Cooker

The cooker will cook at a Controlled Temperature (Setpoint) and controlled Time Interval.
The description of the operation and components needed in the following paragraphs:

Analog Input 0 (AI0): It is the (Pot. P1), It will be used to set the ***Set Point***. It is a Potentiometer of 10K Ohm. Scale the value read to 0 – 200C. This is the Temperature at which the Cooker Heater will be working.
We will Refer to it as ***SP (Set Point Temperature).***
*Display the Set Point on the **Third** Line of the Display. See Figure 1.*
Analog Input 2 (AI2): This is already connected to a simulator that reads a voltage already connected to a sensor. Read the Voltage (0--5), usually we scale it to temperature by just multiplying it by 100 since an increase of 10ms represent an increase by 1C. The minimum Value that it reads is around 27 degrees without doing extra changes. But in this Assignment , we will scale it by multiplying by a **MaxTemp** with default value of 200C. So, multiply the voltage that you read by **MaxValue** (For Now MaxTemp = 200).
We shall Refer to it as ***T (Temperature) or CT Cooking Temperature).***
*Display the Temperature on the **Second** Line of the Display. See Figure 1.*
Example: **CT: 54.75 CK:ON** *(CT means cooking Temperature)*
Heater: This is already connected to ***RC5***. We will Control the temperature by Simply turning ON the Heater or Turning it Off as described below in ***Controlling the Temperature*** section
Cooking Time: This is the time period for Cooking. It can take any Value from **0** to **10** Hours. The
remaining cooking time shall be displayed on the First Line of the display.
It shall be displayed as Time**: HH:MM: SS**. See Figure 1.
For example, Time: 03:23:20 meaning remaining time is 3 hours, 23 minutes and 20 seconds.
Use **Timer 0** to cause an **Interrupt every 1 second** and decrement the Cooking Time by 1 second if and only if the Cooking is ON. When the Time reaches Zero you should turn the Cooking off and turn the Heater Off.
When the Cooking is Done the Buzzer must Beep 4 Beeps. You Can Turn off and ON the Buzzer
with period of 1 second to Generate the Peep. On of second, off one second. Simple Delay is allowed.

Setting/changing the Cooking Time
1. INT0 at RB0. There shall be 5 Selections Modes to change the Value: Sec, 10Sec, Min, 10Min, HR. INT0 will circulate through the Selection You can use 5 values e.g. (0 – 4) with 0 meaning sec and 4 meaning Hours and circulate through them. Rollover when the value exceeds 4. For example, suppose we want to change by one Minute. Select Min (selection 2). We will use RB3 and RB4 to Increment or Decrement the cooking time by one Minute. Display The Selection on the Forth Line of the Display:
MD: <Selected Mode>
Examples MD: Min another Example MD**: 10Sec.** See Figure 1
2. RB3 will Increment the Cooking Time by the amount of the Selected Value. For Example, if we select 10Sec, then Increment the Cooking Time by 10Sec You must read the RB3 in the main Loop and debounce it. If the User keep pressing RB3 for more 500ms then keep increasing the value by the selected value by the selected amount every 500ms

Note the 500ms is not Exact I would accept any reasonable value from 200ms to less than a Second.
For Debouncing you can just put a delay of around 100ms – 200ms in your main loop.
3. RB4 will Decrement the Cooking Time similar to RB3. The Only difference is that it decrements.
4. RB5: Cancels everything, turns the Cooking Off and Cooking Time. Turn Off the Heater. Turn off Cooking.
5. INT1 at RB1: Starts or Resumes the Cooking. Once we press this and Time is Not Zero we should start Cooking. On the Second Line Display if Cooking is ON or Off
Example:
CT: 121.1 CK: ON
6. INT2 at RB2: Stops or Pauses the Cooking.
On the Second Line Display if Cooking is ON or Off
Example:
CT: 121.1 CK: OFF
Controlling the Temperature:
To keep the Temperature around the Setpoint, control the Heating as Follows
*If (Temperature < (**Setpoint - H**) Turn the Heater **ON***
*Else if (Temperature > (**Setpoint + H**) Turn the Heater **OFF***
Else No Change
*Where **H =1** (Usually H is a value that we can set to 0, 1 or 2. But Use H= 1).*

You Must Always display if the Heater is ON or OFF. Do this ON the third line similar to the example.
SP: 121.1 HT: ON See Figure 1 (HT is Heater it Can be On or OFF)
Updating the display:
Update the Cooking Time every Loop. Recall that Timer-0 causes an Interrupt every one second. If the Cooking is ON then it should decrement Time- 0.
Never ever display in any Interrupt routine but decrement the Cooking Time, if Needed set a Flag and display in the main Loop and then clear the Flag. You may just display every Loop since we have some delay caused by displaying on the 4 Lines plus some extra delay added for debouncing the buttons.

Notes:

1. DO not allow the Time to exceed the Maxim Value or be less than zero.
2. Do Not start Cooking if the Timer is Zero.
3. When you press reset, the Cooking Time should be Zero. That means initial Cooking Time is Zero and Heater is OFF
4. When the user presses Stop then the Remaining Cooking Time shall Not change. Which means do not let Interrupt Timer0 decrement the cooking time
5. Beeping should Only be done when the time becomes zero after being decremented in the Timer0 Interrupt.