Signal & System 2022 期末考模擬

- 手做答案可以手寫拍照，
- 程式考題寫出程式碼以及列印執行結果。
- 一並彙整為一個pdf檔上傳。
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- 將請助教開一個 E-Learning 作業於考試當天(6月17日)限時(2.5小時)之內上傳。
- 正式考試為第17周上課時間(6月17日15:00~18:00)

(1)

What is a linear chirp signal? Write down its mathematical function.

(2)

Write a function called myChirp(), it can generate a chirp signal.

- input:
  - a time sequence: ts= [0, 0.0001, 0.0002, ..., T] in (sec)
  - a start frequency f0 (Hz),
  - a ending frequency f1 (Hz).
- output:
  - the chirp sequence: ys= myChirp(ts)

```
def myChirp(ts, f0=100, f1=400):

    #
    # your code ...
    #
    return ys

# 1. generate a time sequence from 0 sec to 10 sec
# 2. test your function.
```

(3) what is DFT (Discrete Fourier Transform), and IDFT (Inverse Discrete Fourier Transform), write down their mathematical definition.

(4) Given a time-domian sequence x[n]= [1,1,1,1], please calculate the DFT X[k]. and also compute y[n], which is the IDFT of X[k].

(5)

Write a function called myDft(), it can compute the DFT of any signal x[n] or the IDFT of any spectrum X[k.

- input:
  - a time-domain signal: x= [x0, x1,... x[N-1]]
  - or a frequency-domain spectrum: X= [X0, X1,... X[N-1]]
- output:

- a spectrum X[k] or a signal x[n]

```
def myDft(x, inverst= False):
    #
    # your code ...
    #
    #
    #
    return X

# 1. generate a time-domain signal x[n] or a time-domain spectrum X[k]
# 2. test your function.
```

(6) If x is a Cosine signal with frequency = 100 Hz, generate a discrete signal with sampling frequency, Fs = 1000 samples/sec, for 10 sec. compute the spectrum X[k] of the the signal x[n] and plot X[k], what does it look like?

(7) what is convolution of 2 signal x[n] and y[n], please write down their mathematical definition.

(8) if x= [1,1,1,1], y=[1,2,3,4,5], what is their convolution z = x*y?

(9) write a function called myConvlution(), which can compute the convolution of two signal.

```
def myConvlution(x,y):
    #
    # your code to implement
    # z = x * y
    #
    return z
```

(10) what is the convolution theorem?

(11) Verify the convolution theorem by using `myDft()` and `myConvolution()`

In [ ]: