You are asked by a Vending machine company to design the controller of a vending machine.  It has a money detector and items dispenser mechanism taken from an old vending machine. Your task is to design a sequential machine controller (a finite state machine) that will interface with the money machine and the dispenser for an effective implementation of the vending machine.

Specifications and other design details are provided below.  You must design the complete system (on paper) that includes the detailed state diagram, Karnaugh maps or truth tables for next state value and outputs and reduce to develop the hardware diagram, and give a detailed report.  {You must work independently on the project.}

You should build this as a Moore machine.  The design should have at least five states (requiring at least 3 state variables).  You can make choices as you see fit.

The vending machine controller interfaces with a coin machine that detects the drop of a coin (DET) (input to the controller), and provides a signal indicating the coins, NI DI and QR signals (input to the controller). of which only one will be on indicating the coin value).  The Controller can be developed from a simple flowchart indicating the various stages of the operation of the vending machine and converting into a state machine.   The controller should be able to output the following signals, DISP (Dispensing product) (output of the controller), CNRT for the coin return (output of controller).  Also, it should output a RD signal (lighting up a green light) and NRD signal (when machine down).  When coinbox is empty, you can display CHG (correct change only) light.    You may use at least three or more products.

Additionally, if you choose to, you can keep track of the coins in each coinbox and keep track of the products dispensed and remaining numbers.  These could be used to light up additional signals.

When the coin boxes are full. CNF (input to controller) signal will be activated by the coin machine.  This signal should be used to set an LED {coin-box-full-led} (output of the controller) to warn the customer that some change may not be accepted by the machine.

Any abnormal condition such as power failure and coin jam will be indicated by a {machine not ready} condition (this is input to the controller),  indicated by lighting a specific LED for that purpose. (NRD – output from the controller).

To get a product, the customer must deposit enough money and push the specific product button.
After dispensing a product, the vending machine should return change (output of the controller CNRT).

The report should include brief write-up explaining the design, flowchart and state diagram, K maps/ truth table of NS values, implementation in hardware.

(Any design/report taken from outside sources will be considered to violate academic integrity policy.)