

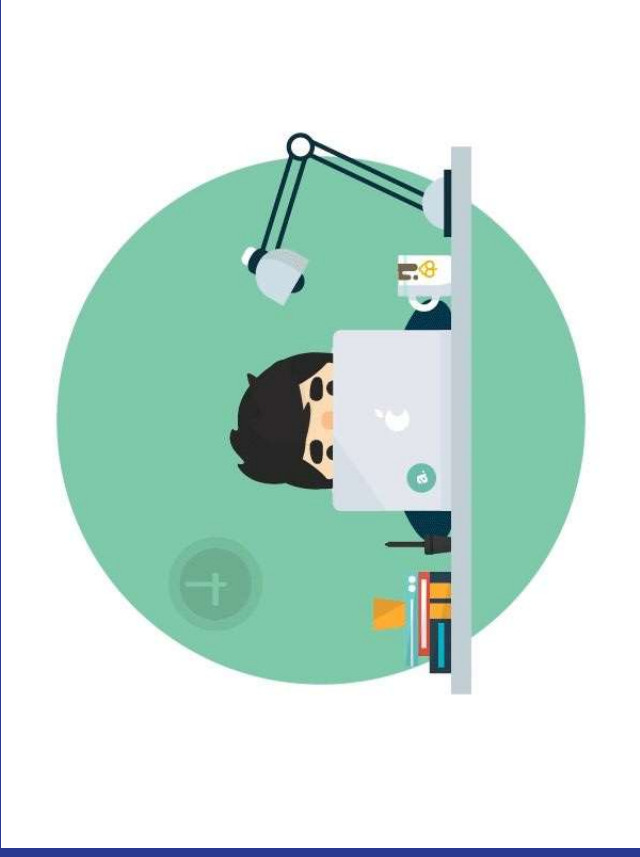


Vending Machine

EEE-301/302 Final Project

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.

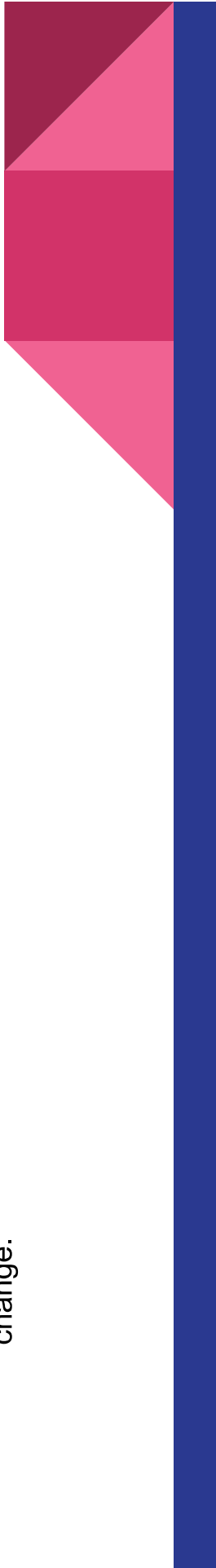


Objective

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.

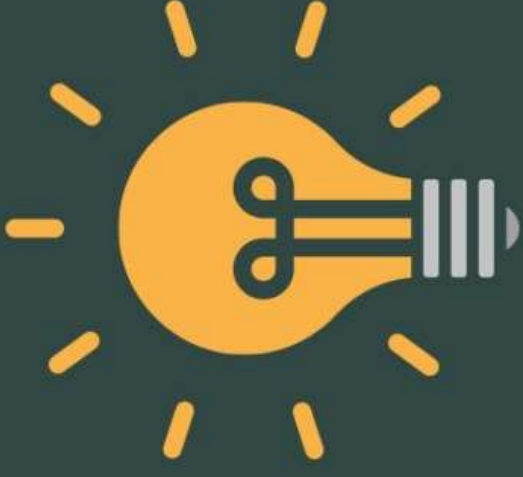
We will try to implement the following features in the vending machine we are designing:

- 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

Project Lead: Farha Nowrin

Project Start:

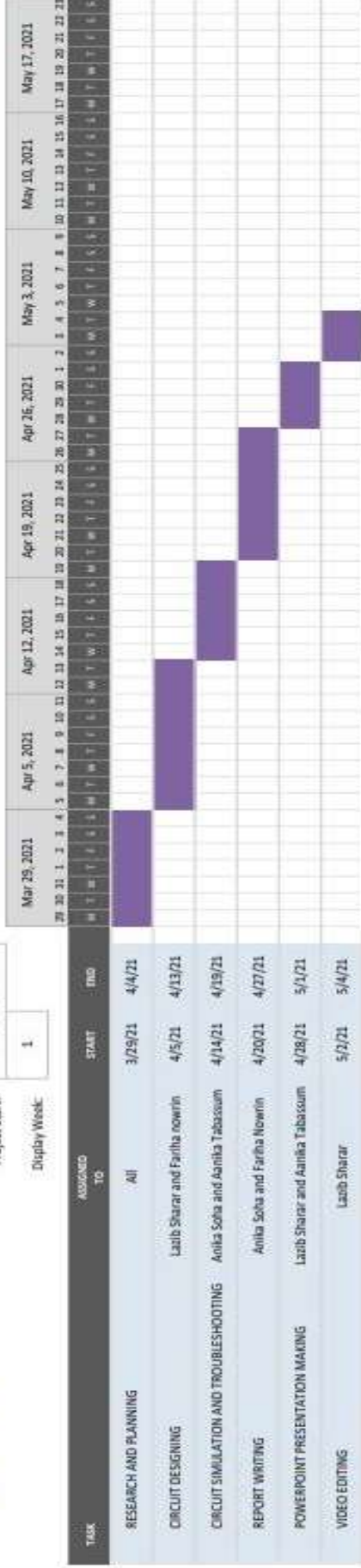
Sun, 3/28/2021

Display Week:

1

SAMPLE GANTT CHART by Venus42.com

<https://www.venus42.com/ExcelTemplates/sample-gantt-chart.html>



Methodology/Theory/Calculations

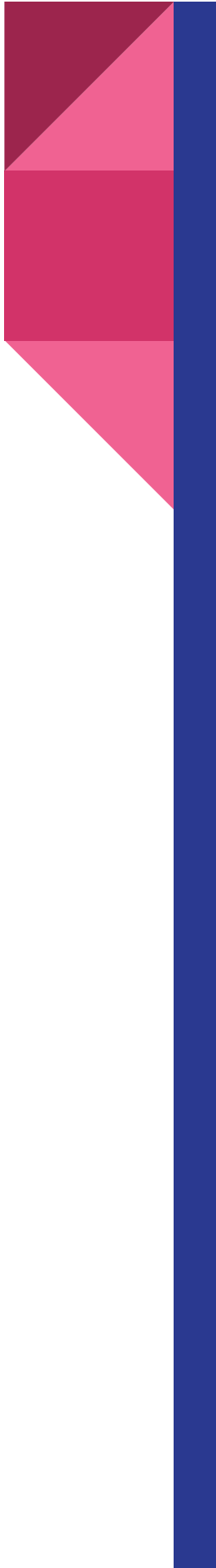
Price Points: 5tk, 10tk, and 15tk
Money to be accepted: 5tk and 10tk

State assigned:

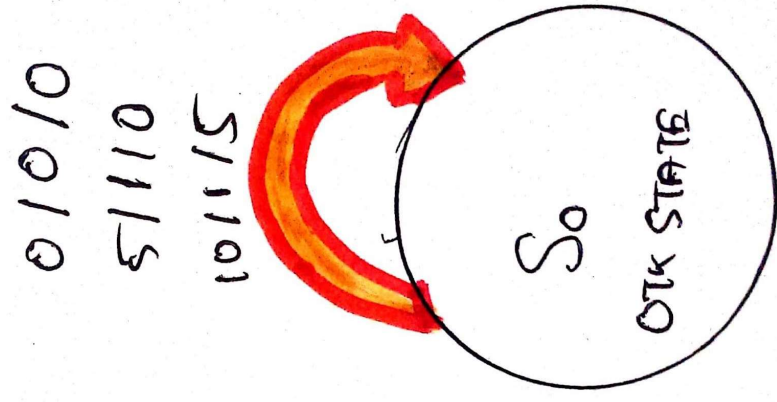
S ₀ = 00	0tk = 00
S ₁ = 01	5tk = 01
S ₂ = 10	10tk = 10
X = 11	X = 11

-legend:

0/0/0  money in/purchase/change



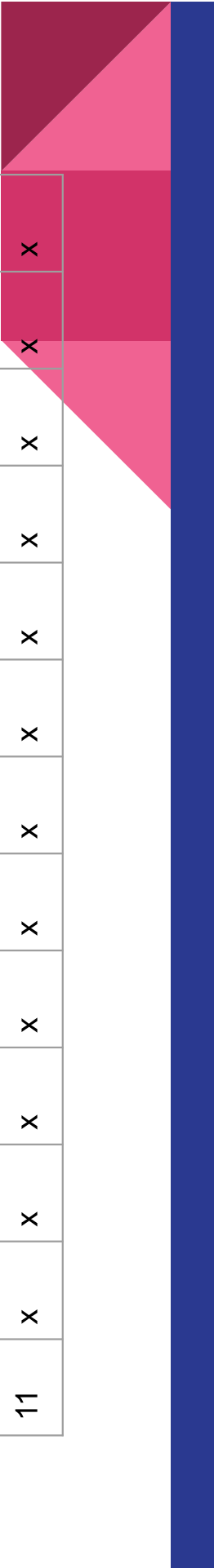
State Flow Diagram for 5tk price point



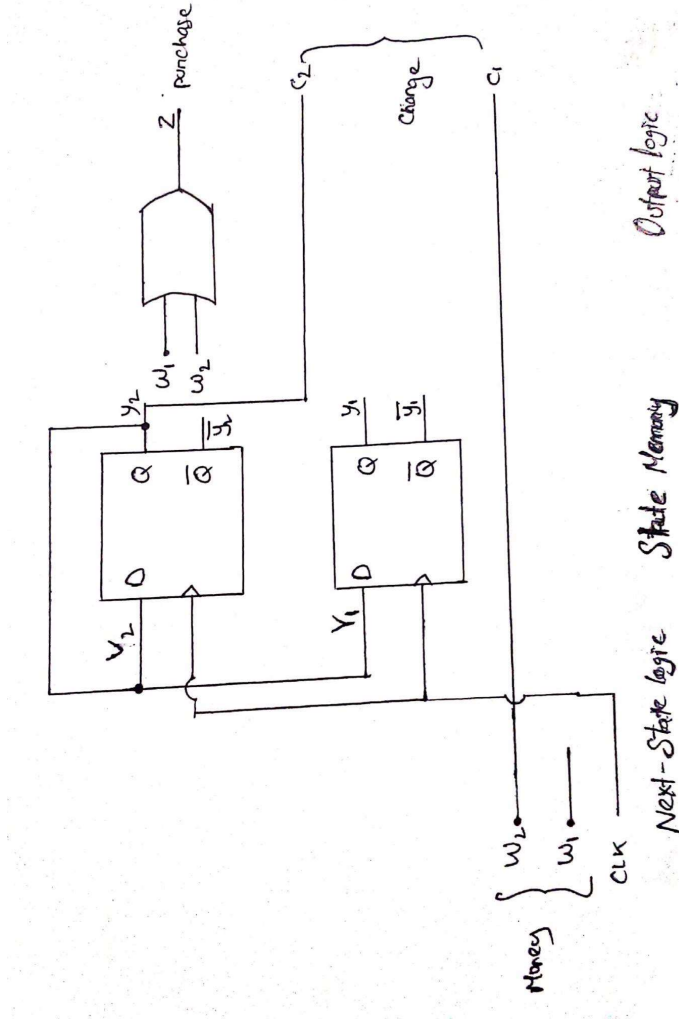
Methodology for 5TK PRICE POINT

State Assigned Table:

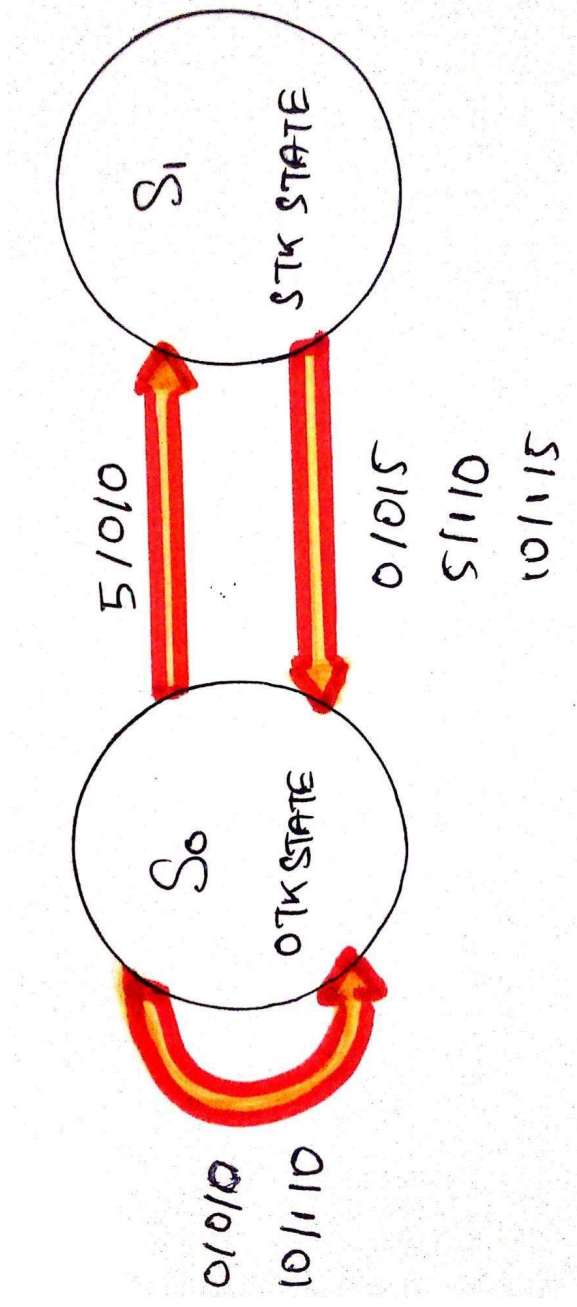
Present state (y2y1)	Next State (Y2Y1) (w2w1)								Output			
	Z (w2w1)								C2C1 (w2w1)			
	00	01	10	11	00	01	10	11	00	01	10	11
00	00	00	00	x	0	1	1	x	00	00	01	x
01	x	x	x	x	x	x	x	x	x	x	x	x
10	x	x	x	x	x	x	x	x	x	x	x	x
11	x	x	x	x	x	x	x	x	x	x	x	x



Circuit for 5tk price point



State Flow Diagram for 10tk price point



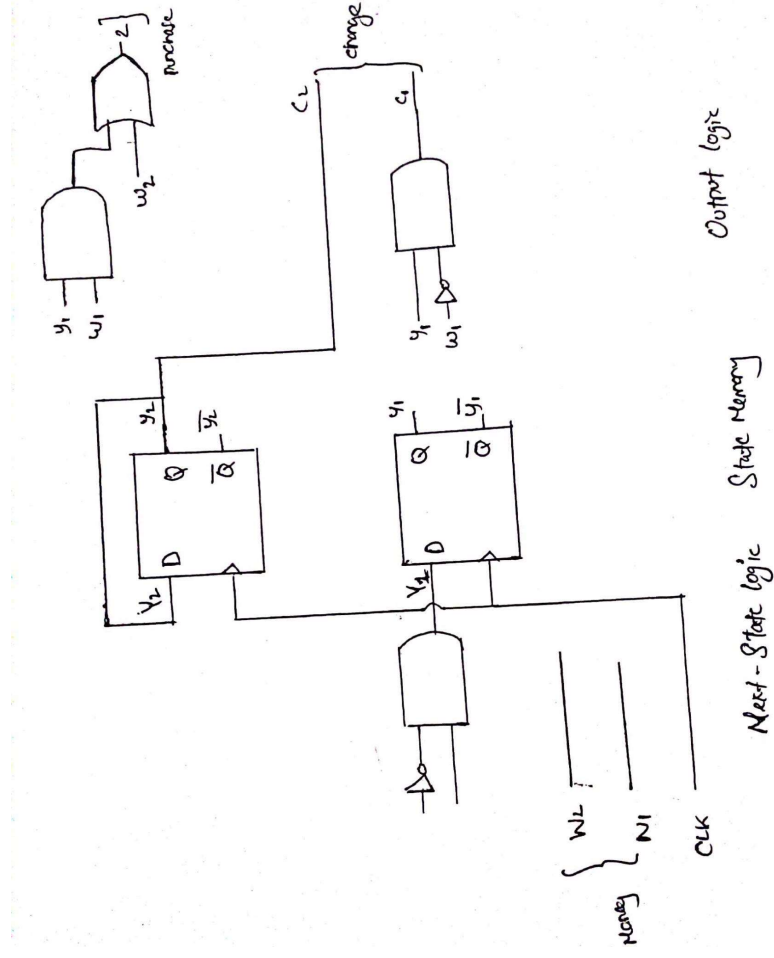
Methodology for 10TK PRICE POINT

State Assigned Table:

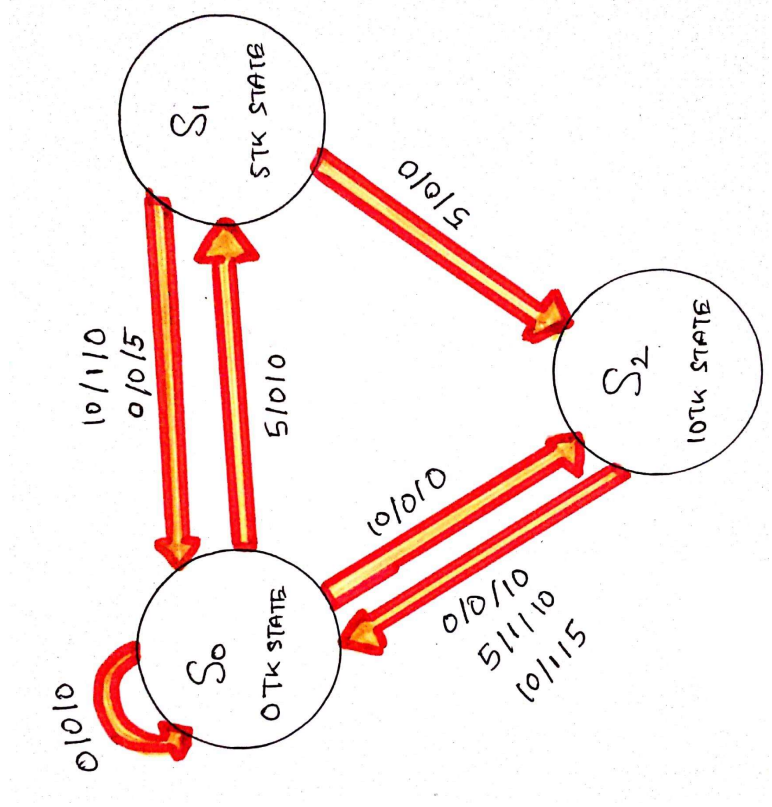
Present state (y2y1)	Next State (Y2Y1) (w2w1)								Output			
	Z (w2w1)								C2C1 (w2w1)			
	00	01	10	11	00	01	10	11	00	01	10	11
00	00	01	00	x	0	0	1	x	00	00	00	x
01	00	00	00	x	0	1	1	x	01	00	01	x
10	x	x	x	x	x	x	x	x	x	x	x	x
11	x	x	x	x	x	x	x	x	x	x	x	x



Circuit for 10tk price point



State Flow Diagram for 15tk price point



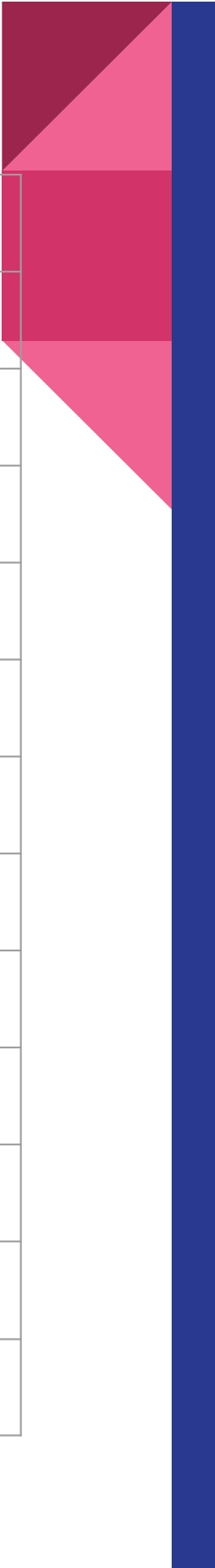
Methodology for for 15TK PRICE POINT

State Table:

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

State Assigned Table:

Present state (y ₂ y ₁)	Next State (Y ₂ Y ₁) (w ₂ w ₁)								Output							
									Z (w ₂ w ₁)				C ₂ C ₁ (w ₂ w ₁)			
									00	01	10	11	00	01	10	11
00	00	01	10	11	x	10	11	00	0	0	0	x	00	00	00	x
01	00	10	00	x	00	1	x	01	0	0	1	x	01	00	00	x
10	00	00	00	x	0	1	x	10	0	1	1	x	10	00	01	x
11	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x



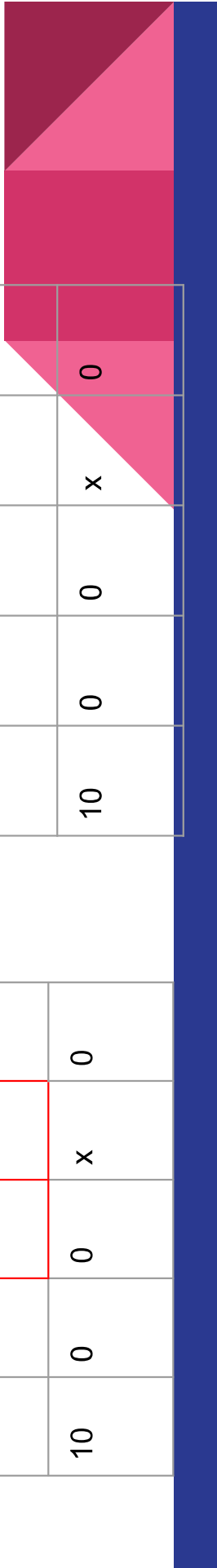
15 TK K-maps

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

$w2w1 \backslash y2y1$	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: $Y1=y2'y1'w1$

$w2w1 \backslash y2y1$	00	01	11	10
00	0	1	x	0
01	0	0	x	0
11	x	x	x	x
10	0	0	x	0



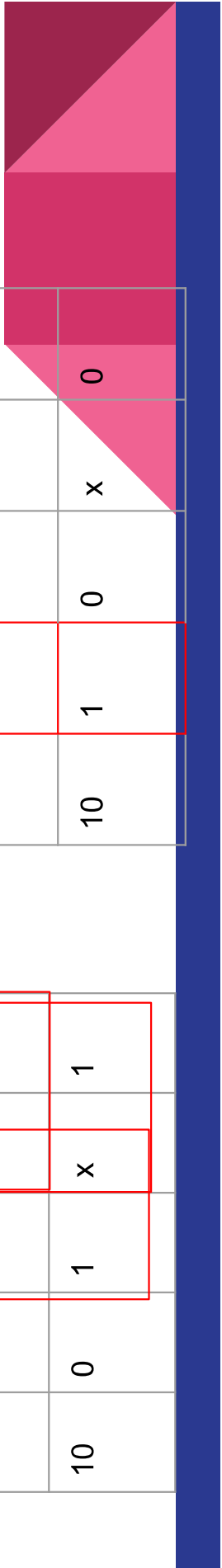
15 TK K-maps

For Z: $Z = y_1w_1 + y_2w_1 + y_2w_2$

$w_2w_1 \backslash y_2y_1$	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: $C_2 = y_2w_2'w_1'$

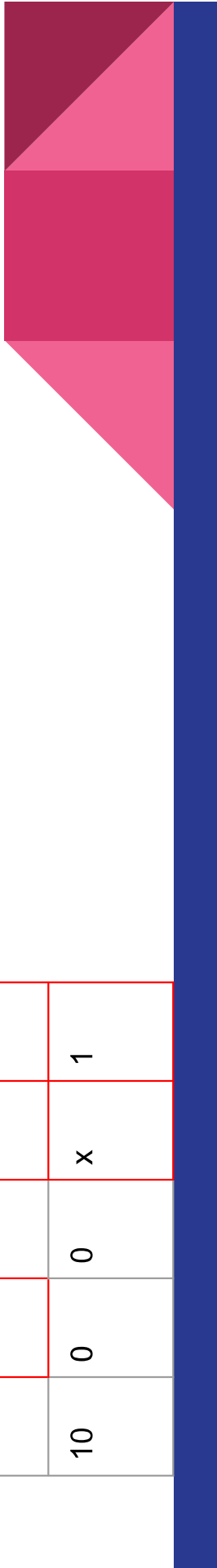
$w_2w_1 \backslash y_2y_1$	00	01	11	10
00	0	0	x	0
01	0	0	x	0
11	x	x	x	x
10	1	0	x	0



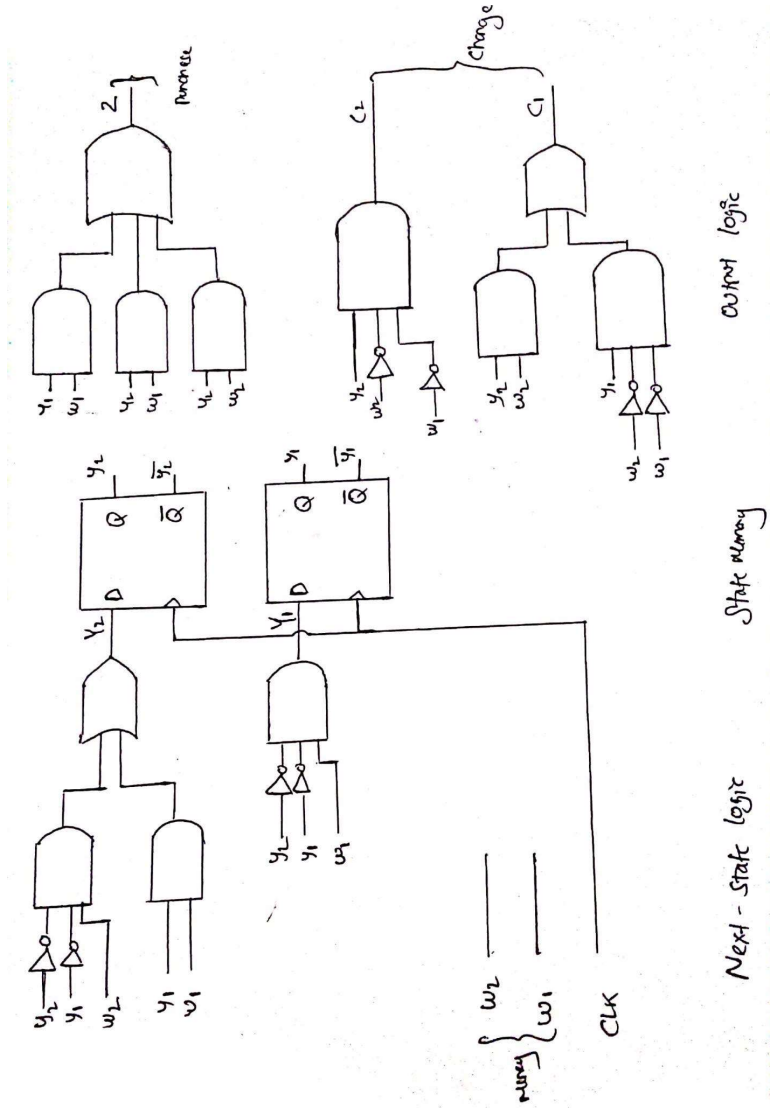
15 TK K-maps

For C1: $C1=y1w2'w1'+y2w2$

$w2w1 \backslash y2y1$	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



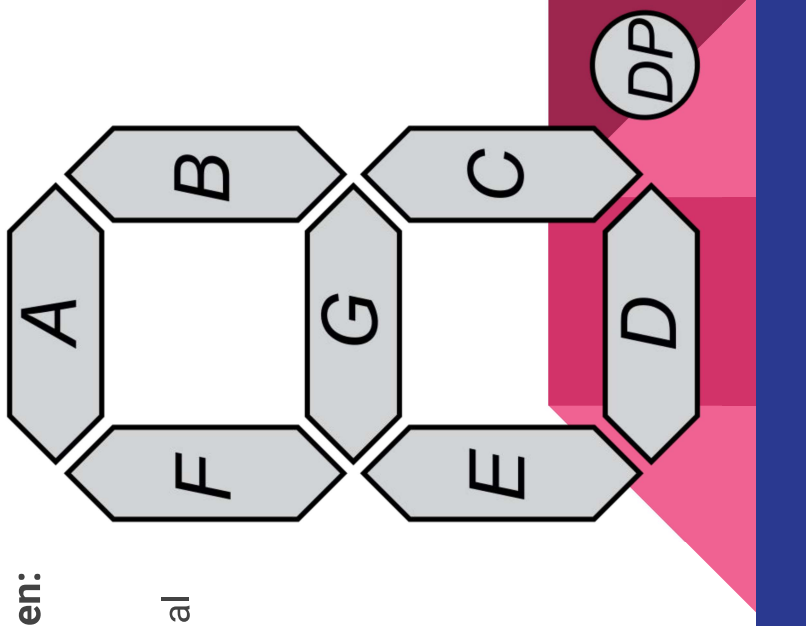
Additional Features outside of the main circuit block:

- **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.

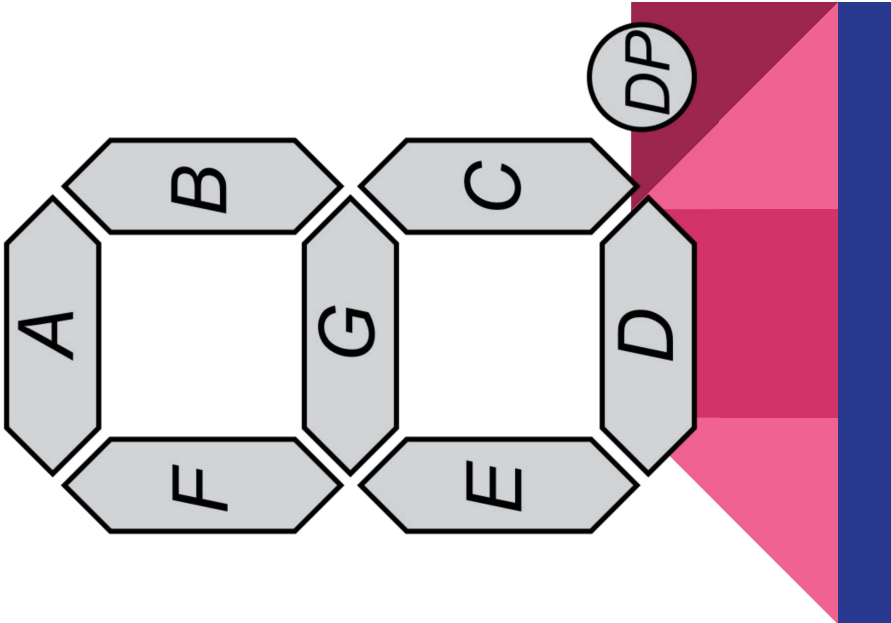


MSB (I2)

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

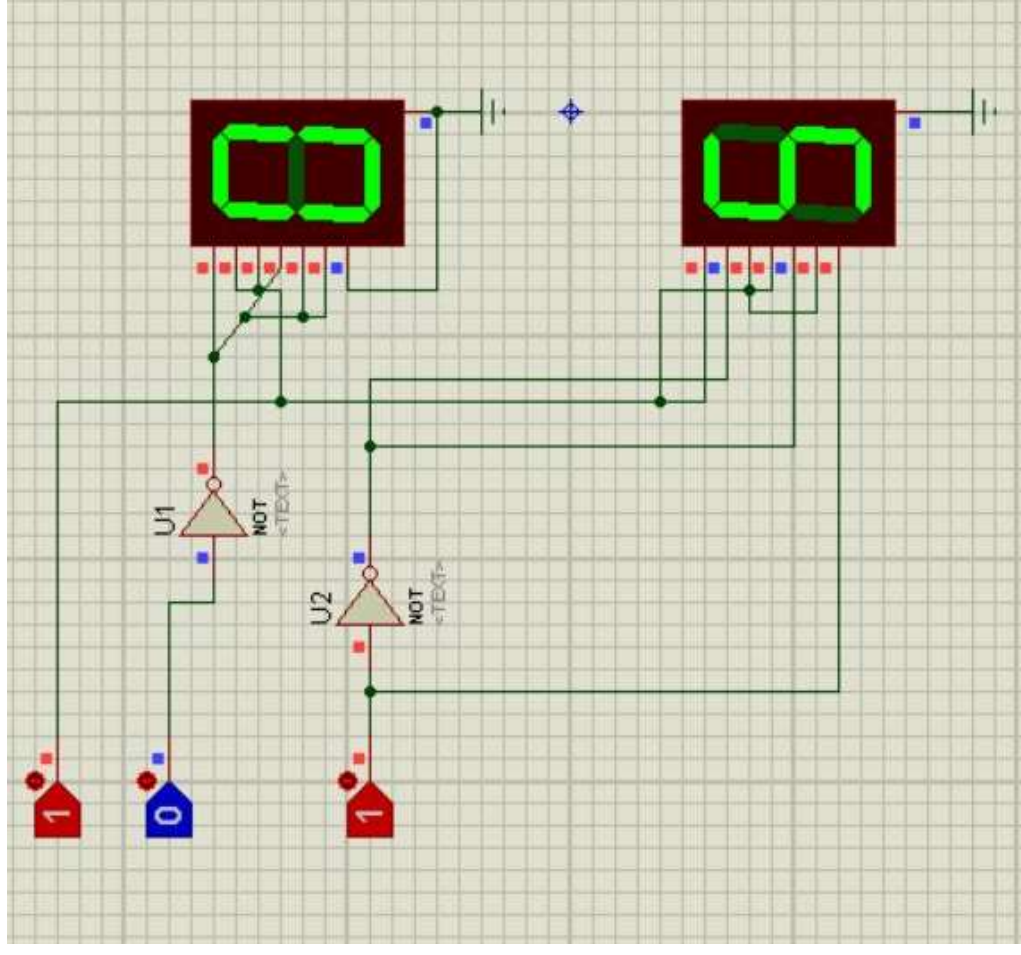


On the left we have the circuit design To represent the money in and changes owed using a 7 segment display.

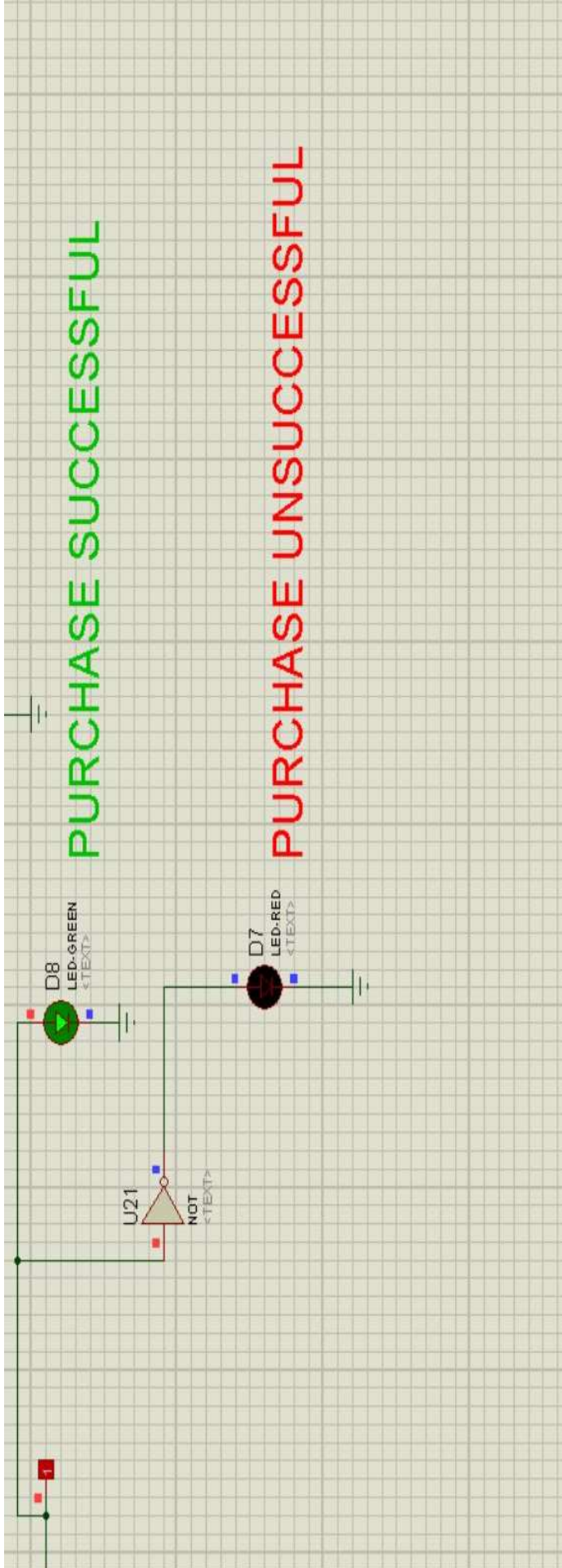
00 is 0 Tk

01 is 5 Tk

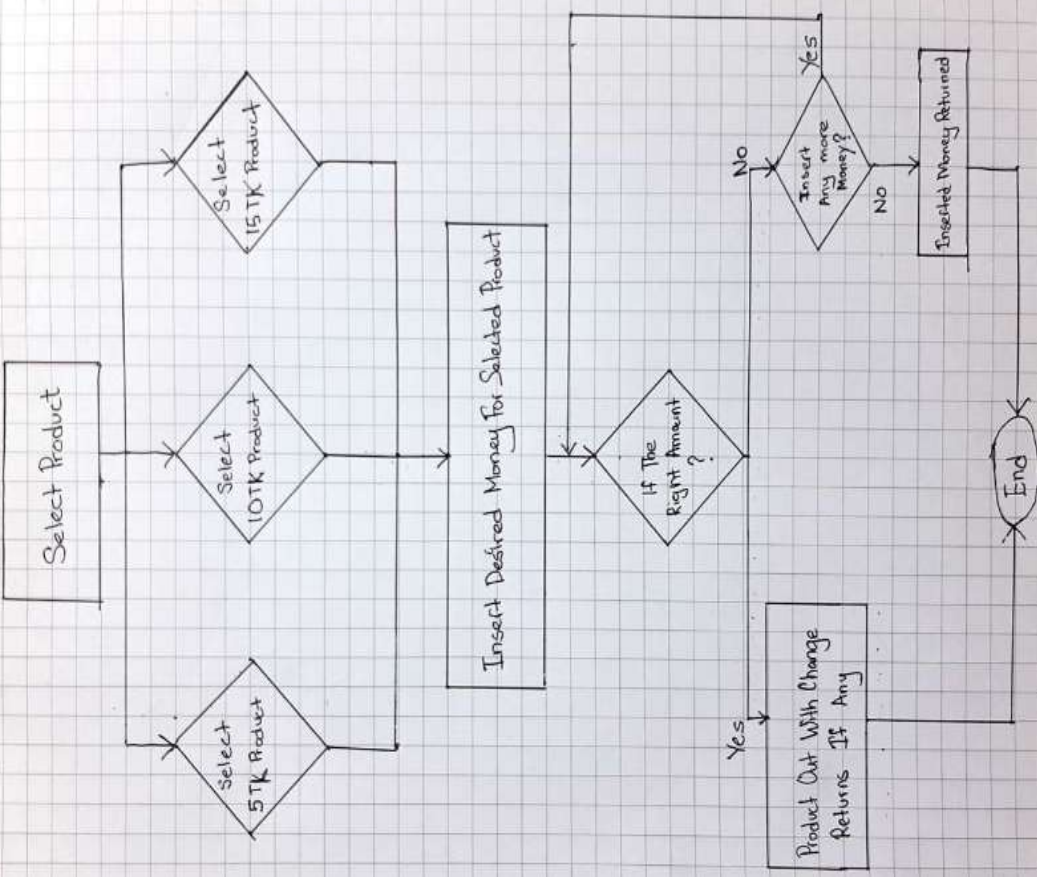
10 is 10 Tk



- Show using LEDs whether purchase has been successful or unsuccessful.

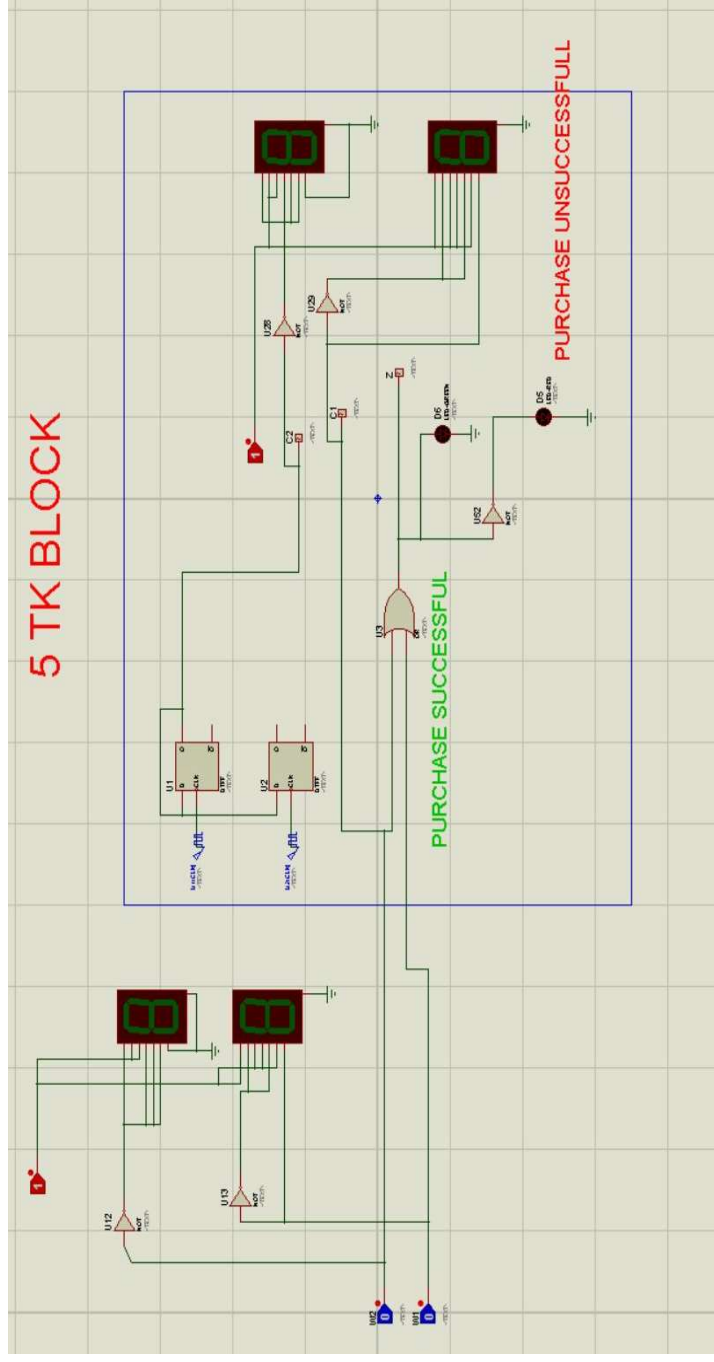


System Design Flow

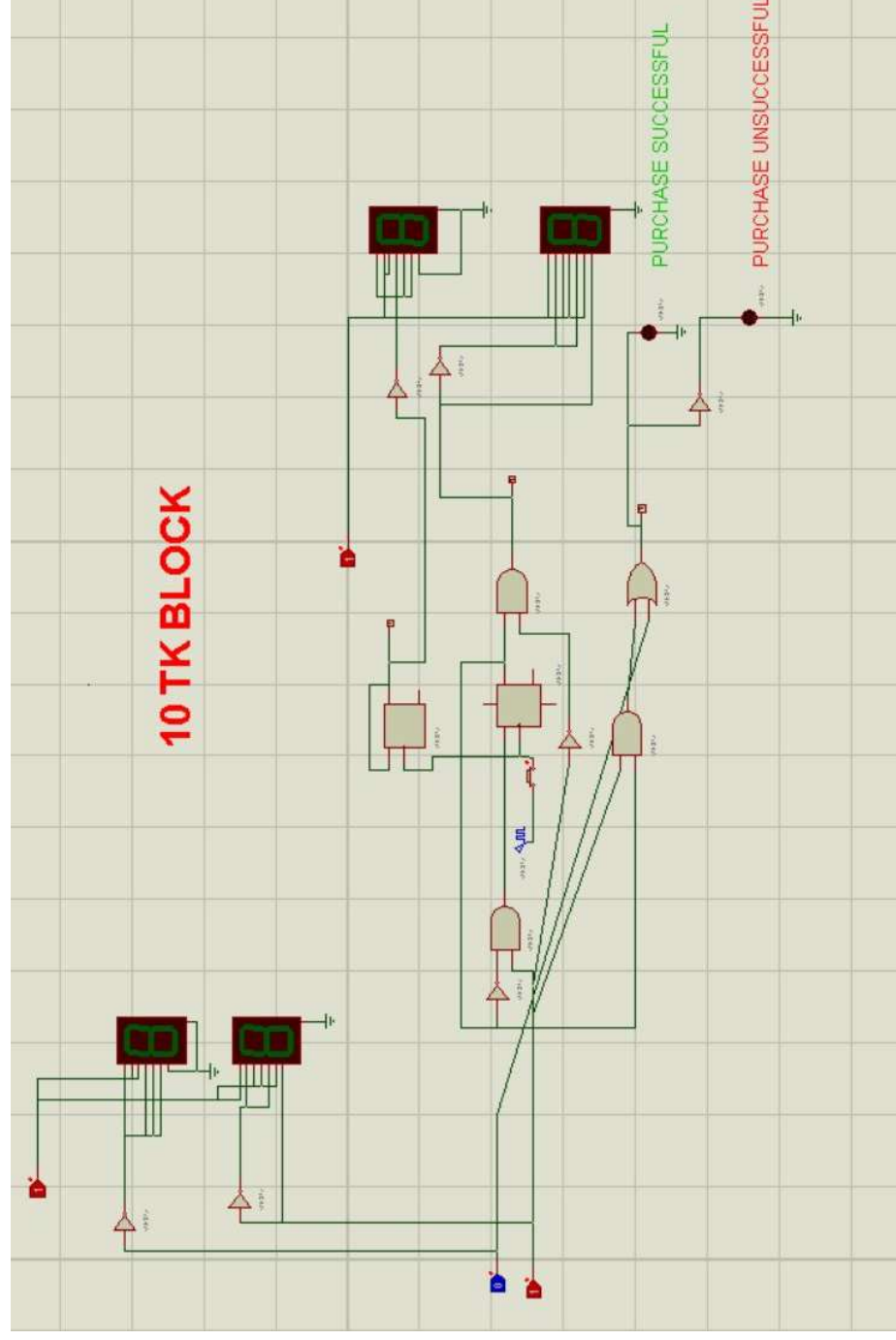


5TK BLOCK:

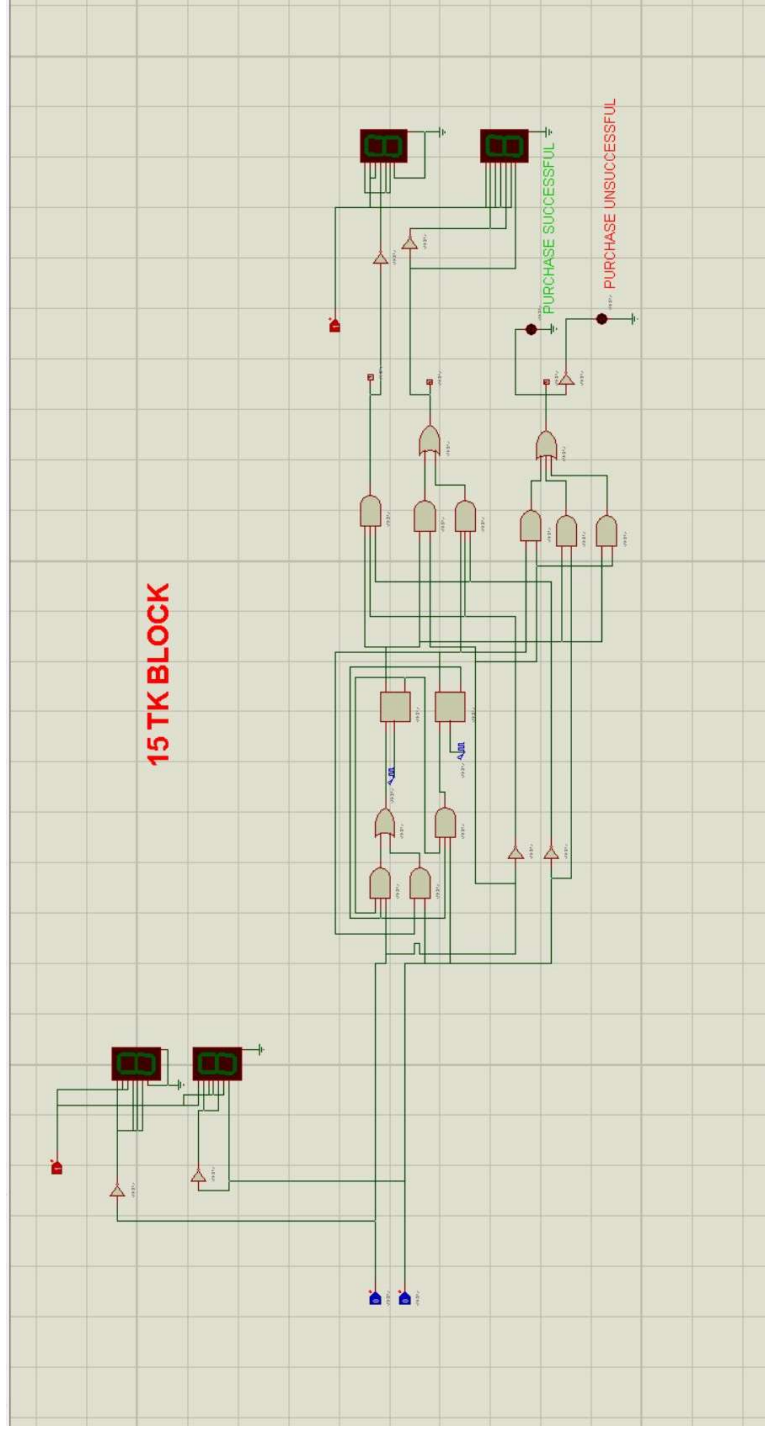
5TK BLOCK:



10 TK BLOCK:



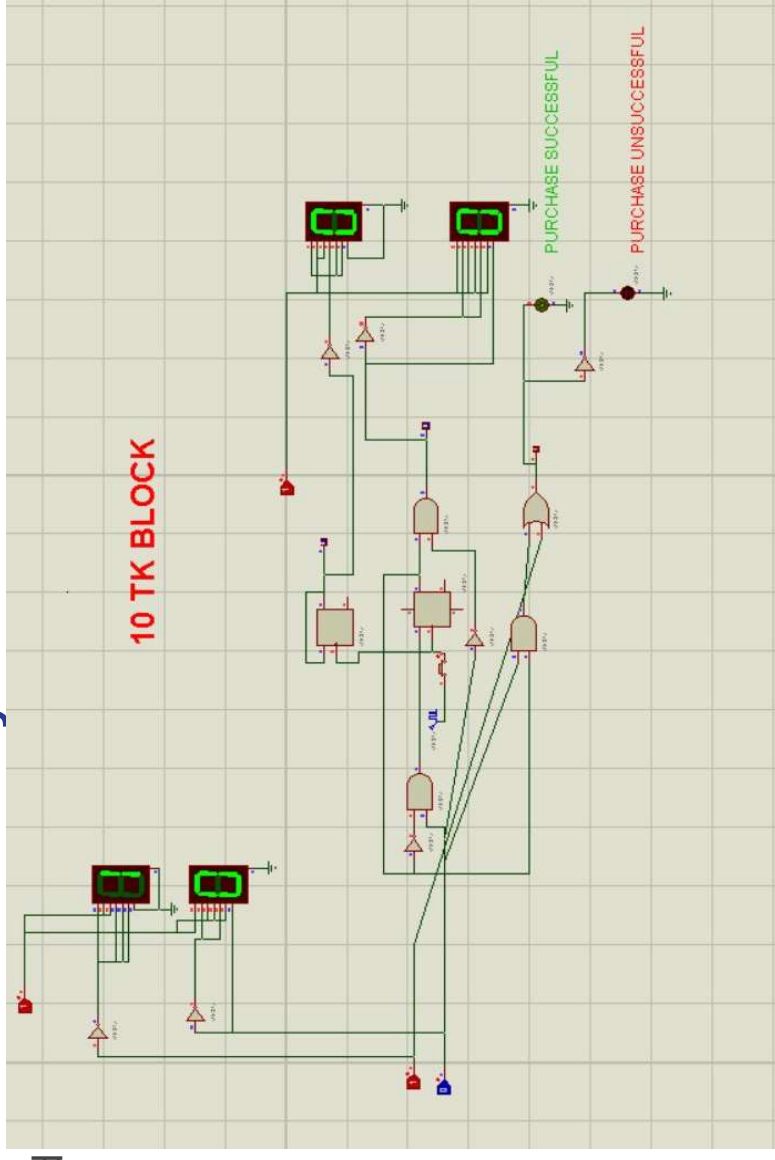
15TK Block:



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

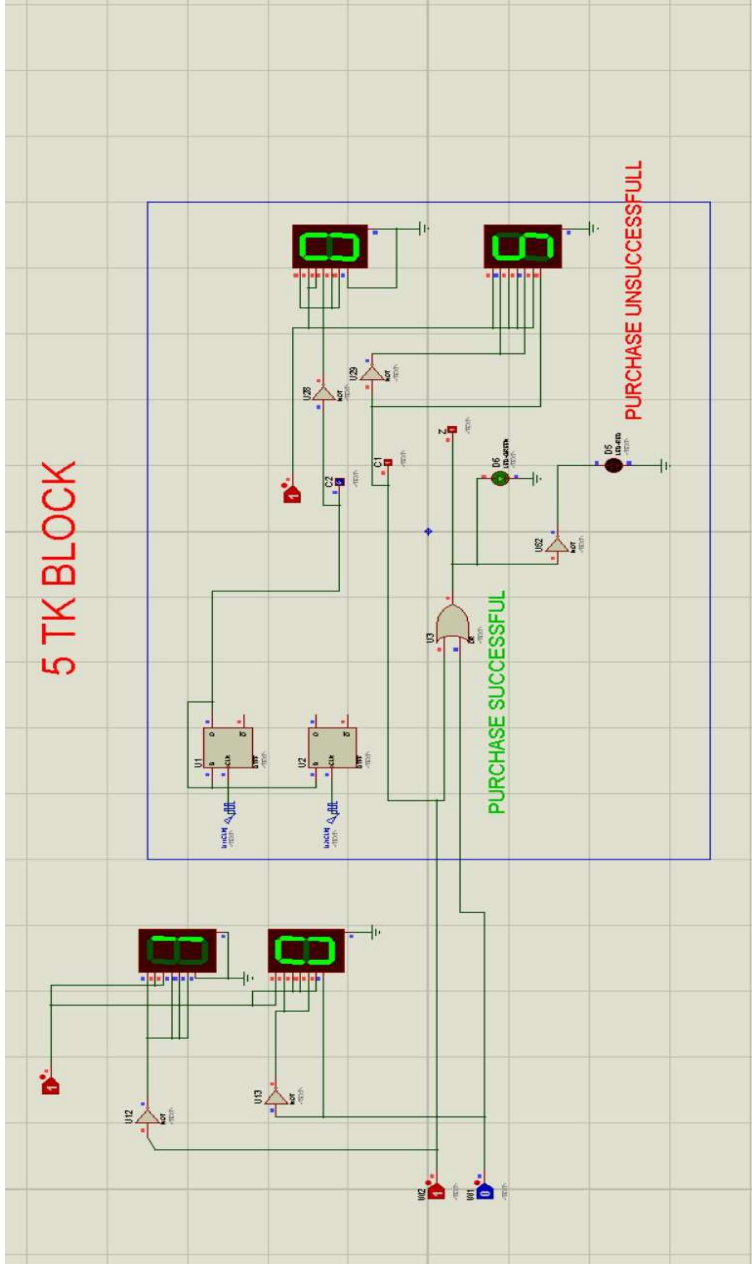
- 10 taka money is being inserted
And we are receiving 0 taka change. Whilst the product

Is being successfully vended as shown with green led being lit.

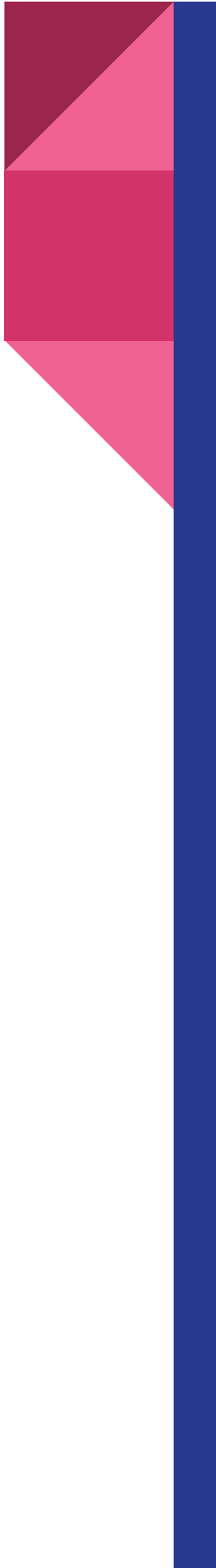
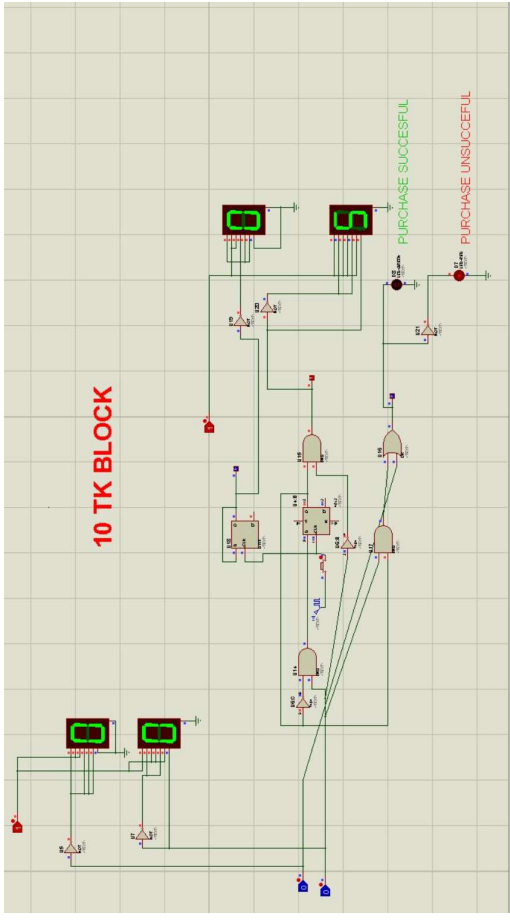
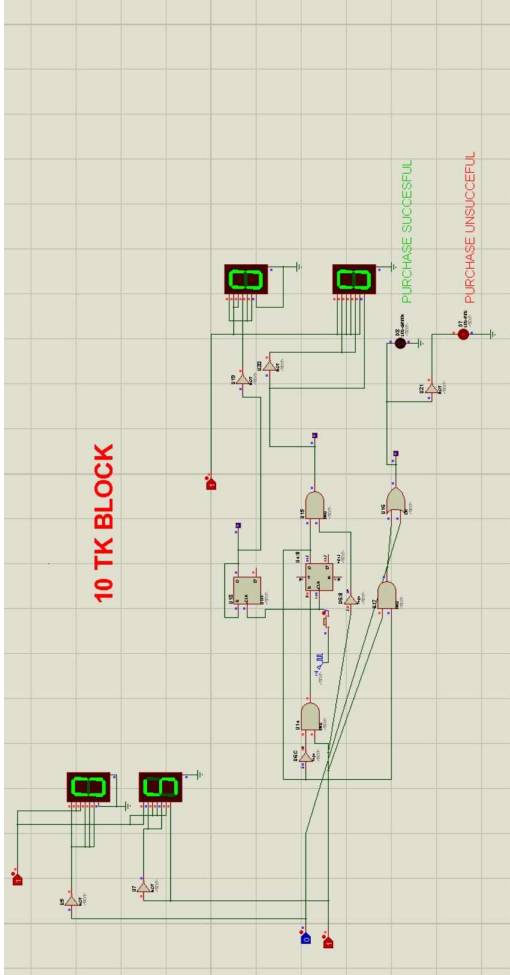


Showing that product is being dispensed and appropriate change is being given if extra money is inserted

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

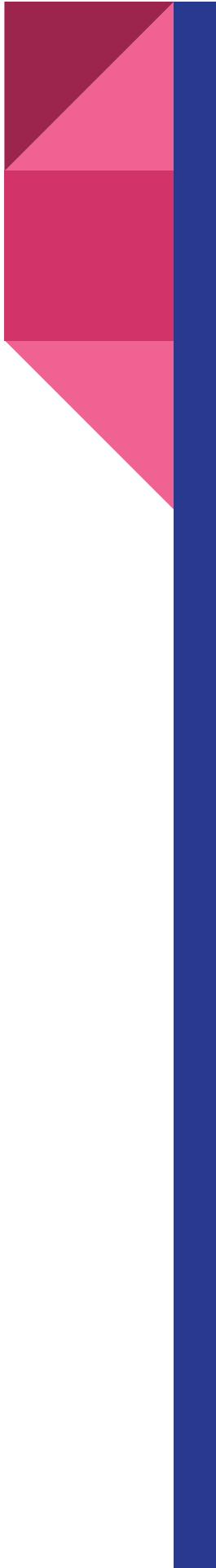


Show that if money is inserted but not the appropriate amount the money is given back to the owner as change



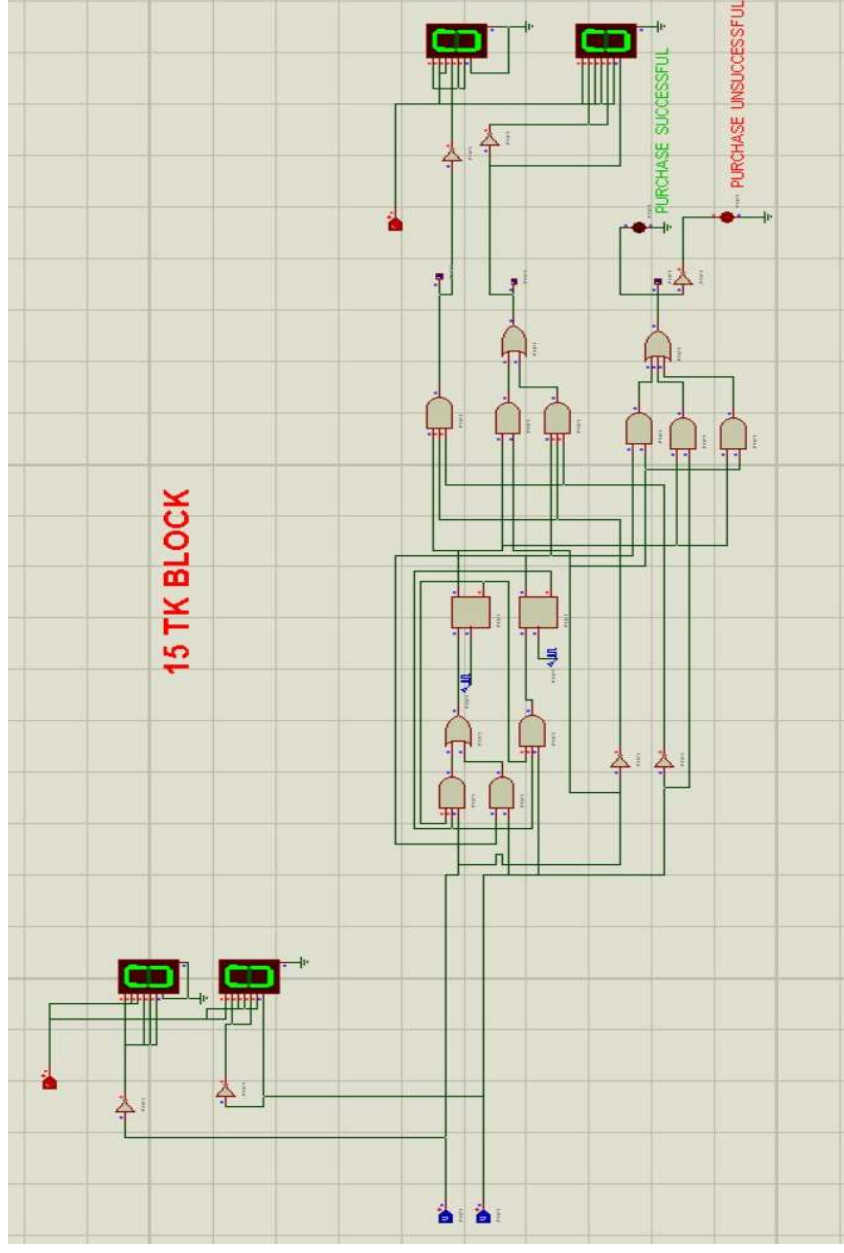
We inserted 5Tk but the product is priced at 10Tk.

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.



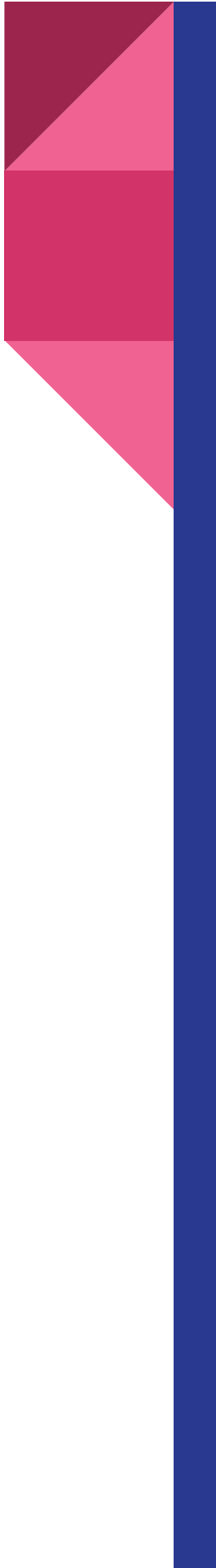
Showing that no product is being dispensed and no change is given if no money is inserted:

- 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%2F92226-the-future-of-vending-machines%2F%3Ffbclid%3DIwAR1vGw-PyITt4RsBZ0lcFcOs1LLNreBg9Tt7C81jSvFKAvfTT0L60F5TUrKk&h=AT1VOvSgPa5dXmAHRlIUtmhv_ofSC7GI8mdrIKp_NMSvs0xCGmteLabTxvIzEiCfxhOUOxYLYoVCyMMic8iI_AkuXam6xxx5RbxbB_OMveB4AOM4AVcF0d3YokdL40GSkoiWTRw
- <https://www.online-sciences.com/technology/automatic-vending-machines-advantages-and-disadvantages/?fbclid=IwAR2q1srlDrXfyWCqm1RyIvc-jGqjEHByX5tDtomey86GogXnxz6RGMYYrZk>
- <https://www.selecta.co.uk/news/benefits-of-vending-machines/?fbclid=IwAR0b9cfsf-UaR1Dxf8nMxZjzmmkAS48NxCSIEBDkWLuUktu6DOos8nBisqQ>



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 they want or if they have faced any problem while purchasing products.