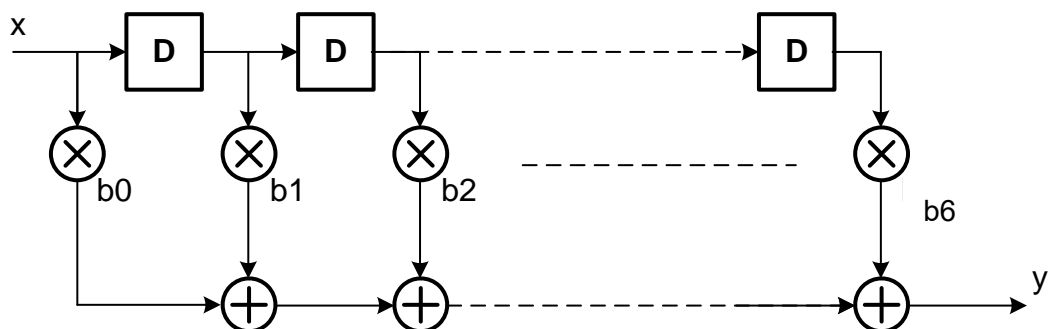# Lab10 – FIR Filter Design

1. Design a 7-tap FIR filter. The coefficients of this filter are listed in Table I.

<div align="center">

Table I   Coefficients table

b0	-0.0156
b1	0.0182
b2	0.0417
b3	0.0260
b4	0.0417
b5	0.0182
b6	-0.0156

</div>

2. Using Matlab to simulate the bit of coefficient achieving the SNR>50dB.

所指為有用訊號功率（Power of Signal）與雜訊功率（Power of Noise）的比。因此為振幅（Amplitude）平方的比：

$$\text{SNR} = \frac{P_{\text{signal}}}{P_{\text{noise}}} = \frac{A^2_{\text{signal}}}{A^2_{\text{noise}}}$$

它的單位一般使用分貝，其值為十倍對數訊號與雜訊功率比：

$$\text{SNR(dB)} = 10 \log_{10}\left(\frac{P_{\text{signal}}}{P_{\text{noise}}}\right) = 20 \log_{10}\left(\frac{A_{\text{signal}}}{A_{\text{noise}}}\right)$$

其中

P_{signal} 為訊號功率（Power of Signal）。
P_{noise} 為雜訊功率（Power of Noise）。
A_{signal} 為訊號振幅（Amplitude of Signal）。
A_{noise} 為雜訊振幅（Amplitude of Noise）。

snr

Signal-to-noise ratio

Syntax

```
r = snr(x,y)
```

```
r = snr(x)
r = snr(x,fs,n)
```

```
r = snr(pxx,f,'psd')
r = snr(pxx,f,n,'psd')
```

```
r = snr(sxx,f,rbw,'power')
r = snr(sxx,f,rbw,n,'power')
```

```
r = snr( ___ ,'aliased')
```

```
[r,noisepow] = snr( ___ )
```

```
snr( ___ )
```

Description

`r = snr(x,y)` returns the signal-to-noise ratio (SNR) in decibels of a signal, x, by computing the ratio of its summed squared magnitude to that of the noise, y. y must have the same dimensions as x. Use this form when the input signal is not necessarily sinusoidal and you have an estimate of the noise.

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