

## 信号与系统 2025 春期末考试回忆版

命题：崔巍 回忆：氢氰酸

理论题全部来自作业，程序题全部来自老师发的代码

1. 用任意算法计算 FFT (30):
  - a) 一个长度为 9 的序列
  - b)  $\{1, 2, 3, 4, 4, 3, 2, 1\}$
2. 判断信号具有的性质 (15):
  - a)  $y(t) = x(t/3)$
  - b)  $y(t) = \cos x(t)$
  - c)  $y[n] = x[n-2] - 2x[n-8]$
3.
  - a)  $x[n] = 2^n u[n]$ , 计算  $y[n] = x[n] - 2x[n-1]$
  - b) 求一个序列  $h[n]$ , 使之满足  $x[n] * h[n] = (1/2)^n (u[n+2] - u[n-2])$
4. 求傅里叶系数, 忘了
5. 补全代码: (20)
  - a) 实现方波:

```
def evaluate(self, ts):
    """Evaluates the signal at the given times.
    ts: float array of times
    returns: float wave array
    """
    ts = np.asarray(ts)
    cycles =
    frac, _ =
    ys =
    return ys
```

- b) 实现 UU 或 UG 噪音:

```
def evaluate(self, ts):
    """Evaluates the signal at the given times.
    ts: float array of times
    returns: float wave array
    """
    ys =
    return ys
```

- c) 用两种方法实现两个序列的卷积函数:

```
def convolve1(self, others):
```

```
def convolve2(self, others):
```

6. 代码挑错: (20)

```
def make_spectrogram(wave, seg_length, win_flag=True):
    """Computes the spectrogram of the wave.

    seg_length: number of samples in each segment
    win_flag: boolean, whether to apply hamming window to each
segment

    returns: Spectrogram
    """
    if win_flag:
        window = np.hamming(seg_length)
    i, j = 0, 0
    step = seg_length

    # map from time to Spectrum
    spec_map = {}

    while j < len(wave.ys):
        segment = wave.slice(i, j)
        if win_flag:
            segment.window(window)

        # the nominal time for this segment is the midpoint
        t = segment.start + segment.end
        spec_map[t] = make_spectrum(segment)

        i += step
        j += step

    return Spectrogram(spec_map, seg_length)
```