Vending Machine

EEE-301/302 Final Project

By Group-11

Project Statement/Research

- **Everyday products are marked up in price due to high overhead costs,(labour,electricity and space) and are not available round the clock. Our vending machine will aim to tackle these problems.**

Objective

A vending machine core objective is to store dried food,beverages and everyday products and dispense them once the appropriate amount of money has been inserted. It also needs to give back changes if the amount of money is more than the price of the product or give the back the entire sum of money if it is insufficient.

We will try to implement the following features in the vending machine we are designing:

- Vend products at 3 different price points
- Accept 2 kinds of coins/notes
- If the amount of money inserted is more than the price of the product, the vending machine will give change back.
- Displaying the amount of money inputted
- Display change to be given
- Self-starting with the initial coin
- Will display using LED if purchase is successful (Green) or unsuccessful (RED).
- If insufficient money is inserted then vending machine will return the money inserted as change.

Motivation

- **Vending machines are a one-time investment. They require no staff, which means no extra wages to pay.**
- **In a crowded place like dhaka city vending machine is the perfect investment for saving up spaces.**
- **Most importantly using vending machine during this pandemic situation can reduce the spread of covid-19 virus by reducing human interaction.**

Equipment List

- 7 Segment Common Cathode Display
- Dual D-Type Flip flop (with Set and Reset)
- Inverter
- Two Input and Three input AND Gate
- Two Input and Three input OR Gate
- Green and Red LED
- Logic Probe
- Logic Toggle
- D-Clock
- Button

[All of these Equipments were picked from the library of PROTEUS 7.7 Professional Portable.

Some equipments were taken of different variety.]

Gantt Chart

Automatic Vending Machine

SIMPLE GANTT CHART by Vertex42.com
https://www.vertex42.com/ExcelTemplates/simple-gantt-chart.html

Project Lead: Fariha Nowrin

Project Start: Sun, 3/28/2021

Display Week: 1

TASK	ASSIGNED TO	START	END
RESEARCH AND PLANNING	All	3/29/21	4/4/21
CIRCUIT DESIGNING	Lazib Sharar and Fariha nowrin	4/5/21	4/13/21
CIRCUIT SIMULATION AND TROUBLESHOOTING	Anika Soha and Aanika Tabassum	4/14/21	4/19/21
REPORT WRITING	Anika Soha and Fariha Nowrin	4/20/21	4/27/21
POWERPOINT PRESENTATION MAKING	Lazib Sharar and Aanika Tabassum	4/28/21	5/1/21
VIDEO EDITING	Lazib Sharar	5/2/21	5/4/21

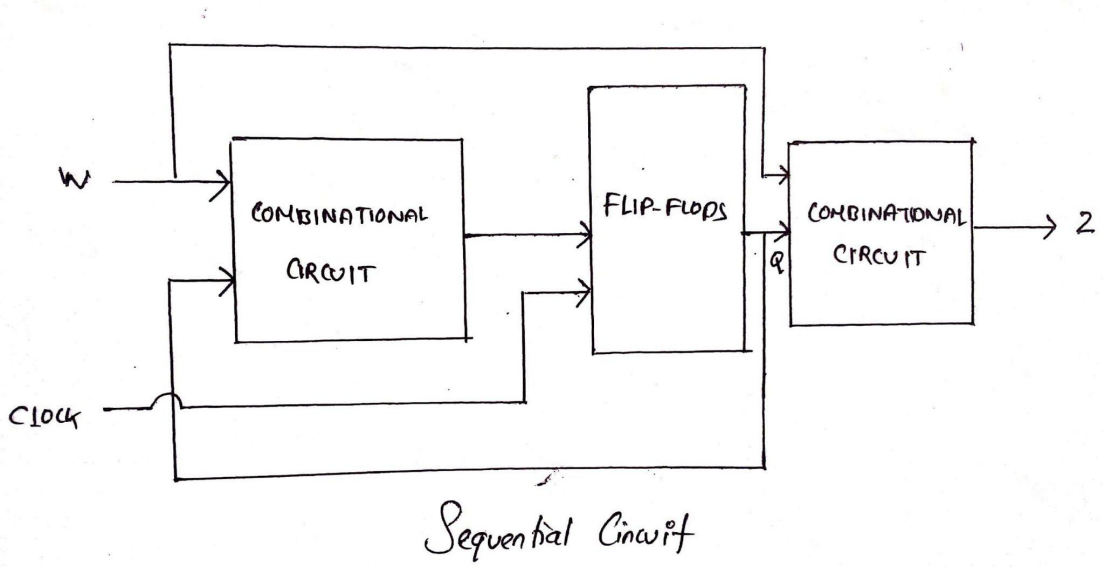
Methodology/Theory/Calculations

Price Points: 5tk, 10tk, and 15tk
Money to be accepted: 5tk and 10tk

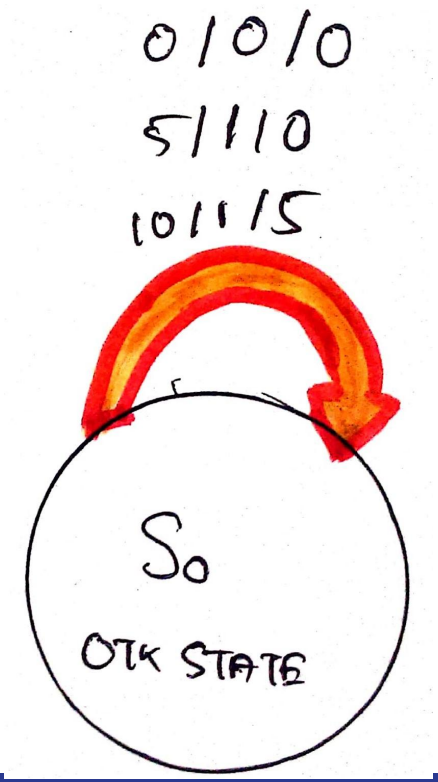
State assigned:

So = 00	0tk = 00
S1 = 01	5tk = 01
S2 = 10	10tk = 10
X = 11	X = 11

-legend:
0/0/0 ➡ money in/purchase/change



State Flow Diagram for 5tk price point

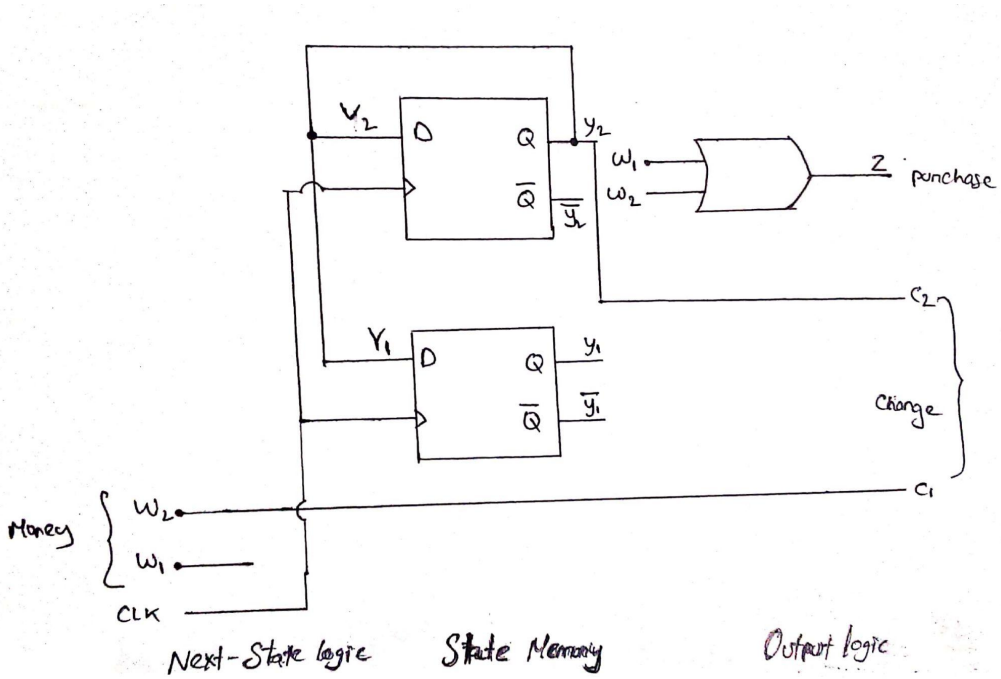


Methodology for for 5TK PRICE POINT

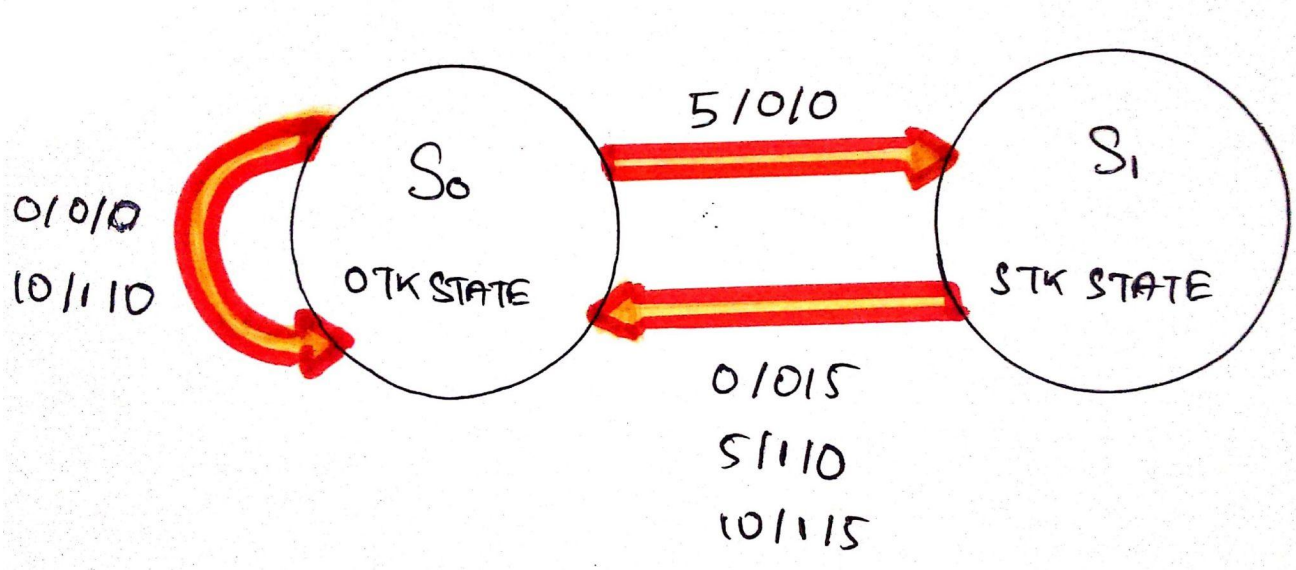
State Assigned Table:

Present state (y2y1)	Next State (Y2Y1) (w2w1)				Output							
					Z (w2w1)				C2C1 (w2w1)			
	00	01	10	11	00	01	10	11	00	01	10	11
00	00	00	00	x	0	1	1	x	00	00	01	x
01	x	x	x	x	x	x	x	x	x	x	x	x
10	x	x	x	x	x	x	x	x	x	x	x	x
11	x	x	x	x	x	x	x	x	x	x	x	x

Circuit for 5tk price point



State Flow Diagram for 10tk price point

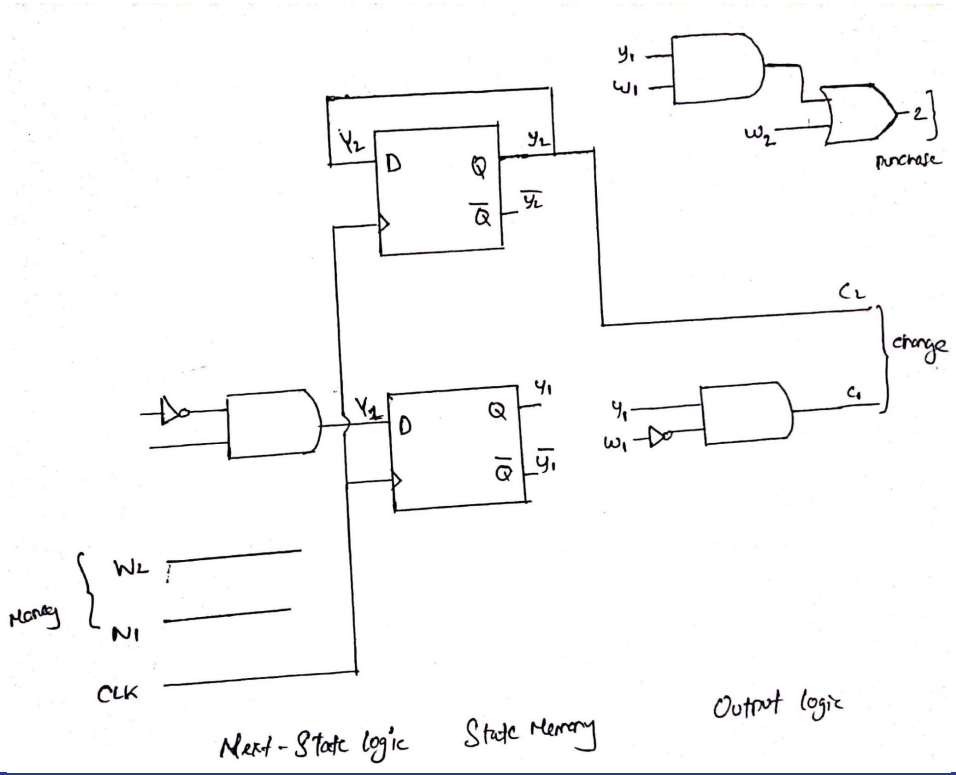


Methodology for for 10TK PRICE POINT

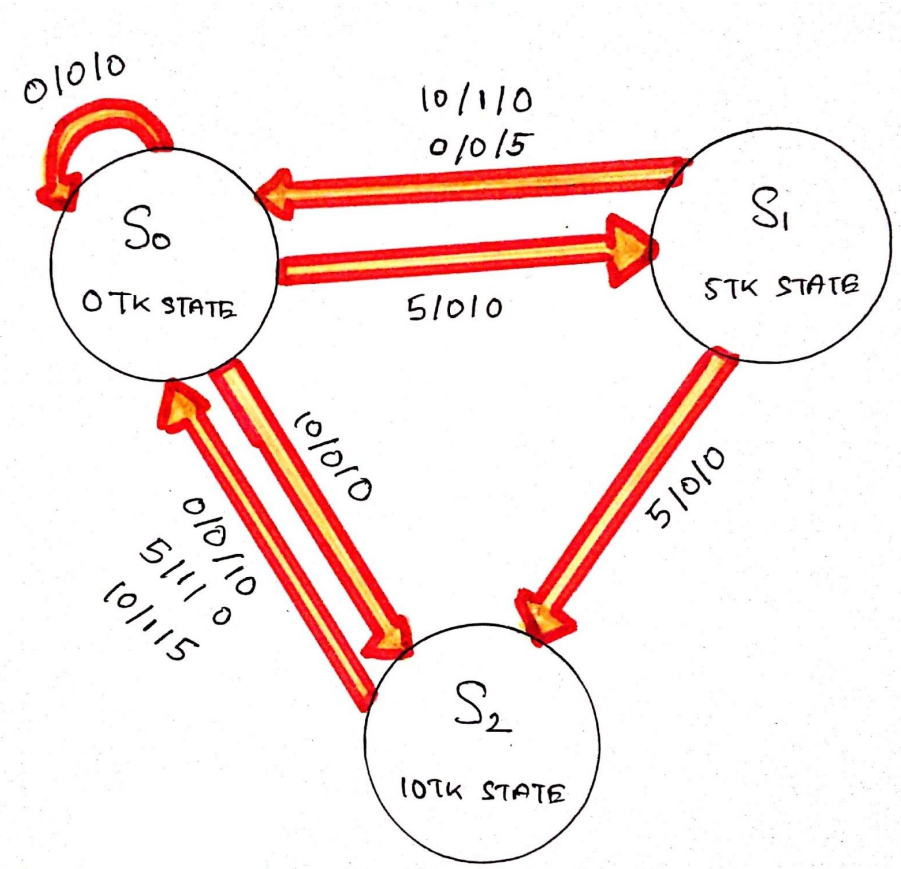
State Assigned Table:

Present state (y2y1)	Next State (Y2Y1) (w2w1)				Output							
					Z (w2w1)				C2C1 (w2w1)			
	00	01	10	11	00	01	10	11	00	01	10	11
00	00	01	00	x	0	0	1	x	00	00	00	x
01	00	00	00	x	0	1	1	x	01	00	01	x
10	x	x	x	x	x	x	x	x	x	x	x	x
11	x	x	x	x	x	x	x	x	x	x	x	x

Circuit for 10tk price point



State Flow Diagram for 15tk price point



Methodology for for 15TK PRICE POINT

State Table:

Present State	Next State (Y2Y1)				Output							
					Z (w2w1)				C2C1 (w2w1)			
	00	01	10	11	00	01	10	11	00	01	10	11
S0	S0	S1	S2	X	0	0	0	X	00	00	00	X
S1	S0	S2	S0	X	0	0	1	X	01	00	00	X
S2	S0	S0	S0	X	0	1	1	X	10	00	01	X

State Assigned Table:

Present state (y2y1)	Next State (Y2Y1) (w2w1)				Output							
					Z (w2w1)				C2C1 (w2w1)			
	00	01	10	11	00	01	10	11	00	01	10	11
00	00	01	10	x	0	0	0	x	00	00	00	x
01	00	10	00	x	0	0	1	x	01	00	00	x
10	00	00	00	x	0	1	1	x	10	00	01	x
11	x	x	x	x	x	x	x	x	x	x	x	x

15 TK K-maps

For Y2: Y2=y2'y1'w2+y1w1

w2w1 / y2y1	00	01	11	10
00	0	0	x	1
01	0	1	x	0
11	x	x	x	x
10	0	0	x	0

For Y1: Y1=y2'y1'w1

w2w1 / y2y1	00	01	11	10
00	0	1	x	0
01	0	0	x	0
11	x	x	x	x
10	0	0	x	0

15 TK K-maps

For Z: Z=y1w1+y2w1+y2w2

w2w1 / y2y1	00	01	11	10
00	0	0	x	0
01	0	0	x	1
11	x	x	x	x
10	0	1	x	1

For C2: C2=y2w2'w1'

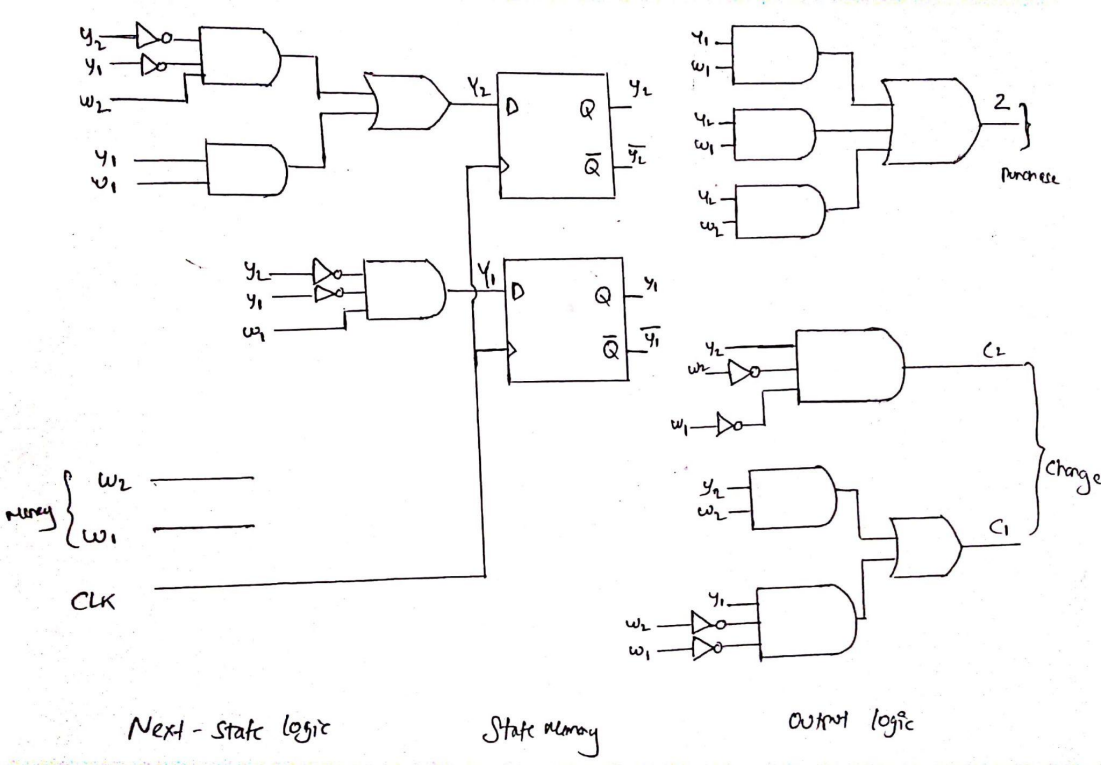
w2w1 / y2y1	00	01	11	10
00	0	0	x	0
01	0	0	x	0
11	x	x	x	x
10	1	0	x	0

15 TK K-maps

For C1: C1=y1w2’w1’+y2w2

w2w1 / y2y1	00	01	11	10
00	0	0	x	0
01	1	0	x	0
11	x	x	x	x
10	0	0	x	1

Circuit for 15tk price point



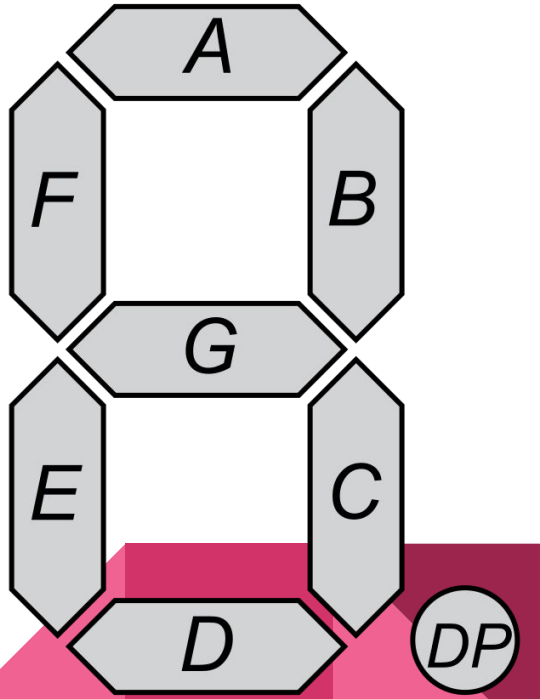
Additional Features outside of the main circuit block:

- **Displaying the money being inputted and the change being given:**

  00 is 0 taka, 01 is 5 taka and 10 is 10 taka in our 7 segment

  Display. Below we showed the logic using truth table and the eventual

  Circuit disconnected from the main block.

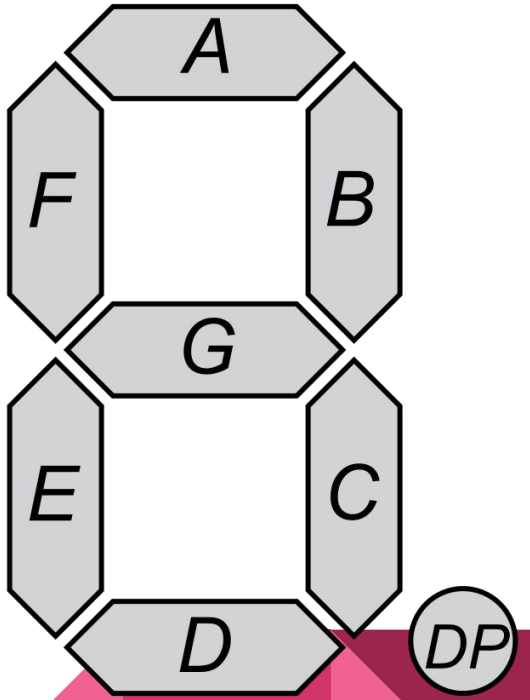


MSB (I2)

A	I2’
B	1
C	1
D	I2’
E	I2’
F	I2’
G	0

LSB(I1)

A	1
B	I1’
C	1
D	1
E	I1’
F	1
G	I1

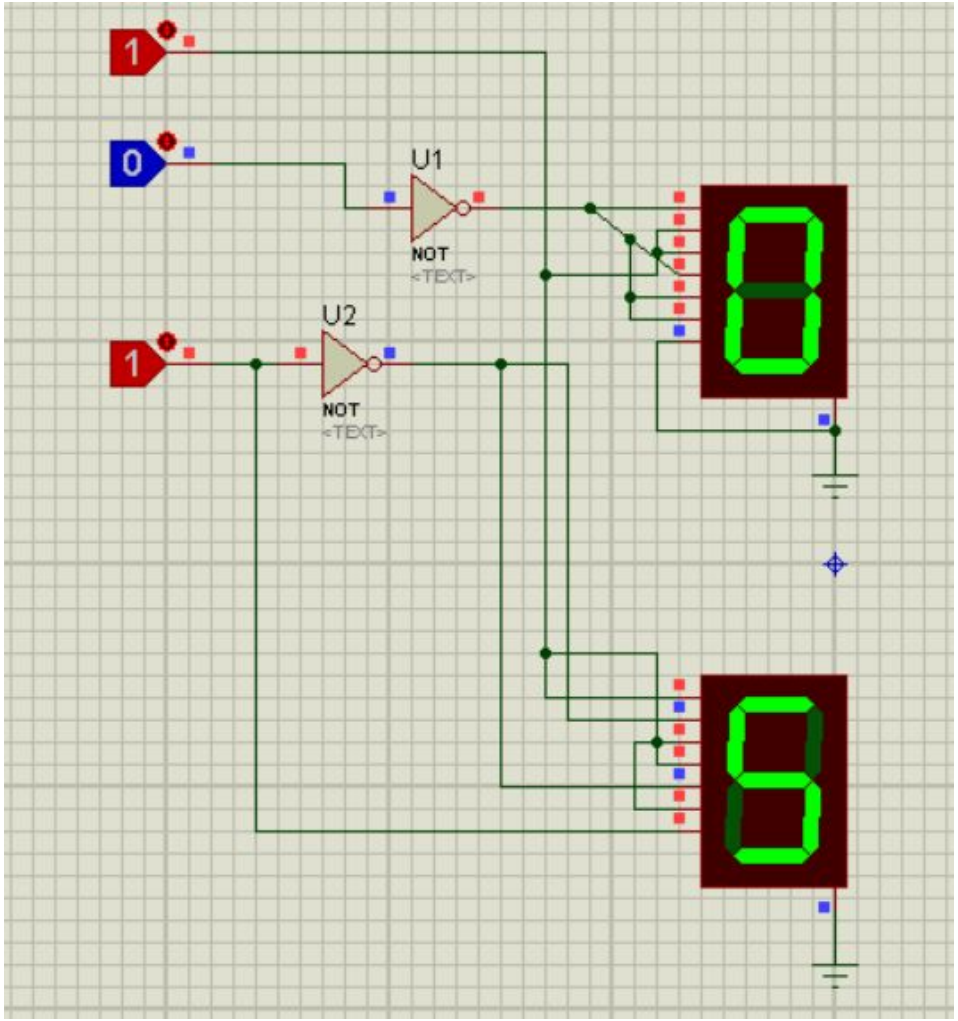


On the left we have the circuit design To represent the money in and changes owed using a 7 segment display.

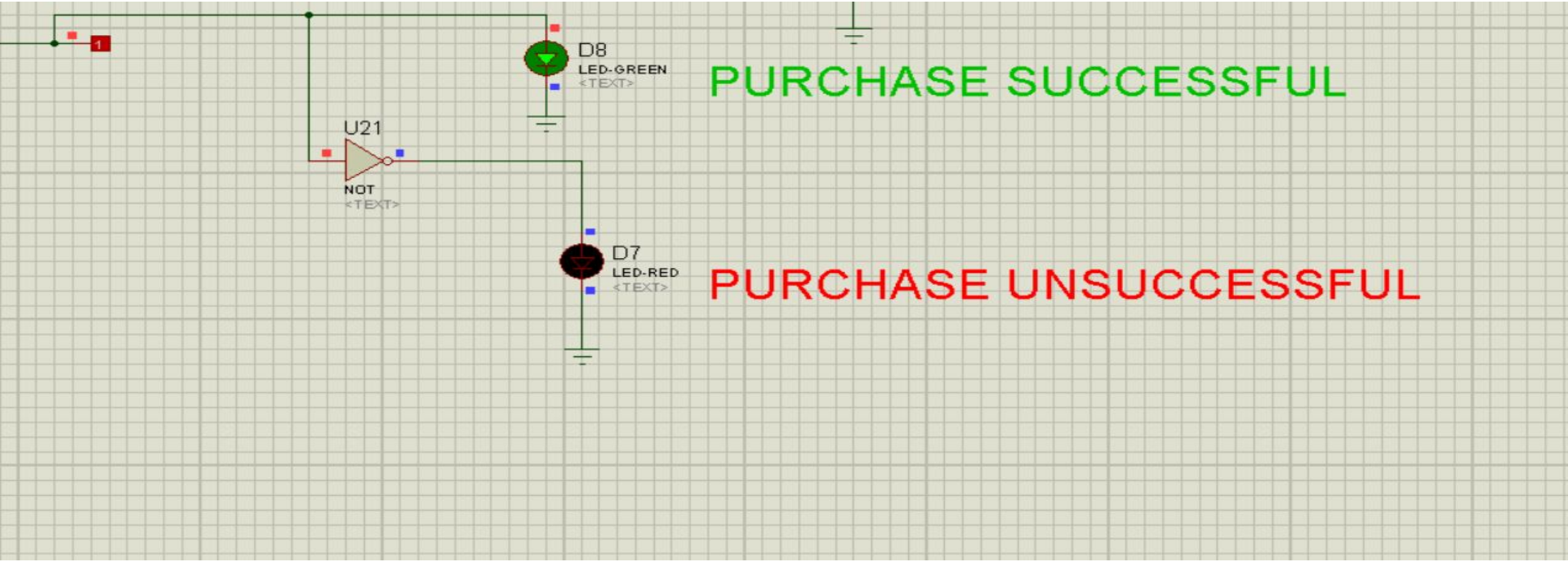
00 is 0 Tk

01 is 5 Tk

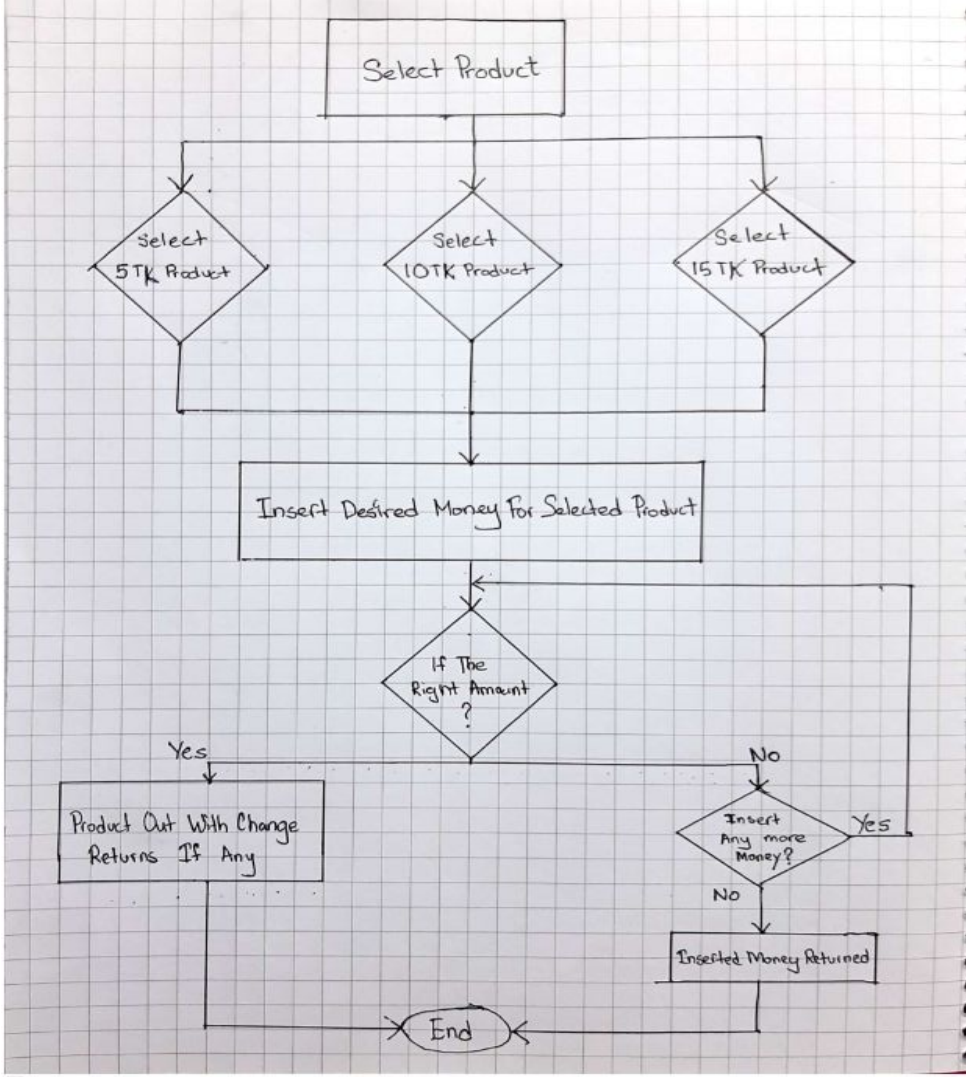
10 is 10 Tk



- **Show using LEDS whether purchase has been successful or unsuccessful.**

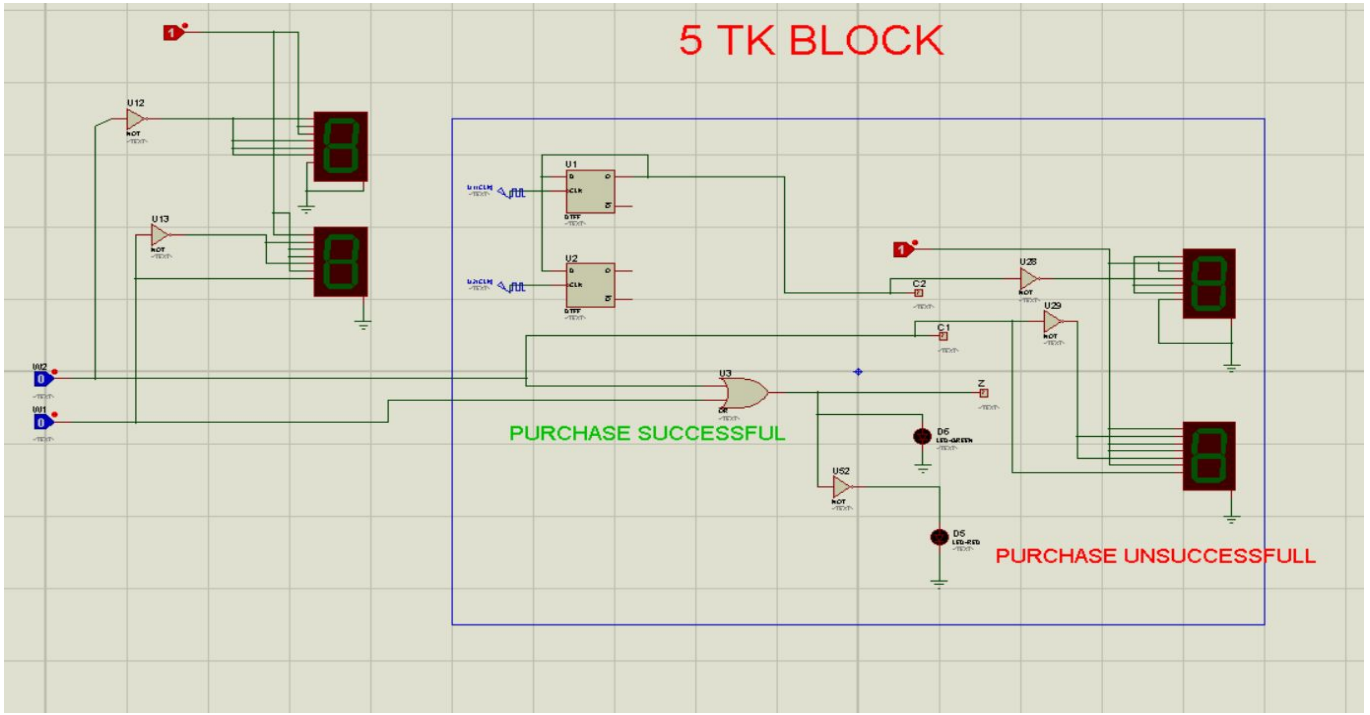


System Design Flow

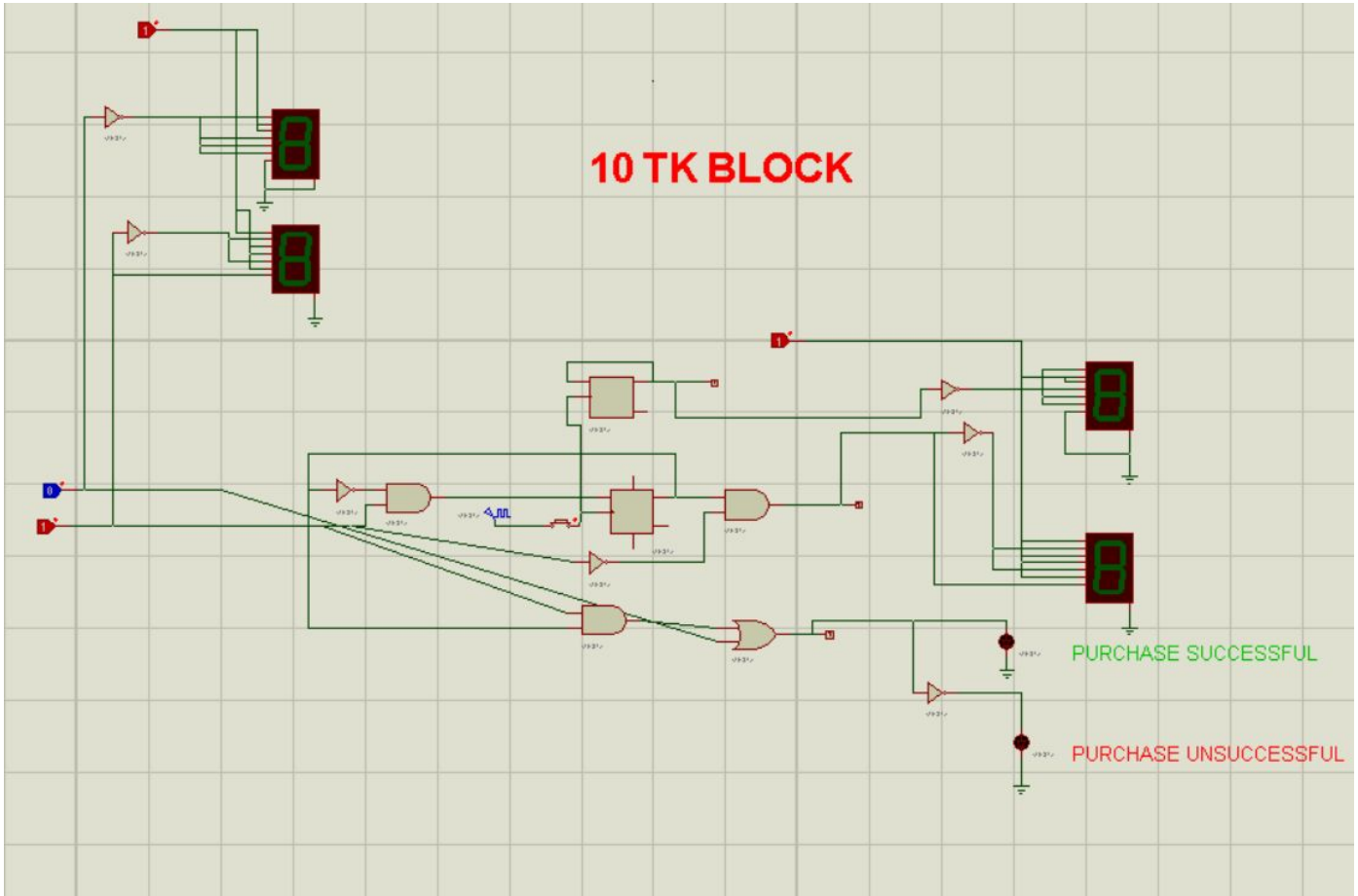


Analysis/Results/Code/Graph/Simulation

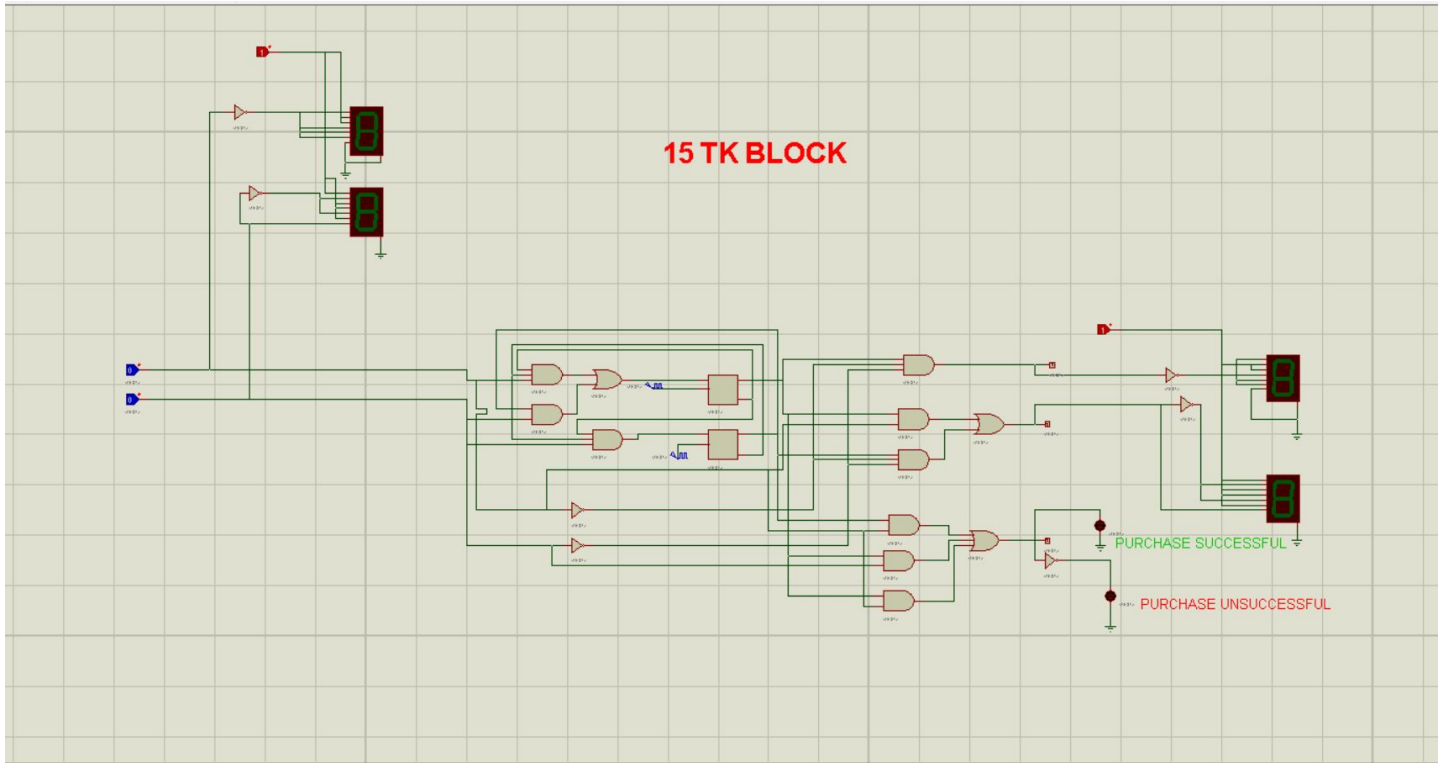
5TK BLOCK:



10 TK BLOCK:



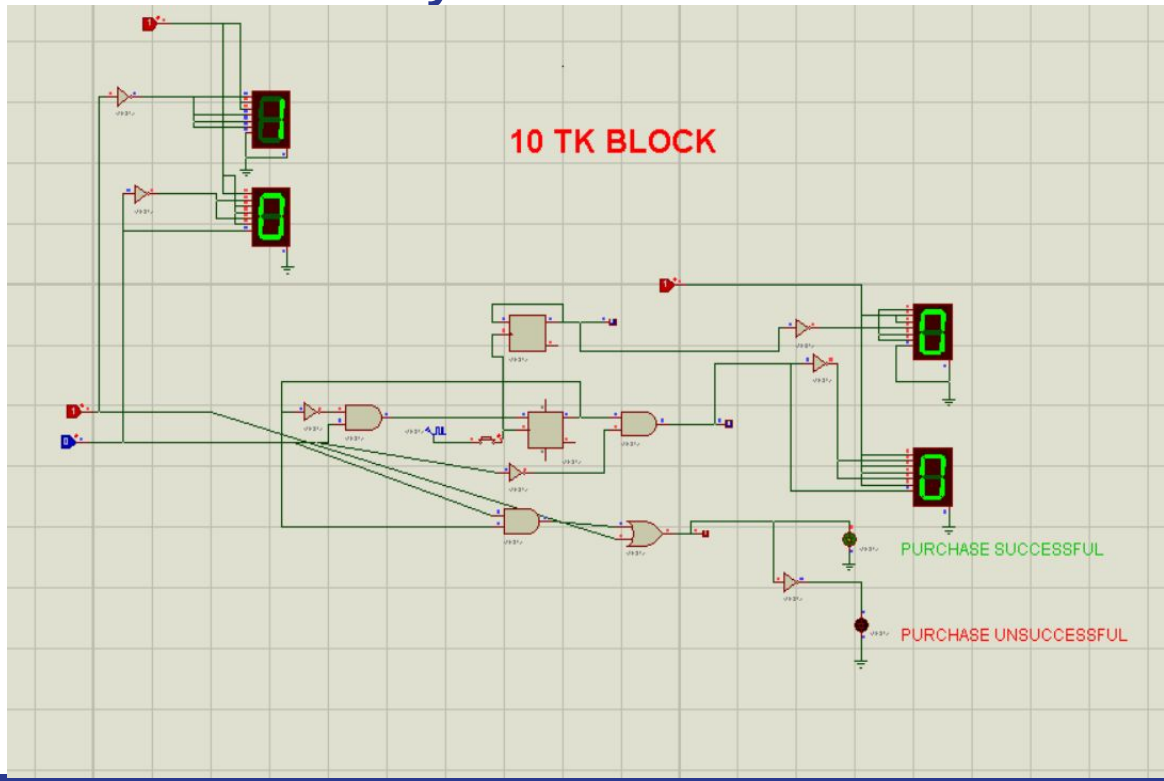
15TK Block:



Showing that the product is being dispensed and no change is being given if exact money is inserted:

- 10 taka money is being inserted

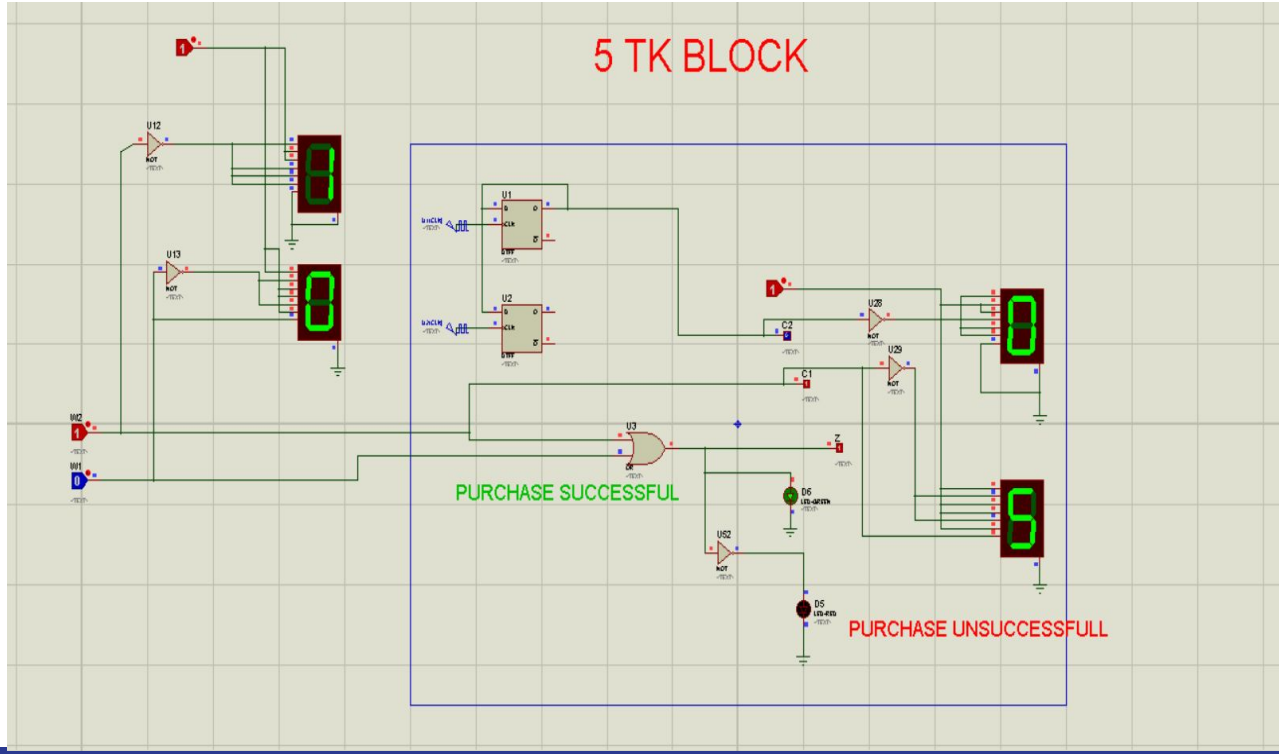
And we are receiving 0 taka change.Whilst the product Is being successfully vended as shown with green led being lit.



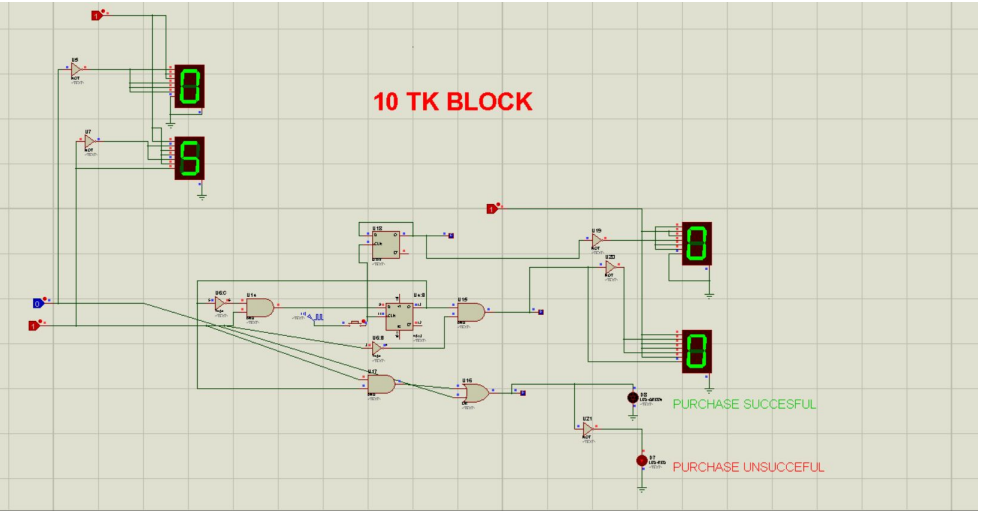
Showing that product is being dispensed and appropriate change is being given if extra money is inserted

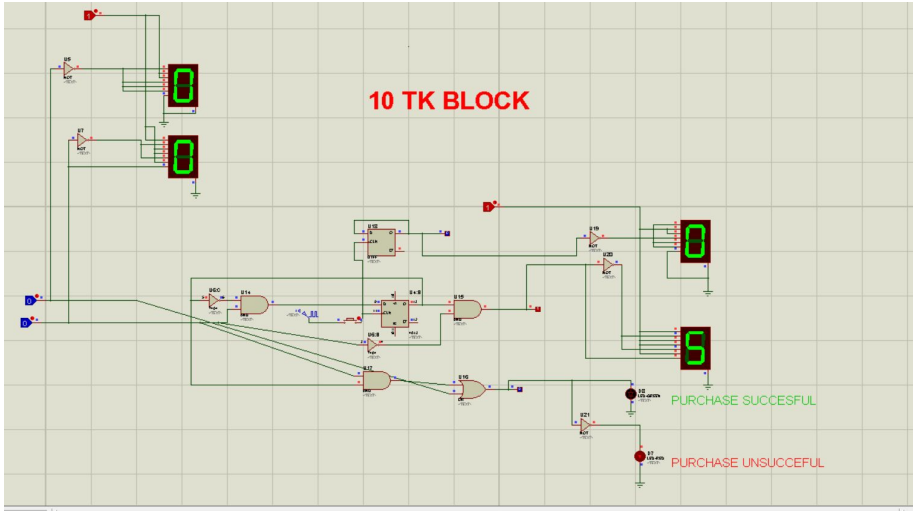
- 10 tk is being inserted

and 5 tk product is being dispensed whilst 5 tk change is being given back as shown



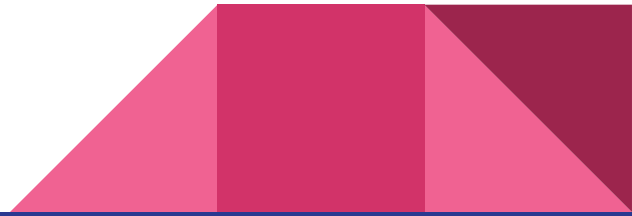
Show that if money is inserted but not the appropriate amount the money is given back to the owner as change





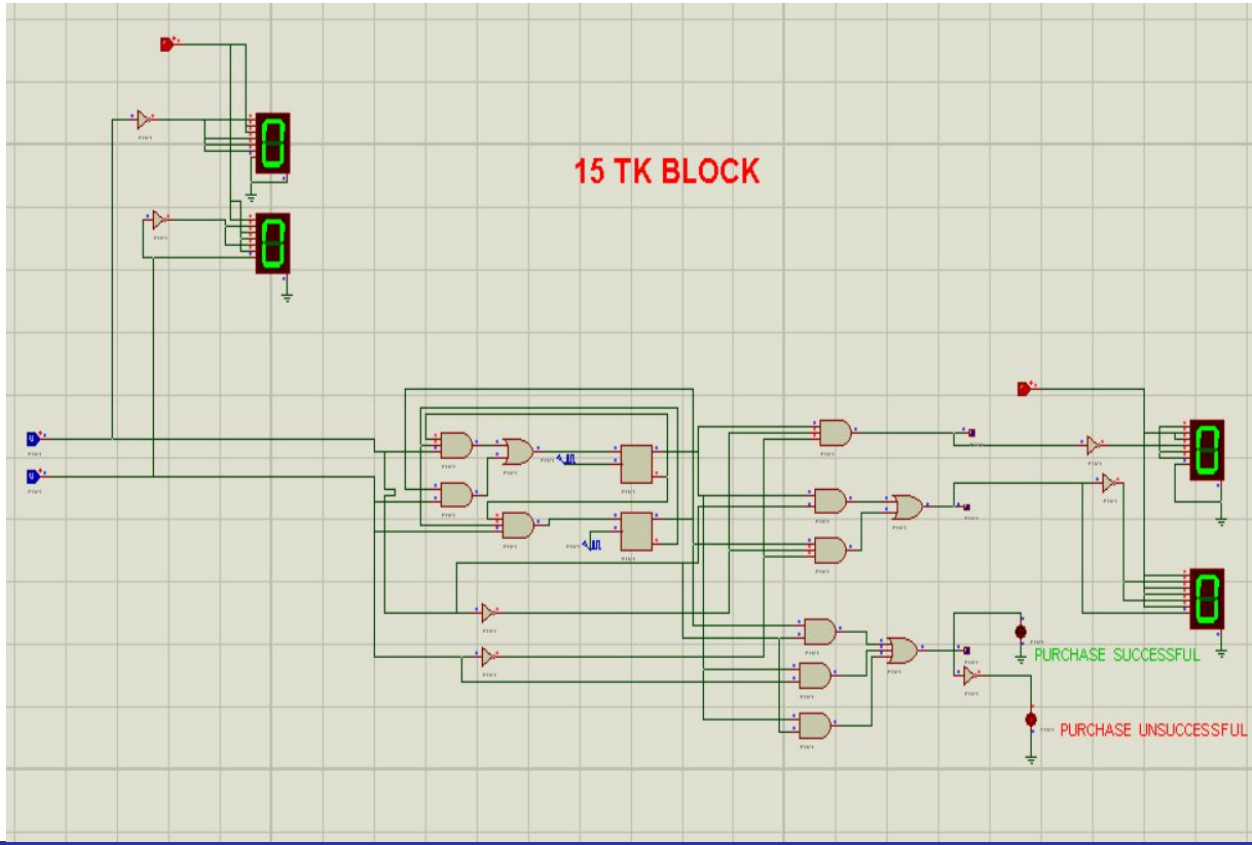
We inserted 5Tk but the product is priced at 10Tk.

In the next clock cycle if we inserted more money than product should’ve been dispensed but we inserted no money so the 5Tk we had originally inserted is returned back to us.



Showing that no product is being dispensed and no change is given if no money is inserted:

- As no money is inserted both the Money in and change Display shows 0 TK. Also LED is red Showing purchase In unsuccessful.



Reference

- https://www.youtube.com/watch?v=KHanq9mriJI
- https://l.facebook.com/l.php?u=https%3A%2F%2Fwww.trendtablet.com%2F9226-the-future-of-vending-machine%2F%3Ffbclid%3DIwAR1vGw-PylTt4RsBZ0lcFcOs1LNreBg9Tt7C81jSvFKAvfTT0L60F5TUrKk&h=AT1VOvSgPa5dXmAHRlJUtmhv_0fSC7GI8mdrlKp_NMSvsoxCGmteLabTxvlZEICfxhOUOxYLyoVCyMMic8i1AkuXam6xxx5RbxbB_OMveB4AOM4AVcF0d3YokdL40GSkoiWTRw
- https://www.online-sciences.com/technology/automatic-vending-machines-advantages-and-disadvantages/?fbclid=IwAR2q1srlDrXfyWCqm1RyIvc-jGqqEHByX5tDtomey86GogXnxz6RGMYYrZk
- https://www.selecta.co.uk/news/benefits-of-vending-machines/?fbclid=IwAR0b9cfsf-UaR1Dxf8nMxZjzmnkAS48NxCSIEBDkWLuUktu6DQos8nBisqQ

Future work and Conclusion

- Vending machines can be used in any deserted place of the world. In remote areas with less shops, if we use vending machines, people can easily purchase necessary products at any time.
- Access to food will be easy from any place of the world.
- In future we can develop the programmings of vending machines to avoid any kind of fault.Moreover, different apps are being created for finding out the closest vending machine in any particular area.People can also comment on these apps mentioning what products the want or if they have faced any problem while purchasing products.