

ELEC3004

Solutions to Assignment 2

1.

```
>> ifft(fft([1 2 4 5 11 25],11).*fft([1 -4 -5 15 -13 19],11))

ans =

Columns 1 through 10

    1.0000   -2.0000   -9.0000   -6.0000  -12.0000    9.0000  -94.0000   51.0000  327.0000 -
116.0000

Column 11

    475.0000

>> conv([1 2 4 5 11 25],[1 -4 -5 15 -13 19]) %check using convolution

ans =

    1    -2    -9    -6   -12     9   -94    51   327  -116   475
```

2.

```
>> format long

>> 537283*423715

ans =

    2.276548663450000e+11

% 227,654,866,345

x=ifft(fft([5 3 7 2 8 3],11).*fft([4 2 3 7 1 5],11))

x =

    1.0e+02 *

Columns 1 through 5

    0.2000000000000000    0.2200000000000000    0.4900000000000000    0.6600000000000000
    0.8300000000000000

Columns 6 through 10

    1.1100000000000000    0.6600000000000000    1.0200000000000000    0.3900000000000000
    0.4300000000000000

Column 11

    0.1500000000000000

y = x.*10.^([11 10 9 8 7 6 5 4 3 2 1]);

>> y*ones(11,1)

ans =

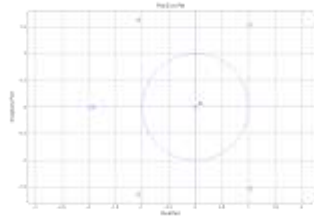
    2.276548663450000e+12
```

3.

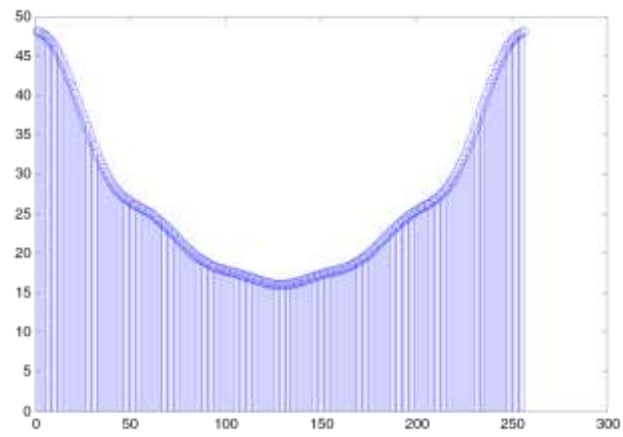
```
A)>> b = [1 2 3 5 12 25];
```

```
>> Hd = dfilt.dffir(b);
```

```
>> zplane(Hd)
```



```
B) stem(abs(fft(b,256)))
```

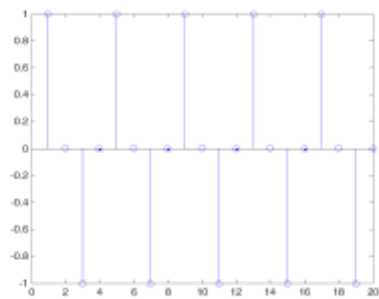


4.

```
>> t = [1:20];
```

```
>> x = sin(2*pi*(10/40)*t);
```

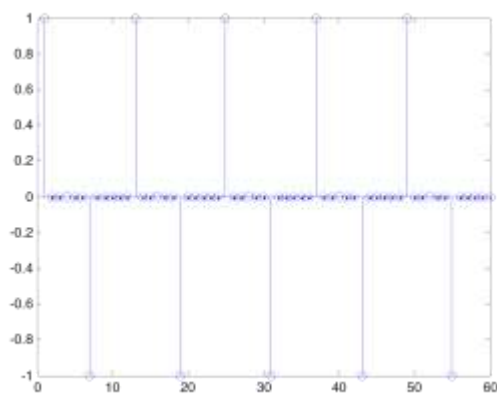
```
>> stem(x)
```



```
>> xm = [x; zeros(1,20); zeros(1,20)];
```

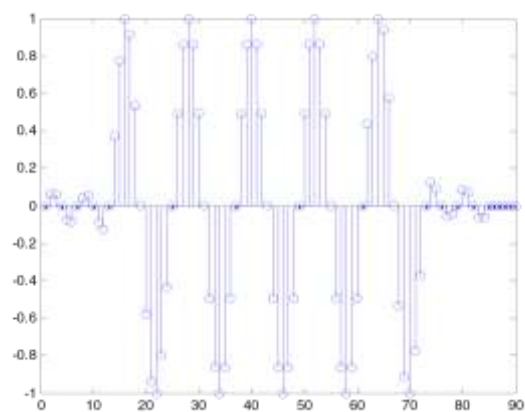
```
>> xr = xm(:);
```

```
>> stem(xr)
```



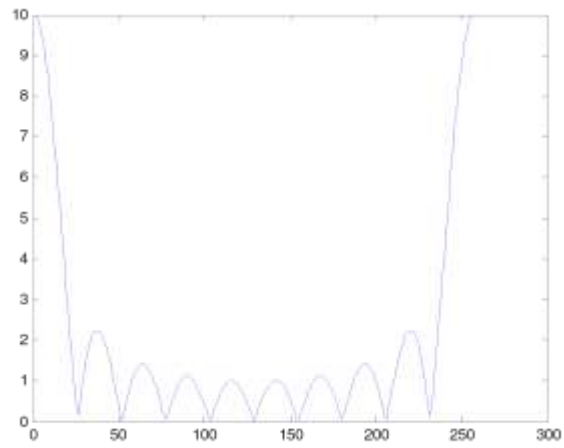
```
>> h = sinc((1/3)*t)
```

```
>> stem(conv(h,xr))
```



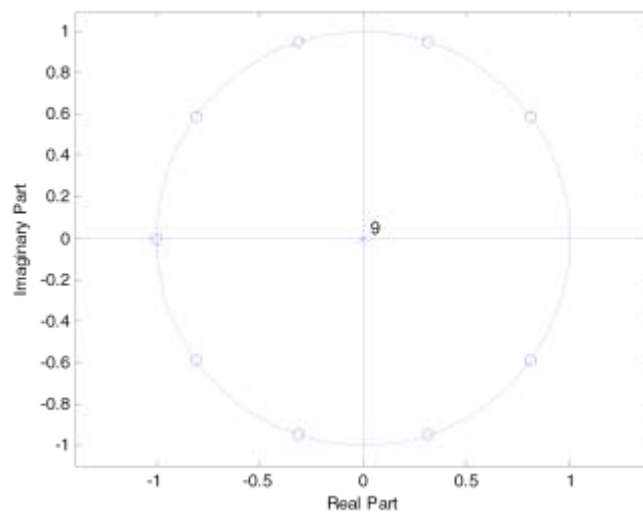
5.

A) `>> plot(abs(fft([1 1 1 1 1 1 1 1 1 1]),256))`



B) 9 times

C) `>> zplane([1 1 1 1 1 1 1 1 1])`



6. $H(z) = h_0 + h_1 z^{-1} + \dots + h_m z^{-m}$

$$H(z) = z^{-m} (h_0 z^m + h_1 z^{m-1} + \dots + h_m)$$

Reversing the sum yields

$$H(z) = z^{-m} (h_m + h_{m-1} z + \dots + h_0 z^m)$$

But for symmetric coeffs, $h_0 = h_m$, $h_1 = h_{m-1}$ etc

$$H(z) = z^{-m} (h_0 + h_1 z + \dots + h_m z^m)$$

$$H(z) = z^{-m} H(z^{-1})$$

Therefore if a is a root of $H(z)$ so is a^{-1} . Hence roots must come in reciprocal pairs.

7&8 should simply meet spec to achieve marks.