Moving Average System : Home Assignment

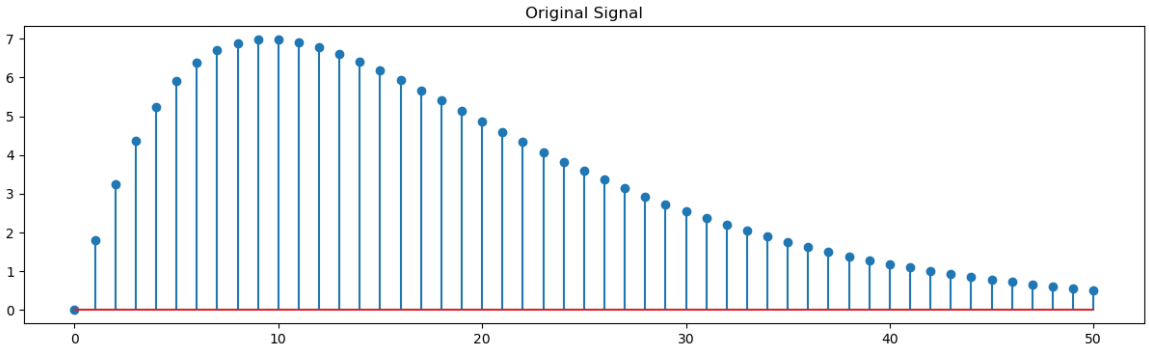
$x[n] = s[n]+d[n] = (s[n] = 2[n(0.9)^n]$ is the signal corrupted by a noise $d[n])$

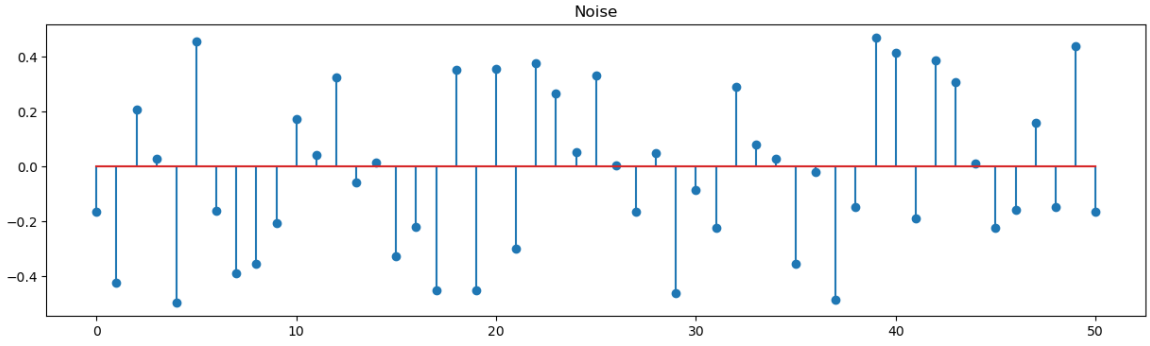
In [1]:
```
import matplotlib.pyplot as plt
import numpy as np
from scipy.signal import lfilter
```

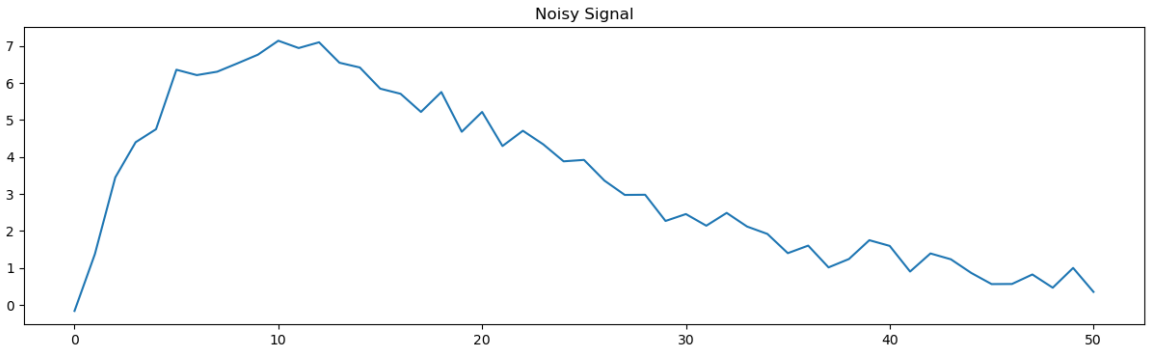
In [2]:
```
R = 50
m = [item for item in range(0, 51)]


S = [] #samples for generating original signal
d = [] #samples for generating random noise
x = [] #samples for generating noisy signal

arr = np.random.rand(R,1)-0.5
for i in m:
    S.append(2*i*(0.9**i))
    d.append(arr[i-1][0])
    x.append(S[i]+d[i])

#filtering noisy signal
M = 3
b = np.ones(M)/M # when value of M is 3
b1 = np.ones(6)/6 # when values of M is 6
b2 = np.ones(10)/10 # when values of M is 10

y = lfilter(b,1,x)
y1 = lfilter(b1,1,x)
y2 = lfilter(b2,1,x)
```

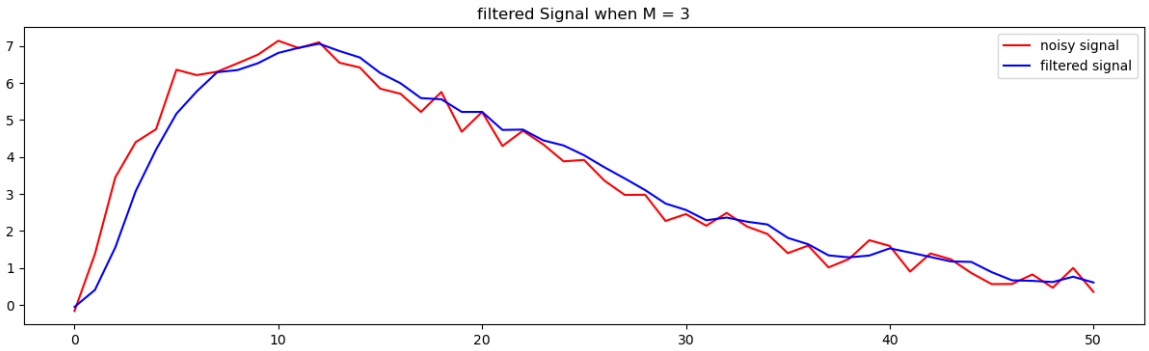
In [3]:
```
plt.figure(figsize=(15,4))
markerline, stemlines, baseline = plt.stem(m, S, markerfmt='o')
plt.title("Original Signal")
plt.show()

plt.figure(figsize=(15,4))
markerline, stemlines, baseline = plt.stem(m, d, markerfmt='o')
plt.title("Noise")
plt.show()

plt.figure(figsize=(15,4))
plt.plot(m,x)
plt.title("Noisy Signal")
plt.show()

plt.figure(figsize=(15,4))
plt.plot(m,x, color='r', label='noisy signal')
plt.plot(m,y, color='b', label= 'filtered signal')
plt.title("filtered Signal when M = 3")
plt.legend()
plt.show()

plt.figure(figsize=(15,4))
plt.plot(m,y1,color='b', label= 'filtered signal')
plt.plot(m,x, color='r', label='noisy signal')
```

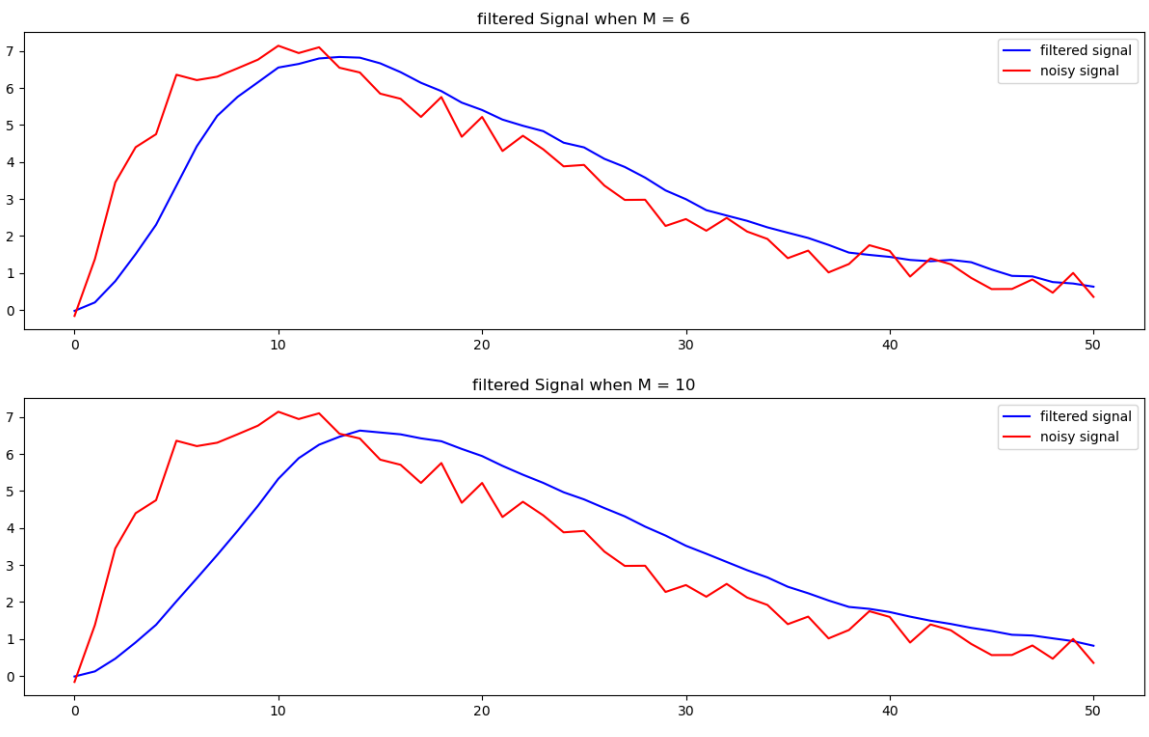
```
plt.title("filtered Signal when M = 6")
plt.legend()
plt.show()

plt.figure(figsize=(15,4))
plt.plot(m,y2, color='b', label= 'filtered signal')
plt.plot(m,x, color='r', label='noisy signal')
plt.title("filtered Signal when M = 10")
plt.legend()
plt.show()
```











conclusion

By applying filter to the noisy signal when the value of M = 3 we were able to reduce some amounts of noise, as we started to increase the value of M to 6 and then to 10 we noticed that if you increase M we will get a smooth signal with little noise but the data in our signal will also be lost or corrupted