Institute of Engineering and Technology (IET)

IMPLEMENTING AND TESTING A FSM
PROJECT REPORT

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TABLE OF CONTENTS

PROBLEM STATEMENT

➢ FSM Description:

A **finite-state machine** (**FSM**) is a mathematical model of computation. It is an abstract machine that can be in exactly one of a finite number of *states* at any given time. The basic idea of an FSM is to store a sequence of different unique states and transition between them depending on the values of the inputs and the current state of the machine. It is defined by a list of its states, its initial state, and the inputs that trigger each transition.
In our project, we have designed a **FSM based Vending Machine GUI**.

Introduction:

A **vending machine** is a machine that provides items such as snacks, chocolates, ice creams, cold drinks, etc. to customers, after the vendee inserts currency into the machine using extremely simple steps.

➢ States in FSM:

We have 6 states in our vending machine:

- ✓ Initiate
- ✓ Product Selection
- ✓ Amount to Deposit
- ✓ Right amount confirmation
- ✓ Product with change
- ✓ Exit

➢ States Description:

- **State 1 – Initiate (Initial State)**

  This is the initial state of the FSM which asks the user whether to buy any product or not. If **yes**, the transition moves towards next state (State 2) and **no** takes it to the last state (State 6).

- **State 2 – Product Selection**

  This state consists of 5 sub-states which allows the user to select any one product out of 5 which includes: Mints, Uncle Chips, Mountain Dew, Snickers and Mineral Water

Transition to any one of these five sub-states takes place through the selection of respective buttons and moves to the next state (State 3).

- **State 3 – Amount to Deposit**

  This state displays the bill amount and activates to collect money from the user. Click on **OK** button transits to the next state (State 4) while **Cancel** button takes the control to the initial state (state 1).

- **State 4 – Right amount Confirmation**

  This is the state where the amount deposited by the user is being checked with the bill amount created.

  If the amount deposited is satisfactory, the next state (State 5) is activated and an unsatisfactory amount takes the control to begin again (State 1).

- **State 5 – Product with change**

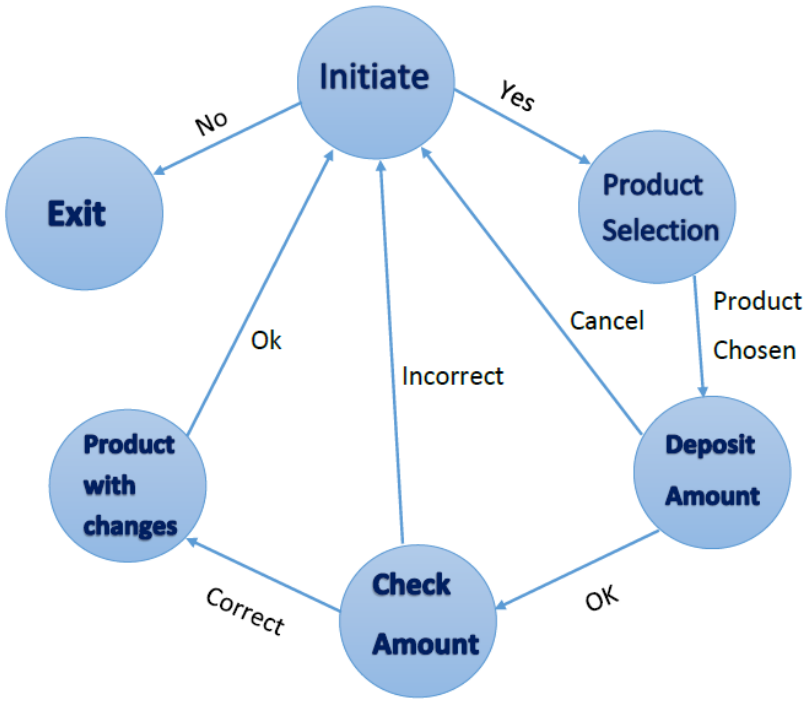
  This state delivers the desired product to the customer along with any change if remains.

  After this, the transition moves to the reset condition i.e. State 1 (Initiate) and the process moves on until a **No** button is clicked in the state 1 which takes the control to final state (state 6).

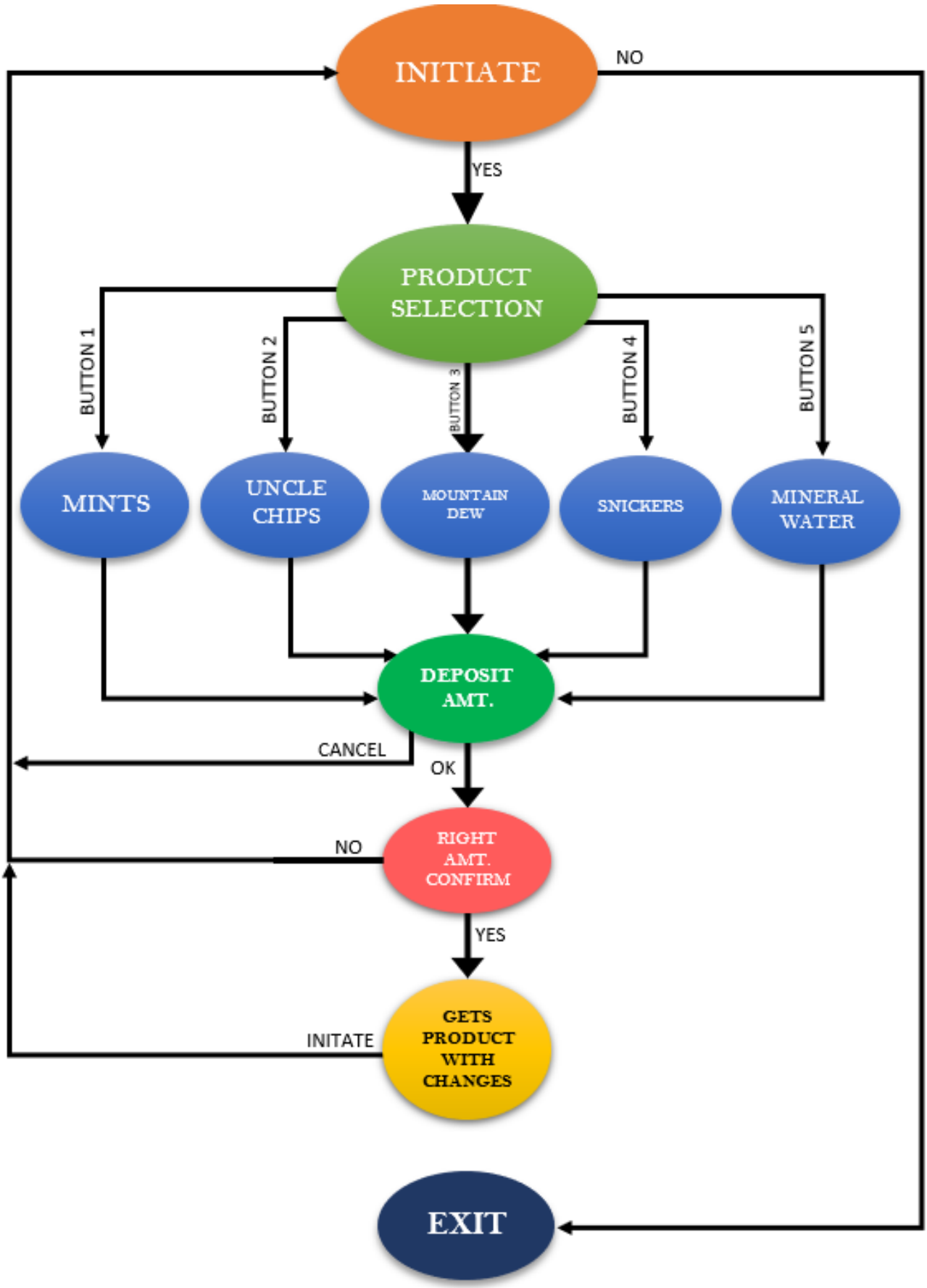
- **State 6 – Exit (Final State)**

  This is the last state in FSM which simply exits the Vending machine services.

➢ State Diagram:



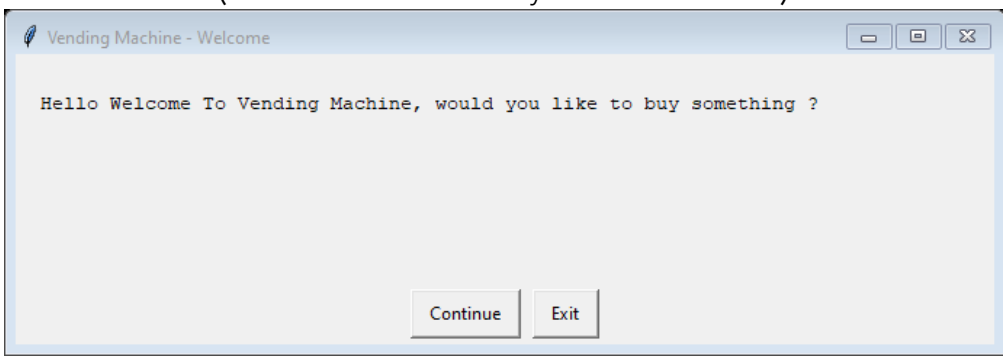
➢ Working Of GUI:



➢ GUI:

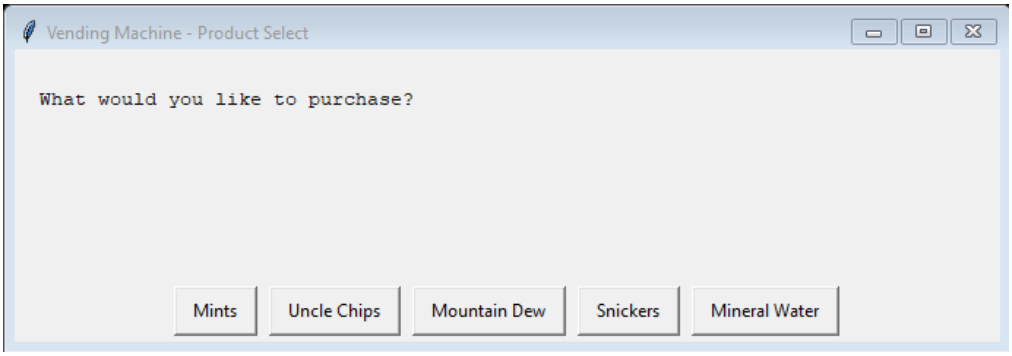
Initial State:

("Continue" will take you to next state)

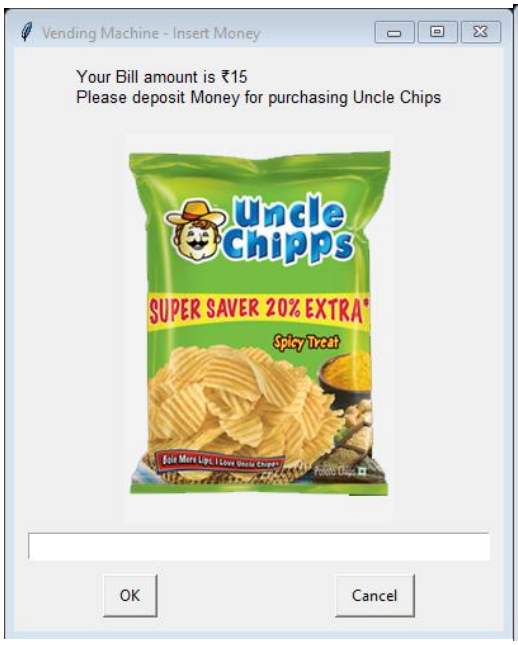


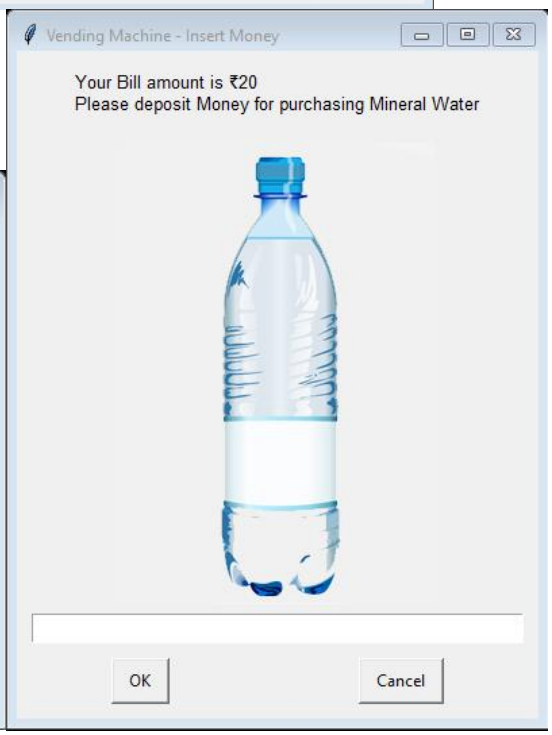
("EXIT" will take you to Exit state)

Product Selection State:

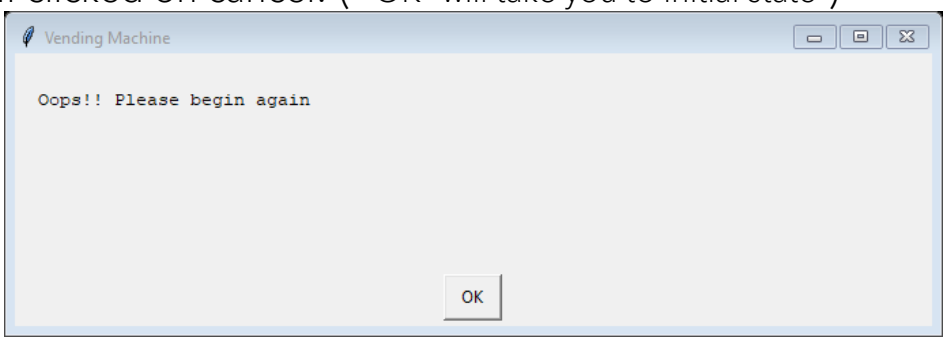


Amount Deposit State

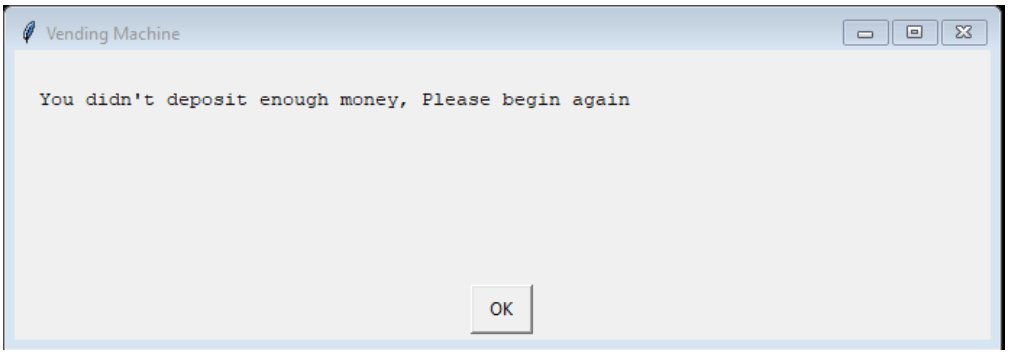




If clicked on cancel: ("OK" will take you to initial state)

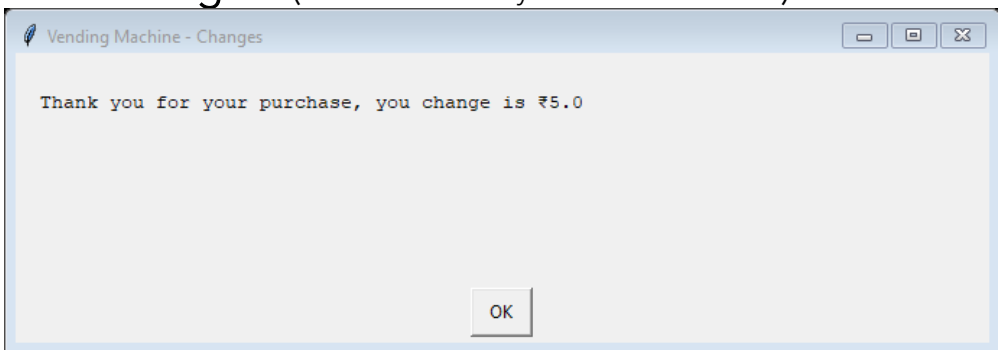


Amount Check State: ("OK" will take you to initial state if deposit amount is less than bill)

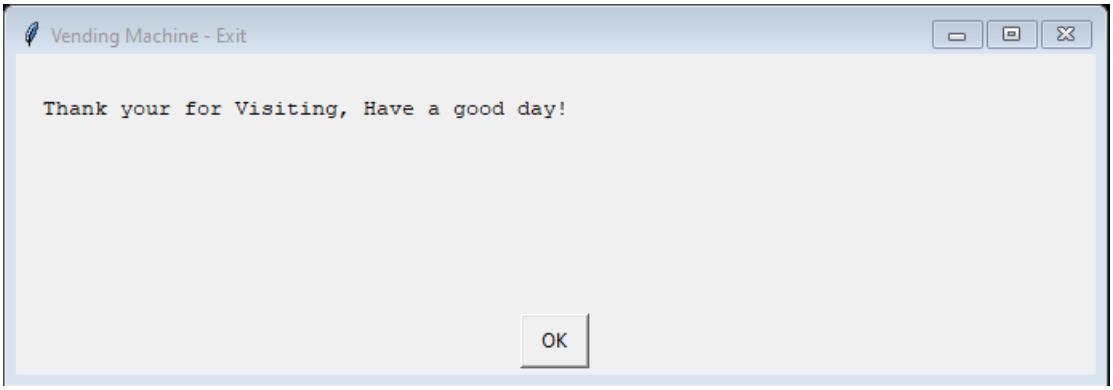


(If amount will be equal to/greater than Bill it will take you to next state)

Product With changes: ("OK" will take you to initial state)



Exit State:



CODE

```
1.   import easygui
2.   cost_mints=10
3.   cost_chips=15
4.   cost_dew=45
5.   cost_snickers=10
6.   cost_water=20
7.   while 1>0:
8.       msg="Hello Welcome To Vending Machine, would you like to buy something ?"
9.       title="Vending Machine - Welcome"
10.      choices=['Continue','Exit']
11.      myChoice=easygui.ynbox(msg,title,choices)
12.
13.      if myChoice==1:
14.          msg1="What would you like to purchase?"
15.          title1="Vending Machine - Product Select"
16.          Choices1=['Mints','Uncle Chips','Mountain Dew','Snickers','Mineral Water']
17.          choice=easygui.indexbox(msg1,title1,Choices1)
18.          if choice==0:
19.              #msg3="Enter quantity: "
20.              #title3="Vending Machine"
21.              #d_int = 1
22.              #Number=easygui.integerbox(msg3,title3,d_int,lowerbound=1,upperbound=5)
23.              #print(Number)
24.              purchasePrice=cost_mints
25.              msg4="Your Bill amount is ₹"+str(purchasePrice)+ " \nPlease deposit Money
  for purchasing Mints"
26.              title4="Vending Machine - Insert Money"
27.
  moneyDeposited=easygui.integerbox(msg4,title4,image='D:\Documents\PYTHON\mints.png')
28.              print(moneyDeposited)
29.
30.              print(purchasePrice)
31.              if moneyDeposited:
32.                  change= float(moneyDeposited) - purchasePrice
33.                  print(change)
34.                  if change>=0:
35.                      msg7="Thank you for your purchase, you change is ₹"+str(change)
36.                      title7="Vending Machine - Changes"
37.                      easygui.msgbox(msg7,title7,ok_button='OK')
38.                  else:
39.                      msg5="You didn't deposit enough money, Please begin again"
40.                      title5="Vending Machine"
41.                      easygui.msgbox(msg5,title5,ok_button='OK')
42.              else:
43.                  msg55="Oops!! Please begin again"
44.                  title55="Vending Machine"
45.                  easygui.msgbox(msg55,title55,ok_button='OK')
46.          if choice==1:
47.              #msg3="Enter quantity: "
48.              #title3="Vending Machine"
49.              #d_int=1
```

```
50.              #Number=easygui.integerbox(msg3,title3,d_int,lowerbound=1,upperbound=5)
51.              #print(Number)
52.              purchasePrice=cost_chips
53.              msg4="Your Bill amount is ₹"+str(purchasePrice)+ "\nPlease deposit Money
  for purchasing Uncle Chips"
54.              title4="Vending Machine - Insert Money"
55.
  moneyDeposited=easygui.integerbox(msg4,title4,image='D:\Documents\PYTHON\chips.png')
56.              print(moneyDeposited)
57.
58.              print(purchasePrice)
59.              if moneyDeposited:
60.                  change= float(moneyDeposited) - purchasePrice
61.                  print(change)
62.                  if change>=0:
63.                      msg7="Thank you for your purchase, you change is ₹"+str(change)
64.                      title7="Vending Machine - Changes"
65.                      easygui.msgbox(msg7,title7,ok_button='OK')
66.                  else:
67.                      msg5="You didn't deposit enough money, Please begin again"
68.                      title5="Vending Machine"
69.                      easygui.msgbox(msg5,title5,ok_button='OK')
70.              else:
71.                  msg55="Oops!! Please begin again"
72.                  title55="Vending Machine"
73.                  easygui.msgbox(msg55,title55,ok_button='OK')
74.
75.          if choice==2:
76.              #msg3="Enter quantity: "
77.              #title3="Vending Machine"
78.              #d_int=1
79.              #Number=easygui.integerbox(msg3,title3,d_int,lowerbound=1,upperbound=5)
80.              #print(Number)
81.              purchasePrice=cost_dew
82.              msg4="Your Bill amount is ₹"+str(purchasePrice)+ "\nPlease deposit Money
  for purchasing Mountain Dew"
83.              title4="Vending Machine - Insert Money"
84.
  moneyDeposited=easygui.integerbox(msg4,title4,image='D:\Documents\PYTHON\dew.png')
85.              print(moneyDeposited)
86.
87.              print(purchasePrice)
88.              if moneyDeposited:
89.                  change= float(moneyDeposited) - purchasePrice
90.                  print(change)
91.                  if change>=0:
92.                      msg7="Thank you for your purchase, you change is ₹"+str(change)
93.                      title7="Vending Machine - Changes"
94.                      easygui.msgbox(msg7,title7,ok_button='OK')
95.                  else:
96.                      msg5="You didn't deposit enough money, Please begin again"
97.                      title5="Vending Machine"
98.                      easygui.msgbox(msg5,title5,ok_button='OK')
99.              else:
100.                 msg55="Oops!! Please begin again"
101.                 title55="Vending Machine"
```

```
                easygui.msgbox(msg55,title55,ok_button='OK')

        if choice==3:
            #msg3="Enter quantity: "
            #title3="Vending Machine"
            #d_int=1
            #Number=easygui.integerbox(msg3,title3,d_int,lowerbound=1,upperbound=5)
            #print(Number)
            purchasePrice=cost_snickers
            msg4="Your Bill amount is ₹"+str(purchasePrice)+ "\nPlease deposit Money
 for purchasing Snickers"
            title4="Vending Machine - Insert Money"

 moneyDeposited=easygui.integerbox(msg4,title4,image='D:\Documents\PYTHON\snickers.png')
            print(moneyDeposited)

            print(purchasePrice)
            if moneyDeposited:
                change= float(moneyDeposited) - purchasePrice
                print(change)
                if change>=0:

                    msg7="Thank you for your purchase, you change is ₹"+str(change)
                    title7="Vending Machine - Changes"
                    easygui.msgbox(msg7,title7,ok_button='OK')
                else:
                    msg5="You didn't deposit enough money, Please begin again"
                    title5="Vending Machine"
                    easygui.msgbox(msg5,title5,ok_button='OK')
            else:
                msg55="Oops!! Please begin again"
                title55="Vending Machine"
                easygui.msgbox(msg55,title55,ok_button='OK')
        if choice==4:
            #msg3="Enter quantity: "
            #title3="Vending Machine"
            #d_int=1
            #Number=easygui.integerbox(msg3,title3,d_int,lowerbound=1,upperbound=5)
            #print(Number)
            purchasePrice=cost_water
            msg4="Your Bill amount is ₹"+str(purchasePrice)+ "\nPlease deposit Money
 for purchasing Mineral Water"
            title4="Vending Machine - Insert Money"

 moneyDeposited=easygui.integerbox(msg4,title4,image='D:\Documents\PYTHON\water.png')
            print(moneyDeposited)

            print(purchasePrice)
            if moneyDeposited:
                change= float(moneyDeposited) - purchasePrice
                print(change)
                if change>=0:

                    msg7="Thank you for your purchase, you change is ₹"+str(change)
                    title7="Vending Machine - Changes"
                    easygui.msgbox(msg7,title7,ok_button='OK')
```

```
                else:
                    msg5="You didn't deposit enough money, Please begin again"
                    title5="Vending Machine"
                    easygui.msgbox(msg5,title5,ok_button='OK')
            else:
                msg55="Oops!! Please begin again"
                title55="Vending Machine"
                easygui.msgbox(msg55,title55,ok_button='OK')
    else:
        msg2="Thank your for Visiting, Have a good day!"
        title2="Vending Machine - Exit"
        easygui.msgbox(msg2,title2,ok_button='OK')
        break
```

RESULTS AND DISCUSSION

- FSM is a mathematical model of computation which has lots of applications in the practical world.
- In this project, we have implemented and tested a FSM based Vending Machine GUI which will provide the user any 1 out of 5 products at a time, along with the change amount.
- Our FSM consists of 6 States where transitions between each State takes place for the specified inputs.
- Python Easy GUI model has been used to build up the Vending Machine GUI.

REFERENCES

Easy GUI

For Images in GUI GOOGLE

APPENDIX

Complete Spyder file and images of GUI