**Peter M. Mwanzia SCT212-0067/2017.**

**Automata CAT:**

A soft drink vending machine dispenses cans of drinks at the JKUAT cafeteria. The machine waits for students and/or staff to insert coins. All soft drinks cost KShs. 50 and the machine can only accept Ten, Twenty and Forty shilling coins. A customer must insert a total of fifty shillings for the machine to dispense drinks.

1. Give the formal definition of the above machine, as a Finite Automaton. **(10 Marks)**

* **Q = {S, q1, q2, q3, q4, q5, q6, q7}**
* **∑ = {10,20,40}**
* **δ is the transition function given by the table**

|  |  |  |  |
| --- | --- | --- | --- |
|  |  | **Input symbols** |  |
| **States** | **10** | **20** | **40** |
| **S** | **q1** | **q2** | **q3** |
| **q1** | **q4** | **q5** | **q7** |
| **q2** | **q5** | **q6** |  |
| **q3** | **q7** |  |  |
| **q4** | **q5** | **q6** |  |
| **q5** | **q6** | **q7** |  |
| **q6** | **q7** |  |  |
| **q7** |  |  |  |

* **q0 the start state = {S}**
* **F = {q7}**

1. Is the machine deterministic or non-deterministic? Justify your answer **(2 Marks)**

**The machine is deterministic. When the machine is in a given state and reads the next input symbol, we know what the next state will be. It is determined.** **For a total input of Ksh50 disregarding the type of denominations comprising that Ksh50, we always get the same output. It can determine what the next step would be.**

1. Draw a state transition diagram for the above machine **(8 Marks)**

10

40

20

20

10

20

10

**q**

**1**

**S**

**qr**

**3**

**q**

**2**

20

40

**q4**

10

**q5**

10

10

**q6**

20

10

**q7**

1. Write a program in a language of your choice to implement the above machine **(10 Marks)**

**#include <iostream>**

**using namespace std;**

**int main(){**

**int a;//no. of 10 shilling coins**

**int b;//no. of 20 shilling coins**

**int c;//no. of 40 shilling coins**

**cout<<"Enter the number of 10 shilling coins";**

**cin>>a;**

**cout<<"Enter the number of 20 shilling coins";**

**cin>>b;**

**cout<<"Enter the number of 40 shilling coins";**

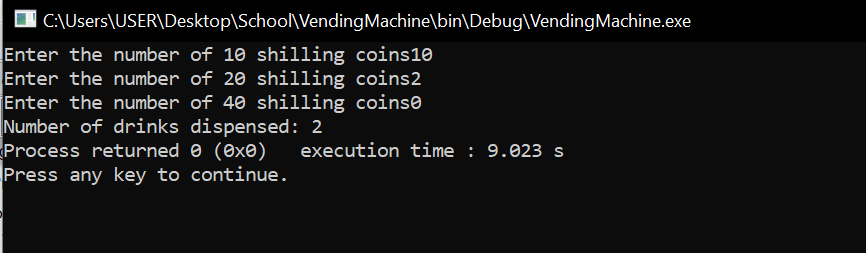
**cin>>c;**

**int total\_amount = 10\*a + 20\*b + 40\*c;**

**int number\_of\_drinks = total\_amount/50;**

**cout<<"Number of drinks dispensed: "<<number\_of\_drinks;**

**}**

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