can be used to store the state of various components or registers, such as the selection made by the user or the amount of inventory available for each item. This helps in maintaining the state of the vending machine and executing the appropriate actions based on user inputs.

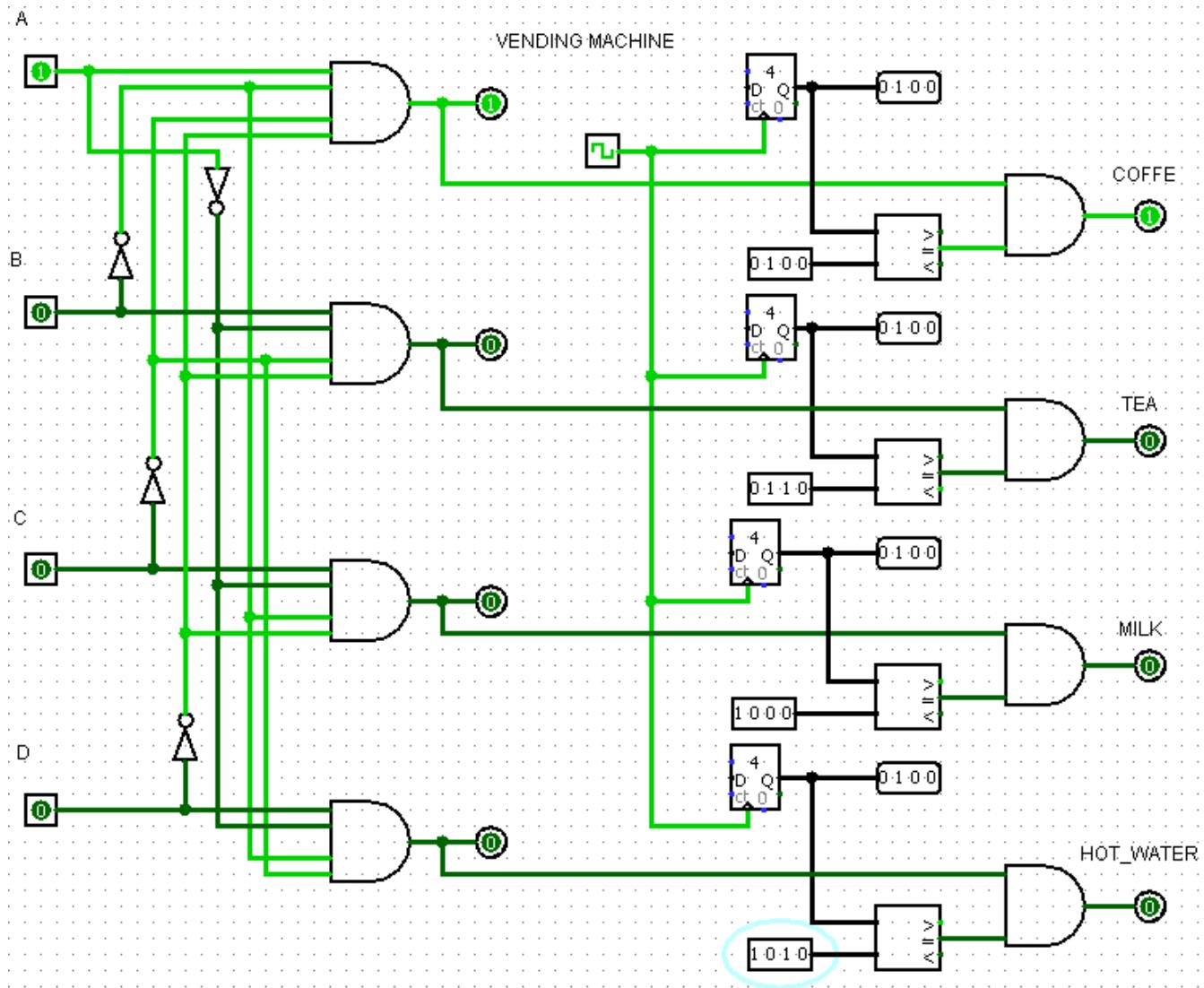
**4. Explain the role of a comparator in the control mechanism of a vending machine.**

Answer: A comparator is used to compare two values and determine their relationship (e.g., equality, greater than, less than). In a vending machine, comparators can be utilized to compare the user's selection with the available options and trigger the corresponding action, such as dispensing the selected item. By comparing input values, comparators enable the vending machine to execute the desired functionality based on user choices.

**5. How can logic gates be employed in the design of a choice-based vending machine?**

Answer: Logic gates, such as AND, OR, XOR, are fundamental building blocks in designing the control mechanism of a vending machine. These gates are used to process and manipulate input signals, enabling functions like option selection, validation, and item dispensing. For instance, AND gates can be employed to combine multiple input signals to activate a particular output, while OR gates can be used for selecting among different options.

## Circuit Diagram:



## Procedure:

1. Design a vending machine based on prescribed conditions.
2. Vending machine should give 1 item as output out of the available 4 items depending on the choice of the customer and according to the conditions applied (i.e. clock pulses).
3. For the above specified functionality select the required modules/units in logisim and implement the required logic circuit.
4. Verify the functionality of the designed system.

## Viva Questions and answers:

1. Can you explain the overall functionality of the choice-based vending machine you've designed using Logisim?
2. What role do logic gates play in the operation of the vending machine's control mechanism?
3. Can you describe the significance of using D-flip flops in the vending machine design? How do they contribute to its functionality?
4. How do you handle scenarios where the user makes an invalid selection or the vending machine runs out of stock for a particular item?
5. What challenges did you encounter during the design and implementation of the vending machine? How did you overcome them?

**Result:** The experiment successfully demonstrated the design of choice based vending machine with control mechanism using Logisim.