**Lab 3：Fourier Series Representation of Periodic Signals**

|  |  |
| --- | --- |
| Author | Name：袁通 代育津 Student ID: 11810818 11910114 |
| Introduction  In this lab, we will explore the Fourier Series representation of periodic signals. We have totally four problems in this lab:  In problem 3.5, we will first synthesize a periodic discrete-time signal, then examine the DTFS representation of several different square waves and finally write a function which computes the DTFS coefficients of a periodic signal.  Lab results & Analysis：  3.5 Synthesizing Signals with the Discrete-Time Fourier Series  Text  Description automatically generated      Text, letter  Description automatically generated    From the coefficient given, we found that is real, and and , and are conjecture with each other, so the imaginary part will offset each other, so is real.  Text  Description automatically generated  For N=5, we can derive that, , , so here we have  Text  Description automatically generated  We define and we get the plot, the real and imaginary part of signal, from the plot we can see that signal has only nonzero real part, so our prediction is verified.  Chart  Description automatically generated  Table  Description automatically generated  Text, letter  Description automatically generated  Here the plots of three signals are shown below.  Diagram  Description automatically generated with medium confidence  Text  Description automatically generated  The plots of DTFS coefficients of three signals are shown below. We can derive that , so for for for , and we can extract the same result from the plot, which also verify our predict.  A picture containing chart  Description automatically generatedText, letter  Description automatically generated  Chart, histogram  Description automatically generated  The signal which fewer coefficient synthesized are shown in the plot, we found that with more coefficient, the synthesized signal is more similar to the original signal .    Chart  Description automatically generated  Form the plot of real and imaginary part of the signal we can found that the imaginary part of is 0 so the signal is real.  Text  Description automatically generated  Note: Please indicate meaning of the symbols in all expressions. Please indicate the coordinate and unit in all figures. | |
| Experience  You can write your experience with this project. Any comment and suggestion on this course are also very welcome. | |
| Score |  |

字体：英文Times new Roman；中文宋体，正文五号

文件名统一命名方式：LabX+姓名+学号，例如：Lab1+张三+00001 （正式报告删除此行！）