**Explanation for the Code**

**Code 1: PSD\_loop :-**

**Section 1 & 4:**

Reads the Excel data provided and stores it in the cells timeData and currentData.

**Section 2:**

Before knowing about section 2, need to have information about **Code2: plot\_cycles.**

**Code 2: plot\_cycles :-**

* We first find the indices where time will be greater than the threshold, It's where we do the SS analysis.
* Then, we put these values in Ir\_A\_sub and time\_vector\_sub.
* Find zero crossings in the Ir\_A\_sub.
* If your zero crossings are enough as you mentioned in the details given by user, then the loop will run otherwise it will display “not enough cycles.
* If the loop runs it will store the values in current\_lc and current\_lc for the given number of zero crossings given by the user.

**Code 1: PSD\_loop :-**

**Section 2:**

* Write your individual time values and number of zero crossings.
* Allocate space for your cells you will be creating.
* Put your data that you stored in cells timeData and currentData in the variables time\_exp and current\_exp.
* Get your individual threshold time and number of zero crossings values.
* Give those as input to the function plot\_cycles.
* Plot your output you got from this function as this will be give your required signal in SS and with your required number of zero crossings.
* Then, store these PSD’s and frequencies in cells for each data you provided.

**Code 3: Calculate\_psd**

* Calculate the sampling frequency.
* Calculate the length of the segment.
* Calculate PSD using pwelch command by dividing the signal into segment (overlapping) and calculating modified periodogram for each segment (It's essentially the square of the magnitude of the FFT of the signal, normalized by the length of the signal.) and then averaging them.
* [],[] represent overlapping segment and number of fast fourier transform (NFFT). This defines the resolution of your FFT. It is set to default here.
* Then calculate the power at 60 hz, and calculate PSD with respect to fundamental.

**Code 1: PSD\_loop :-**

**Section 3:**

* Prelocating to store the variables.
* Plotting all the graphs with respect to the first graph.
* The first one is the reference, and others are plotted with respect to the reference. That is PSD\_dB\_fea\_h here in the code.
* In other section, around the target frequency the value of PSD\_db is provided and then displayed.