1. Difference Equation:

   ○ For a moving average filter equation given by,

   $$y[n] = \frac{1}{n+1} \sum_{k=0}^{n} x[k]$$

   Convert the equation of $y[n]$ to a recursive form, take any arbitary input signal $x[n]$ and using python programme, find the response $y[n]$ using the derived recursive structure.

   ○ Consider a causal LTI system whose input $x[n]$ and output $y[n]$ are related by the difference equation

   $$y[n] = \frac{1}{4} y[n-1] + x[n]$$

   Write a python programme to find $y[n]$ if $x[n] = \delta[n-1]$.

2. Discrete Time Fourier Series:

   ○ Check whether the signal $x[n]$ given by

   $$x[n] = \sum_{m=-\infty}^{\infty} \{4\delta[n-4m] + 8\delta[n-1-4m]\}$$

   is a periodic signal or not. If yes, find the DT Fourier series coefficients of the signal.

   ○ For the signal x[n] given above, verify all the properties of DT Fourier Series.

3. Discrete Time Fourier Transform:

   ○ For the DT signal $x[n]$ in the above question, find the DT Fourier Transform of a period of signal.

   ○ Verify all the properties of DT Fourier Transform for the above signal.