

# Report

## ■ HW

–Generate two sinusoidals with frequencies of 1/4 and 1/8

```
s1 = cos(2*pi*0.25*t);  
s2 = cos(2*pi*0.125*t);
```

– Using the methods mentioned in this lab., design an FIR filter that can filter out the sinusoidal with the frequency of 1/8. The required output SNR is 20dB

$$s(n) + v(n) \rightarrow y(n) = \bar{s}(n) + \bar{v}(n)$$
$$e(n) = \bar{s}(n) - s(n) + \bar{v}(n) = y(n) - s(n)$$

$$\text{SNR(dB)} = 10 \log_{10} \frac{E\{|\bar{s}(n)|^2\}}{E\{|e(n)|^2\}}$$

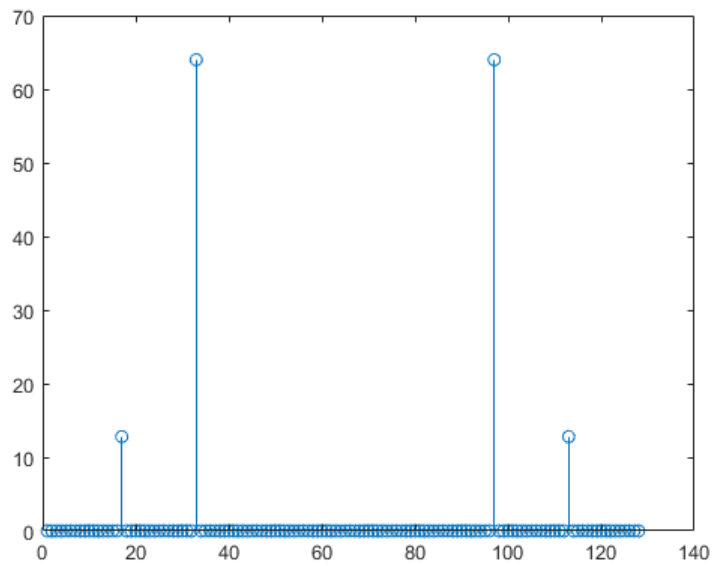
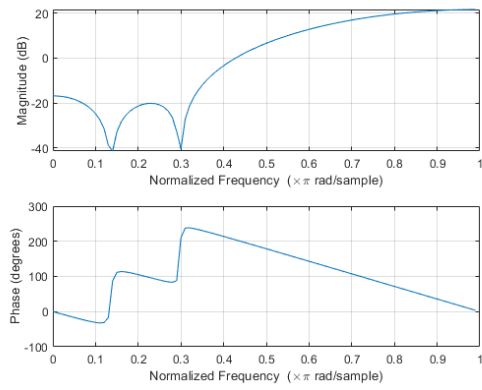
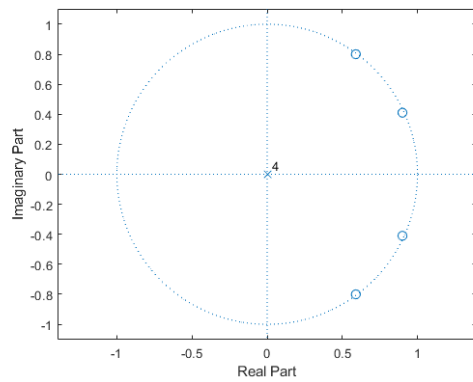
	SNR	20.1086
	t	1x125 double

濾掉 $f=1/8$ 的訊號：透過zeros和poles的選取來設計濾波器

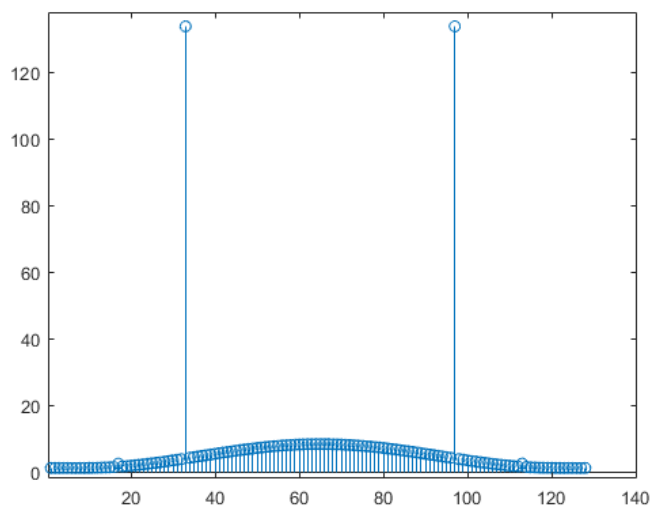
**FIR** Filter的設置:

```
a = poly([0.9+0.41j,0.59+0.8j,0.9-0.41j,0.59-0.8j]);
```

```
b = 1
```



原來訊號的頻譜



-濾完之後的頻譜

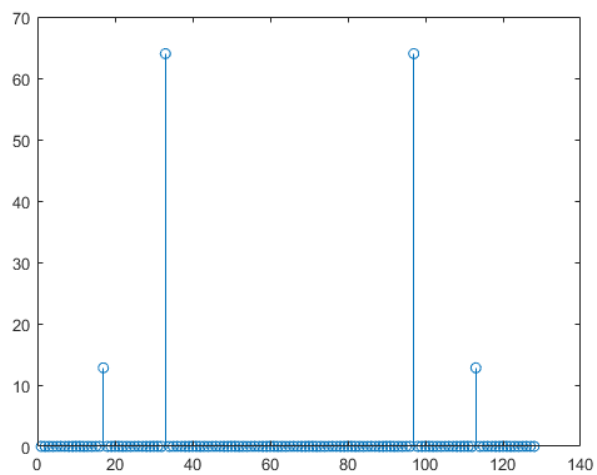
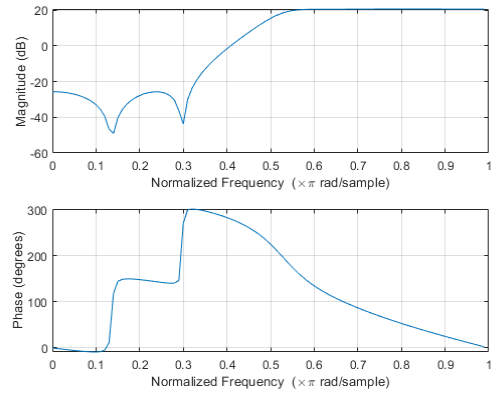
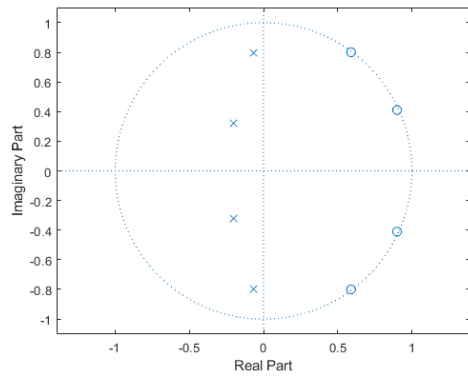
有雜訊後的頻譜

經過濾波後的頻譜

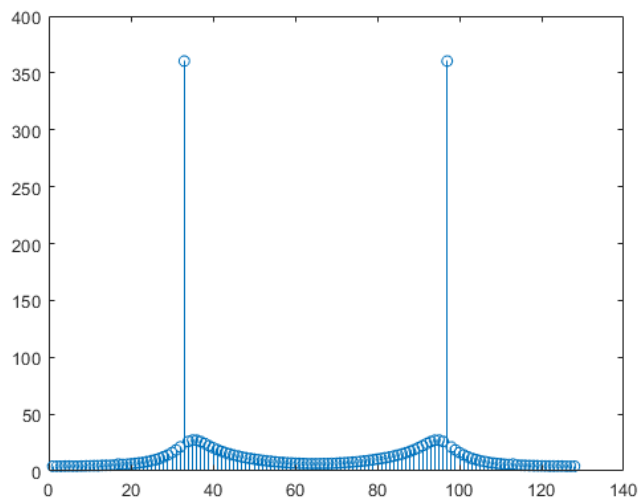
**IIR** Filter的設置:

```
a = poly([0.9+0.41j,0.59+0.8j,0.9-0.41j,0.59-0.8j]);
```

```
b = poly([-0.07+0.8j, -0.2+0.323j, -0.2-0.323j, -0.07-0.8j]);
```



-原來訊號頻譜，



-濾波後的頻譜

## Conclusion

這次學到如何從設置 **zeros** 和 **poles** 的方向去實現我們想要設計的濾波器，覺得非常充實。