

# **A REPORT ON “CHOCOLATE VENDING MACHINE”**

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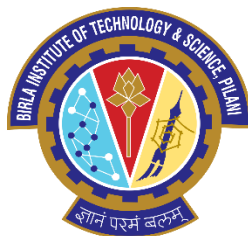
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# **Chocolate Vending System**

## **PROBLEM:**

**DESCRIPTION:** This automatic machine vend three different types of chocolates.

Perk: Rs. 5.00

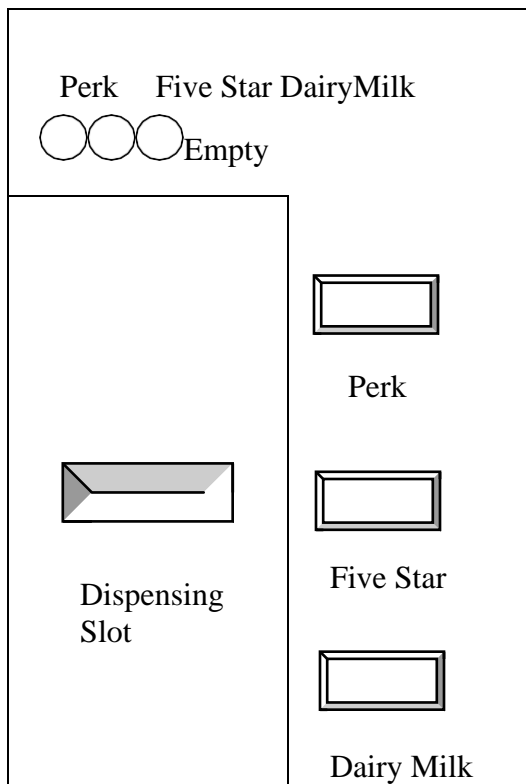
Five-Star: Rs10

Dairy Milk: Rs20.

The currency has to be given in terms of 5 Rupee coins. A weight sensor is used to detect whether the coin is a Rs 5 coin or not. There are three buttons available for the selection of the chocolate. After the chocolate has been selected, the user has to put the correct currency into the coin slot. When the user has dropped the entire amount into the slot, the machine dispenses the correct chocolate.

LED's are used as indicators to show if any of the chocolates being vended are not available.

## **User Interface:**



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## **WORKING**

This automatic machine vends three different types of chocolates.

PERK                      RS 5

FIVE STAR              RS 10

DAIRY MILK            RS20

This automatic machine vends three different types of chocolates. Perk: Rs. 5.00, Five-Star: Rs10.00, Dairy Milk: Rs20.00. The currency has to be given in terms of 5 rupee coins. A weight sensor (by the means of a pressure sensor) is used to detect whether the coin is a Rs 5 coin or not. There are three buttons available for the selection of the chocolate. After the chocolate has been selected, the user has to put the correct currency into the coin slot. When the user has dropped the entire amount into the slot, the machine dispenses the correct chocolate and the current number depending upon the amount put in. LEDs are used as indicators to show if any of the chocolates being vended are not available. If the input is invalid(not a multiple of 5), the invalid LED glows to indicate this . If the user puts in less money, no chocolates will be dispensed and the user will not get the money back. If the user puts in more money ,the chocolate will be dispensed and the extra money will not be returned.

# **ACKNOWLEDGEMENT**

We would like to show our gratitude to Prof. K.R. Anupama for giving us this opportunity and facilitating extended understanding of the concepts by means of this design assignment.

We would like to thank the entire teaching staff and student assistants for sharing their knowledge and wisdom. This would not have been possible without the constant support and guidance of all these people. We thank them for being patient throughout and helping us at every step.

## **System Requirements:**

- Coins denomination should be 5.
- System is a vending machine which give chocolates of three types i.e. Dairy Milk, Five Star and Perk.
- The prices of the chocolates are as follows:  
Dairy Milk – Rs. 20  
Five Star – Rs. 10  
Perk – Rs. 5
- User presses the button for chocolate selection and then puts in money (currency in terms of 5 Rupee coin only).

## **System Specifications:**

- 3 LEDs are used to indicate if chocolate is available in the machine.
- Each LED is of 5 Volt.
- Motor is used to dispense the correct chocolate.
- Motor used is of 12V.
- Pressure Sensor (with conversion factor of 1KPa = 20 mV) is used to
- Sense the pressure of the input coin.
- Analog to Digital Converter is used to digitize the reading taken by pressure sensor. The resolution of the ADC is  $5V/256 = 19.53125 \text{ mV}$
- Unipolar Stepper Motor is used to serve the purpose of the dispensing slot.

## **ASSUMPTIONS:**

- Maximum 30 chocolates of each type are available.
- In each transaction, the user can get only one chocolate of a particular type (i.e. dairy milk, perk, five star)
- The chocolate will be dispensed only if the amount put is equal to or more than the price of the chocolate. If the user puts in less money no chocolates will be dispensed and the user will not get the money back. If the user puts in more money the chocolate will be dispensed and the extra money will not be returned.
- The pressure of a 5 rupee coin is 1KPa which gives a 20mV voltage.

# **HARDWARE DESCRIPTION:**

## **Components used with justification wherever required**

### ➤ **8086**

- 8 bit microprocessor
- 40 pin chip
- 20 multiplexed address lines (AD0-AD19) and 16 multiplexed data lines(D0-D15)
- Operates in Minimum mode of Operation
- Operates with a 5MHz clock provided by 8284

### ➤ **8255**

- Programmable Peripheral Interface

Port Specifications:

#### **PORT A (INPUT)**

Port (A0-A7) – Used for communication with ADC

#### **PORT B (OUTPUT)**

- 1.PB0-Select Signal for LED Decoder
- 2.PB1-Select Signal for LED Decoder
- 3.PB2- MOTOR
- 4.PB3-MOTOR
- 5.PB4-MOTOR
- 6.PB5-MOTOR
- 7.PB6-ADD A(ADC)
- 8.PB7-ADD B(ADC)

#### **PORT C (OUTPUT(PC0,1,2,3,7),INPUT(PC4,5,6))**

- 1.PC0-ADD C(ADC)
- 2.PC1-SOC
- 3.PC3 –LED Enable
- 4.PC4-IN0(Input from the Dairy Milk Switch)



5.PC5-IN1(Input from the Five Star Switch)

6.PC6-IN2(Input from the Perk Switch)

7.PC7-EOC

➤ **8254**

-Programmable Interval Timer

-to generate clock for ADC

➤ **6116**

- RAM 2K

- 2 units used

➤ **2716**

- ROM 2K

- 4 units used

➤ **74LS373**

- Octal Latch

- 3 units used

- for de-multiplexing address lines to A0-A19

➤ **Stepper Motor**

- Voltage 4V

- Current 1.2A

-For dispensing chocolates

➤ **MPX 4250**

-Pressure Sensor

-1 unit

➤ **74145**

-Decoder IC

-1 UNIT

➤ **74HC138**

-MEMORY DECODER

-1 UNIT

➤ **OR GATE**

- 2 INPUT OR GATE
- 8 UNITS

➤ **NOT GATE**

- 3 UNITS

➤ **LED**

- 4 UNITS

➤ **AND GATE**

- 2 INPUT
- 1 UNIT

➤ **SPST PUSH BUTTONS**

- BUTTONS
- 3 UNITS

➤ **ADC 0808**

- 6 analog inputs with voltage varying from 0 – 5 V with 8-bit resolution T 20 output can be directly connected to it (as it directly compatible)

➤ **74LS245**

- Buffer Data Bus (Bidirectional)
- 2 units

**74LS138**

- 3:8 Decoder
- 3 units

# ADDRESS MAPPING

RAM --  $2K+2K=4K$

ROM –  $4K+4K=8K$

The system uses 4KB of RAM and 8KB of ROM. Both consist of two chips of 2KB size each. They are organized into odd and even bank to facilitate both byte and word size data transfers.

Chip	Allocation
ROM1	00000H - 00FFFH
RAM1	01000H - 01FFFH
ROM2	FF000H - FFFFFH

## MEMORY MAPPING

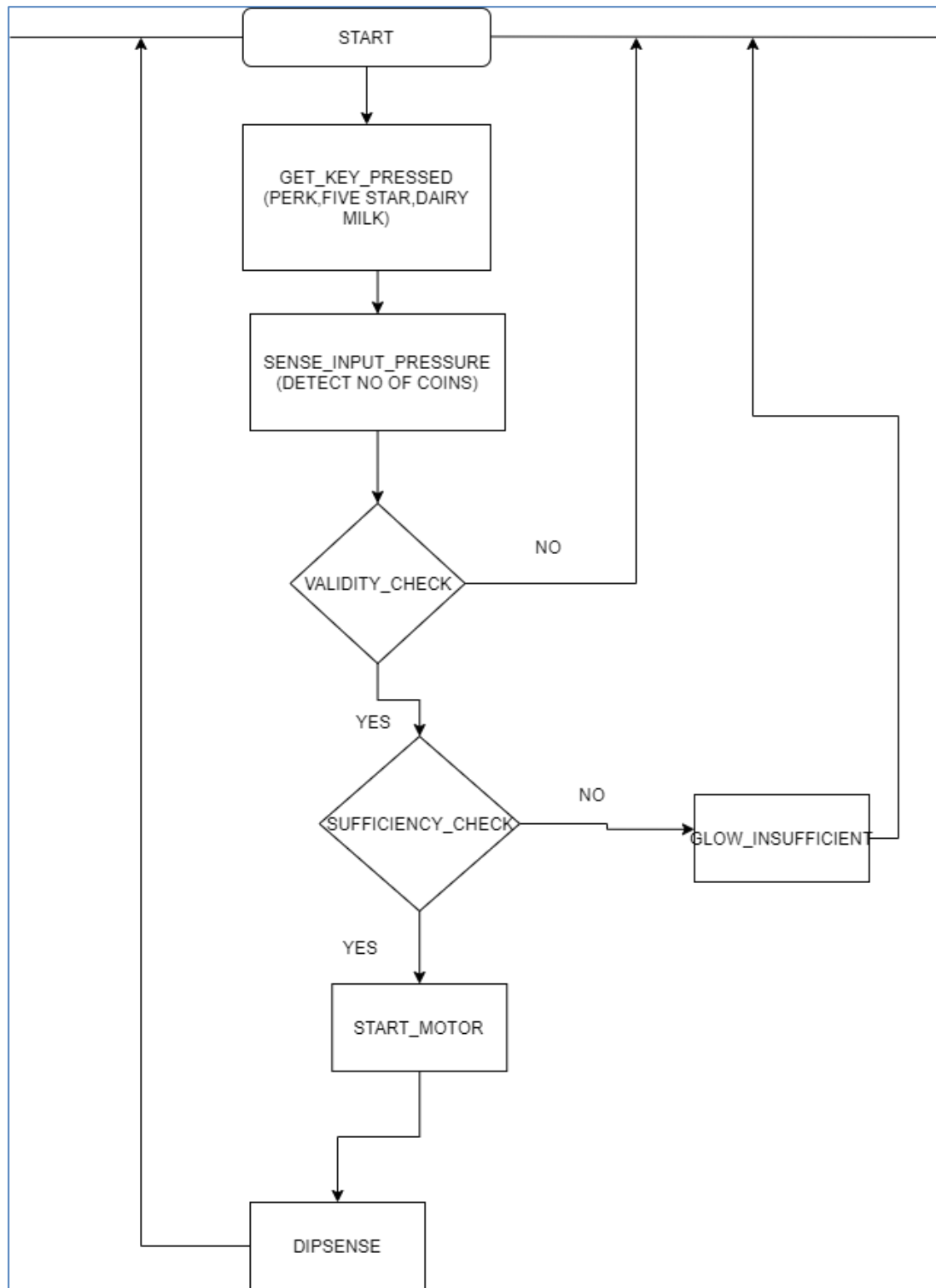
CHIP	A19	A18	A17	A16	A15	A14	A13	A12	A11	A10	A9	A8	A7	A6	A5	A4	A3	A2	A1	A0
ROM1(4K)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
To	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1
RAM1(4K)	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
To	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1
ROM2(4K)	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
TO	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

## I/O MAPPING

<b>8255A</b>	<b>PORT</b>	<b>ADDRESS</b>
	<b>A</b>	<b>10h</b>
	<b>B</b>	<b>12h</b>
	<b>C</b>	<b>14h</b>
	<b>Control Register</b>	<b>16h</b>

8254	Address	A7	A6	A5	A4	A3	A2	A1	A0
Counter 1	18H	0	0	0	1	1	0	0	0
Counter 2	1AH	0	0	0	1	1	0	1	0
Counter 3	1CH	0	0	0	1	1	1	0	0
Control Register	1EH	0	0	0	1	1	1	1	0

# FLOWCHART



## **LEGEND FOR READING FLOWCHART:**

- GET\_KEY\_PRESSED: Gets the key pressed by the user.
- SENSE\_INPUT\_PRESSURE: Converts the input pressure to the number of coins.
- VALIDITY\_CHECK: Checks if the number of coins placed on the tray are equal to the one required for the chocolate button pressed.
- SUFFICIENCY\_CHECK: Checks if the selected chocolate is available in sufficient quantity or not.
- GLOW\_INSUFFICIENT: Glow the LED for the corresponding chocolate which is found insufficient.
- START MOTOR AND DISPENSE: Uses motor to dispense the corresponding number of chocolates.

## **VARIATION IN PROTEUS IMPLEMENTATION**

1. Using 8253 as 8254 is not available in Proteus.
2. Two 2732 ROM chip [4K] instead of four 2716 ROM 2K], as 2716 is not available on Proteus.
- 3.ROM in only 00000 – as proteus allows to change reset address.

# **LIST OF ATTACHMENTS**

1. Report.pdf.
2. Manuals
  - a. ADC0808
  - b. StepperMotor
  - c. MPX4250
3. Proteus File –CVM.dsn
4. EMU8086 ASM File –CVM.asm
5. Binary File after assembly –CVM.bin
6. Design-Design Attachment.pdf