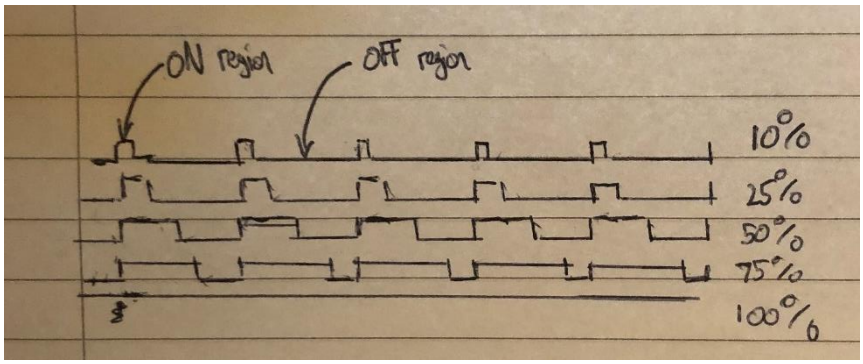
LAB 1 Sheet

Question 1)

From equation 1 you can see the relationship between the resolution of the ADC, System voltage, ADC reading, and Analog Voltage measured. The reason why a 5V Vref is used is because the Arduino uses successive approximation for the ADC converter, therefore using a 5V Vref allows the 3.3V output from the thermistor/thermocouple to be converged to accurately, as well as the Vref will have a very good initial accuracy as the correct supply voltage will be supplied hence giving the correct digital reading corresponding to the output voltage. This wouldn't be the most optimum use of the ADC pin because using 5V as the Vref would decrease the max resolution, whereas if you wanted to increase the resolution you would need to oversample where increasing the number of samples would increase the number of bits.

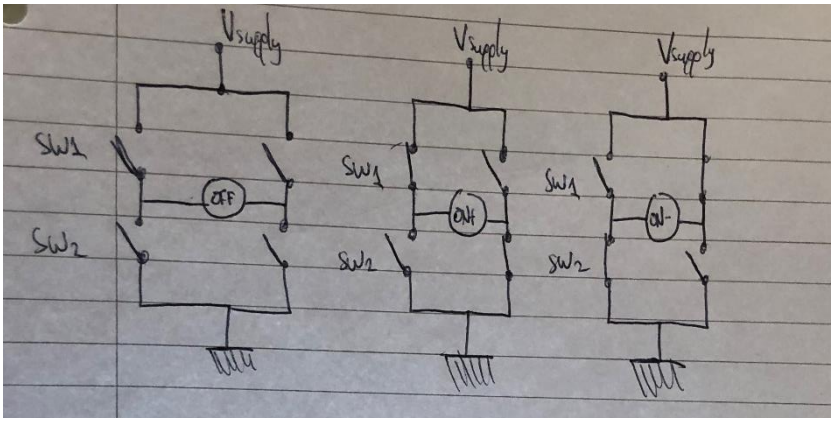
Question 2)

The voltage will be zero in the OFF region because there is some voltage between the two terminals.

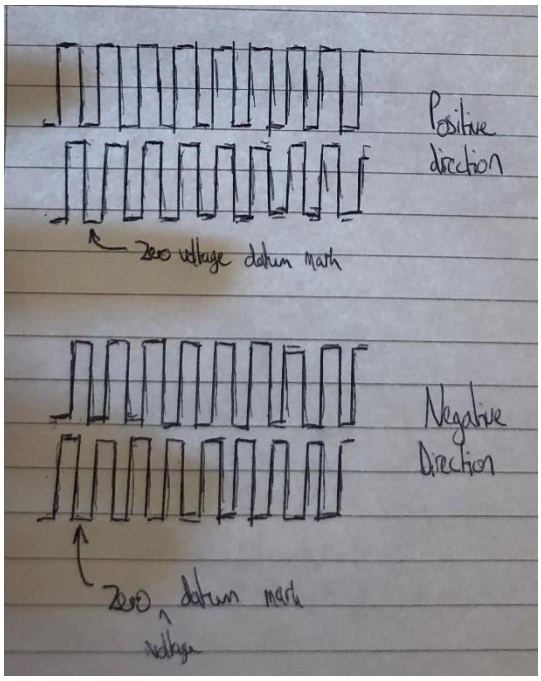


Question 3)

The difference between the ON (+) and ON (-) is the switches that are on for SW1 and SW2 as this causes the current to follow opposite paths towards ground. The PWM frequency in the Arduino is 490Hz. The frequency of the audible note is also 490Hz.



Question 4)



Question 5)

No this could not be used as an alternative because the quadrature decoder firstly is much more precise therefore the digital signals will have a better resolution. Furthermore, the quadrature decoder has a quadrature index which can be used as a reference point, indicate when to start monitoring the position, signify a complete revolution of the disk and finally verify position. Whereas using just the quarter pulses and timer counter would not give as much as information. Finally, the internal counter is not 100% accurate hence affecting the digital signal reading by either adding or losing time.

Question 6)

The Arduino programme was to slow when reading the code as a result the programmer froze. During this time, I can suspect that the programme was trying to go through the Arduino library trying to access the relevant pins.