So the system of the coffee machine is controlled from the Ui and it is consisting of two sides the first one is the main panel and the other one is the settings panel.

The main panel:-

The main panel has four sections in addition to the settings button which leads to the settings panel, and those four sections are:-

1-mode selections// In this section the user selects between four buttons which are coffee, hot water, Nescafe and cleaning cycle.

A-Coffee:-

-When pressed a configuration tab will be containing three configurations:-

1-brew with//Allows the user to choose between water(the system uses water pump) or milk(the system uses milk pump).

2-size//allows the user to choose between single or double(amount of time from water pump, making single 1x sec and double 2x sec + amount of time from tank 2 making single 1x sec and double 2x sec).

3-sugar//allows the user to choose between low, medium and high(turning motor of tank 1 for the set time);taking low selection as the reference meaning that low setting is 1x sec (set from setting menu) then medium is 2x and high is 4x.

Coffee mode logic//in this mode after every configuration is being selected and the time settings are set from settings the user will press start then the machine will dispense the coffee, sugar and the water(or milk) then the external heater turns on for the selected amount of time and the set temperature without using the thermos-block in coffee logic.

B-Hot water:-

-When pressed a configuration tab will be containing three configurations:-

1-Liquid selection// Allows the user to choose between water(the system uses water pump) or milk(the system uses milk pump).

2-size//allows the user to choose between single or double(amount of time from water pump, making single 1x sec and double 2x sec).

3-sugar//allows the user to choose between low, medium and high(turning motor of tank 1 for the set time);taking low selection as the reference meaning that low setting is 1x sec (set from setting menu) then medium is 2x and high is 4x.

Hot mode logic//in this mode the machine just dispenses hot water that is achieved by turning the water pump and the thermo-block/internal heater(set temp. and time from settings).

C-Nescafe:-

-When pressed a configuration tab will be containing three configurations:-

1-size//allows the user to choose between single or double(amount of time from water pump, making single 1x sec and double 2x sec + amount of time from tank 3 making single 1x sec and double 2x sec).

2- sugar//allows the user to choose between low, medium and high(turning motor of tank 1 for the set time);taking low selection as the reference meaning that low setting is 1x sec (set from setting menu) then medium is 2x and high is 4x.

3-milk// allows the user to change between no milk, medium and extra.

Nescafe logic// in this mode after every configuration is being selected and the time settings are set from settings the user will press start then the machine will dispense the Nescafe, sugar and the water achieved by turning the water pump and the thermo-block/internal heater(set temp. and time from settings)

If the user selected no milk, then the machine will dispense only the hot water according to the chosen size and if the user selected medium milk the system will dispense whole liquid volume of the selected size but will be 75% hot water and 25% milk, and if the user selected extra the system will dispense liquid volume of the selected size but it will consist of 50% hot water and 50% milk.

D-Cleaning cycle:-

-When pressed a configuration tab will be containing two configurations:-

1-milk system//opens the milk pump for amount of time(set from settings).

2-water circuit// opens the water pump for amount of time(set from settings).

Cleaning cycle logic:-

Just opening the milk pump and water pump for the set time knowing that user can select both to work at the same time.

2-cup indication//this acts as a main power switch on the whole system under the label of ''coffex is working'' and that is working by an ultrasonic sensor that indicates that there is a cup so other functions can work and if there are no cups detected then nothing will start working in the machine.

3-volume control//this is just controlling the volume level of the song that is been played by the df-mini-player when the system is plugged in.

Additional notes:-

1- If any of the coffee, hot water or Nescafe modes are selected after any cycle are complete the mixing mechanism will run for a set time in the settings(Mixer); the mixing mechanism is consisting of two motors, three relays, two limit switches and lead screw; one motor is controlled via 2 relays and is connected to the lead screw and hitting the up limit switch indicating the home position when mixing is activated the motor moves the mechanism down(the up and down movement is controlled via two relays one for up and the other for down) so it moves down until it reaches the bottom limit switch after that the mixing motor turns on for the set amount of time in the settings then the motor moves up until it reaches the top limit switch.
2- the system is composed of 5 dc motors(5v-geared motors), one thermo bolck (220v), one water pump(220v), one external heater(220v), one milk pump (12v); all of that is controlled via relays and esp32(ESP-32S 38Pin Development Board WiFi Bluetooth with New CP2102 Chip ) in addition to two heat sensors(MAX6675 Thermocouple Temperature Module with K-Type Sensor) to monitor the thermos-block and the ecternal boiler and a df-mini-player to play background music using this module(DFPlayer Mini MP3 DF Player Module Board MP3 Audio Voice Decode Board For Arduino Supporting TF Card U-Disk IO/Serial Port/AD)
3- motor functions/
   1.three motors will be dispensing sugar, coffee, nescafe.
   2.two motors will be for mixing mechanism.