K L E F

KONERU LAKSHMAIAH EDUCATION FOUNDATION

(Deemed to be university estd, u/s, 3 of the UGC Act, 1956)

(NAAC Accredited "A" Grade University)

DEPARTMENT OF

ELECTRONICS AND COMMUNICATION ENGINEERING

20IE3150-MIDGRADE
CAPSTONE PROJECT-1

PROJECT REPORT

ACADEMIC YEAR :2022-2023

III YEAR/I SEMESTER

A VLSI Implementation of Vending Machine Based on Verilog

Submitted by

1. V.V. jathin guptha   2000040153

2. V. Likitha   2000040154

BONAFIDE CERTIFICATE

This is to certify that this Project report titled is **A VLSI Implementation of Vending Machine Based on Verilog** the bonafide work of **V.V.JATHIN GUPTHA-2000040153, V.LIKITHA - 2000040154 ,** III Year / I Semester, under the guidance of **Dr.K.Girija Sravani,** Department of Electronics and Communication Engineering, in 201E3150 MIDGRADE CAPSTONE PROJECT-1 at Koneru Lakshmaiah Education Foundation in theyear 2022-2023.

Signature of the Faculty in charge   **Signature of the HOD/ECE**

Submitted for the University Practical Examination held on……………………

INTERNAL EXAMINER   **EXTERNAL EXAMINER**

ABSTRACT

Machine as we all know is a machine which can vend different products which is more like an automated process with no requirement of man handling which we normally see in fast moving cities because of fast paced life. This paper compares different aspects like area, timing constraint, speed, power dissipation of a vending machine with 2 different design styles algorithm while installation. FSM based algorithm has been utilized to simulate model, synthesize the machine on the stratix III family of FPGA provided with quartus design tool which is logic device design software from Altera.

INTRODUCTION

An automated machine which is intended to provide the users with a diverse range of products: snacks, beverages, pizzas, cupcakes, newspapers, tickets, etc. A vending machine dispenses a product to the users based on the amount of money inserted and selection of the product. Vending machine is a 24x7 standalone unit which requires a standard power supply connection to function. It consist of simple electro-mechanical systems which helps to automate the entire vending process.

Vending Machines are used to dispense various products like Coffee, Snacks, and Cold Drink etc.When money is inserted into it.Vending Machines have been in existence since 1880s. The firstcommercial coin operated machine was introduced in London and England used for selling postcards. The vending machines are more accessible and practical than the convention purchasingmethod. Nowadays, these can be found everywhere like at railway stations selling train tickets, inschools and offices vending drinks and snacks , in banks as ATM machine and provides evendiamonds and platinum jewelers to customers. Previous CMOS and SED based machines are moretime consuming than the FPGA based machines. The FPGA based machine is also more flexible,programmable and can be re-programmed. But in microcontroller based machine, if one wants toenhance the design, he has to change the whole architecture again but in FPGA user can easilyincrease the number of products.

SOFTWARE REQUIRED

- IDE: EDaplayground

STATE DIAGRAM:
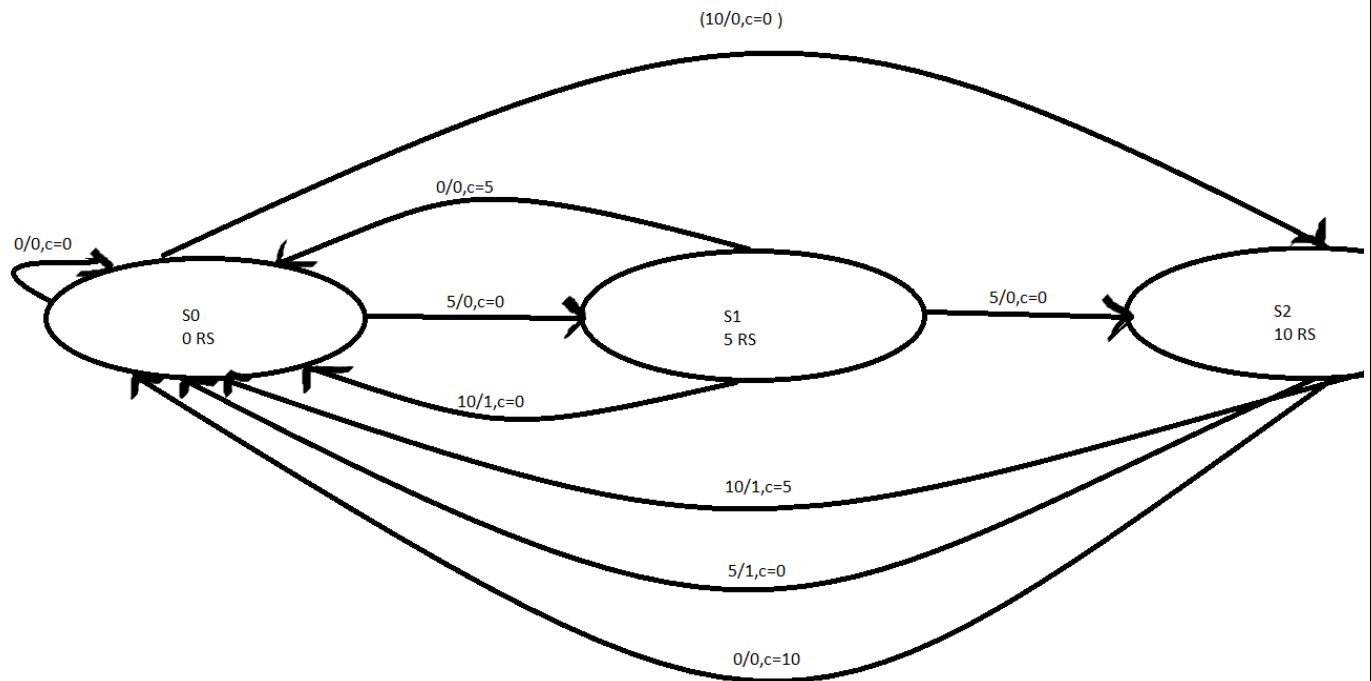
DESIGN OBJECTIVES:

- To Design a powerful vending machine containing

- the following features:

- 1. Sell four different types of snacks and accept

- three types of coins(Rs1, Rs2, Rs5)

- 2. Give change after successful trade

- 3. Return money when trade fails

- 4. Small size and acceptable power consumption

- 5. If cancel button is enter, amount will return
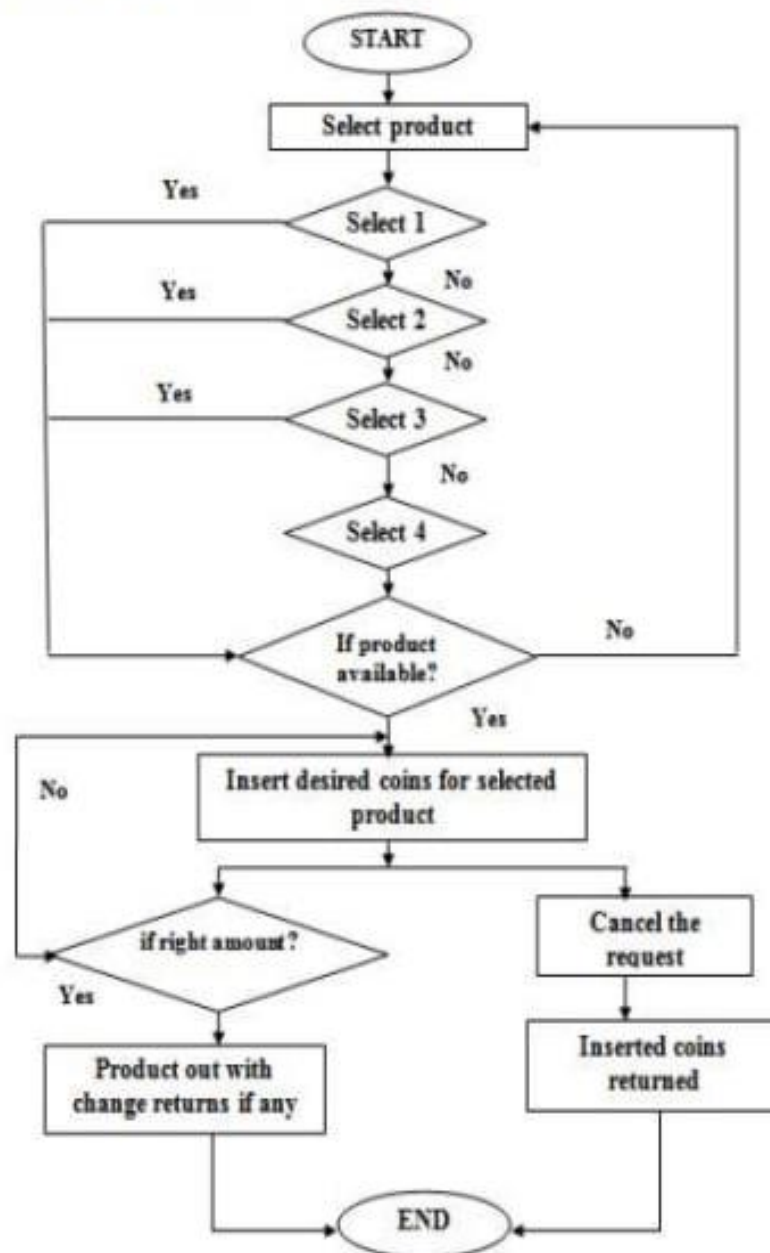
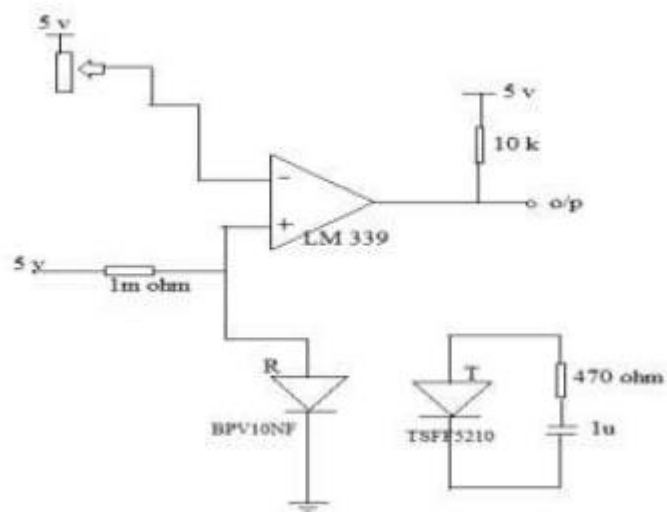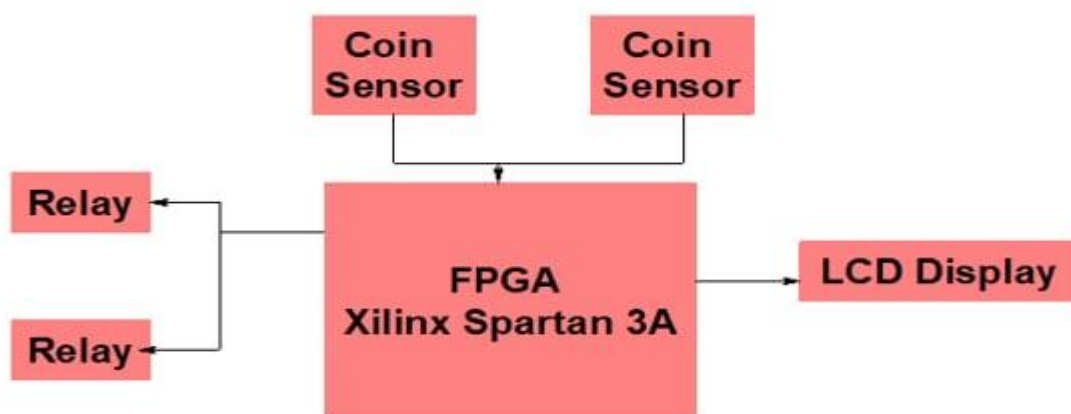## BLOCK-DIAGRAM

DESIGN METHODOLOGY

Fig 3 Flow chart of vending machine

CIRCUIT DIAGRAM: -

BLOCK DIAGRAM: -

VERILOG CODE: -

```verilog
module vending_machine(
input clk,
input rst,
input [1:0]in,
output reg out,
output reg[1:0] change
);

parameter s0 = 2'b00;
parameter s1 = 2'b01;
parameter s2 = 2'b10;

reg[1:0] c_state,n_state;

always@ (posedge clk)
begin
    if(rst == 1)
     begin
         c_state = 0;
         n_state = 0;
         change = 2'b00;
     end
    else
      c_state = n_state;

    case(c_state)
      s0:
      if(in == 0)
        begin
            n_state = s0;
            out = 0;
            change = 2'b00;
        end
      else if(in == 2'b01)
        begin
            n_state = s1;
            out = 0;
            change = 2'b00;
        end
      else if(in == 2'b10)
        begin
            n_state = s2;
            out = 0;
            change = 2'b00;
        end
      s1:
      if(in == 0)
```

```verilog
            begin
                n_state = s0;
                out = 0;
                change = 2'b01;
            end
        else if(in == 2'b01)
            begin
                n_state = s2;
                out = 0;
                change = 2'b00;
            end
        else if(in == 2'b10)
            begin
                n_state = s0;
                out = 1;
                change = 2'b00;
            end
        s2:
        if(in == 0)
            begin
                n_state = s0;
                out = 0;
                change = 2'b10;
            end
        else if(in == 2'b01)
            begin
                n_state = s0;
                out = 1;
                change = 2'b00;
            end
        else if(in == 2'b10)
            begin
                n_state = s0;
                out = 1;
                change = 2'b01;
            end
    endcase
end
endmodule
```
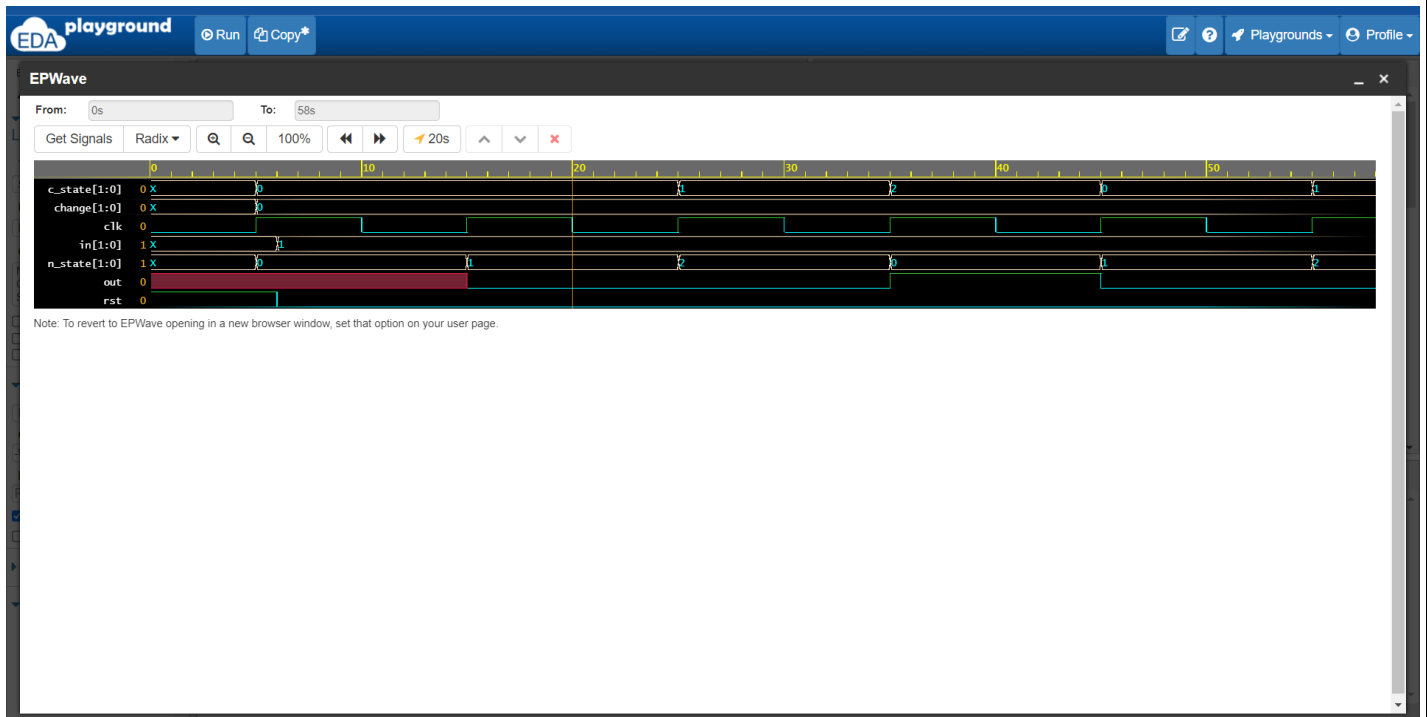
TEST BENCH CODE:-

```verilog
module vending_machine_tb;
reg clk;
reg[1:0] in;
reg rst;
wire out ;
  wire[1:0] change;
  vending_machine uut(
    .clk(clk),
    .rst(rst),
    .in(in),
    .out(out),
    .change(change)
  );
  initial begin
    $dumpfile("vending_machine.vcd");
    $dumpvars(0,vending_machine_tb);
    rst=1;
    clk=0;
    #6 rst=0;
    in = 1;
    #11 in =1;
    #16 in = 1;
    #25 $finish;
  end
  always #5 clk=~clk;
endmodule
```

OUTPUT:-

CONCLUSION:

The designed vending machine prototype was successfully implemented using VERILOG . It is equipped with interactive user interface system that eliminates the uses of push buttons. In conclusion, the project has achieved all the proposed objectives to improve the overall performance of the vending machine on terms of cost saving, attractiveness, reliability, and not easily damaged by vandalism activities.