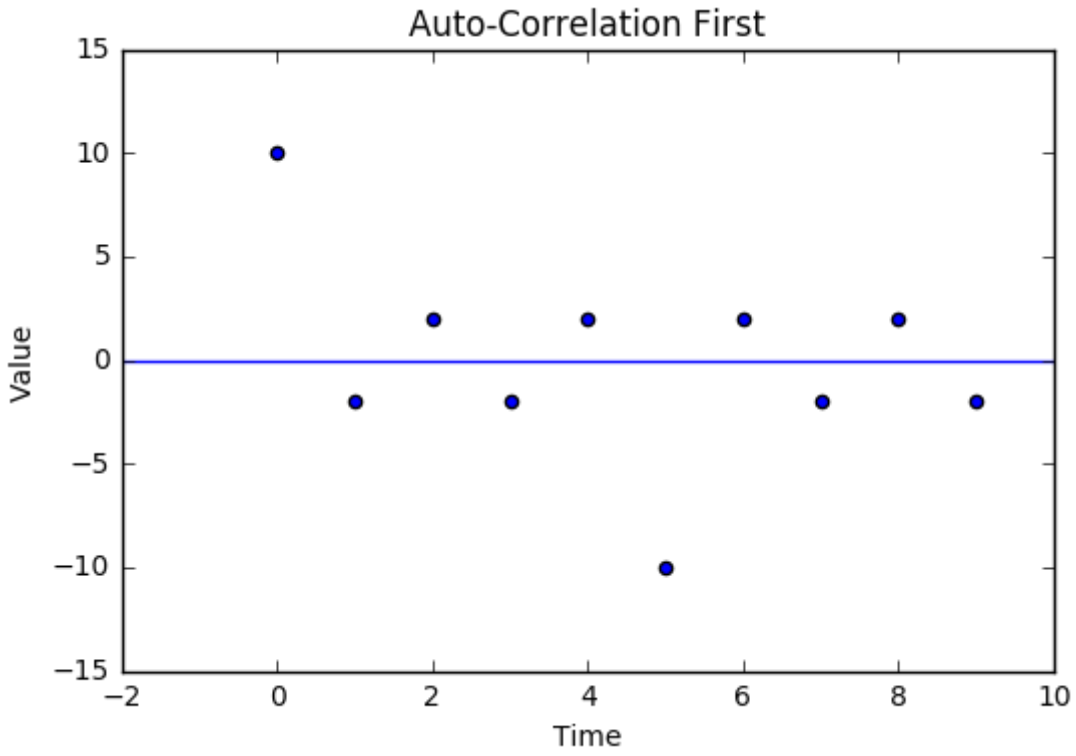
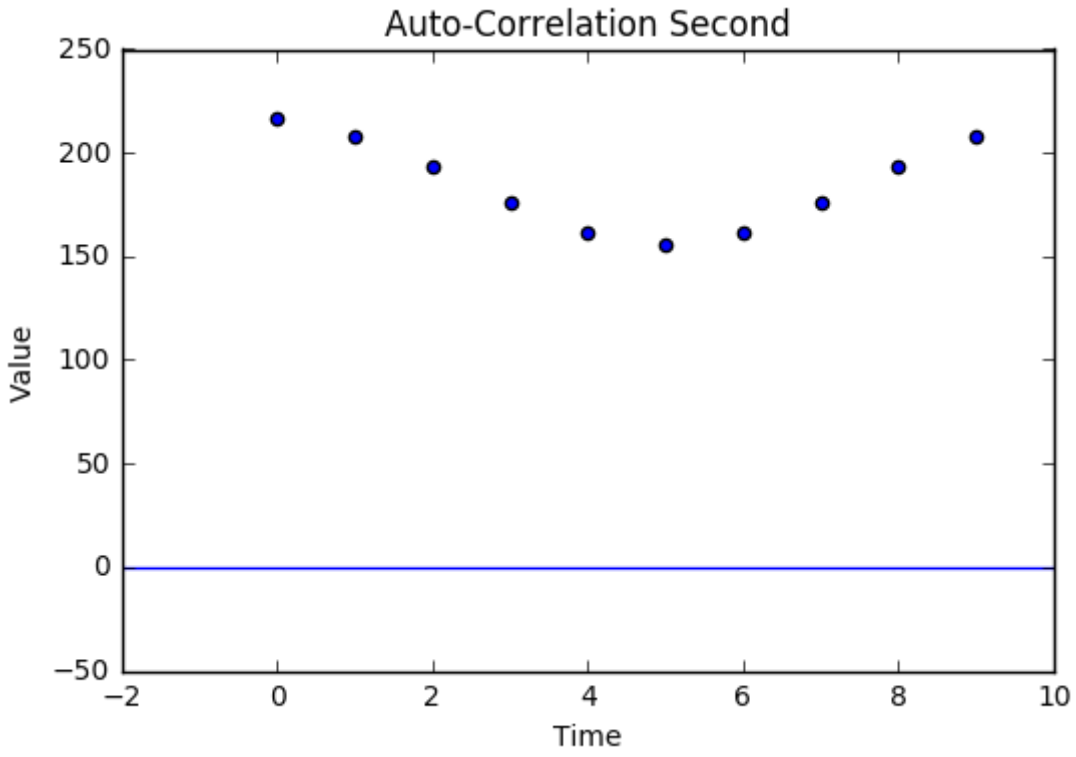
In [1]:
```
import numpy as np
from scipy.linalg import circulant
import matplotlib
import matplotlib.pyplot as plt
import matplotlib.cm as cm
import matplotlib.mlab as mlab
%matplotlib inline
```

In [12]:
```
first_signal = np.array([1,-1,1,-1,-1,-1,1,-1,1,1])
auto_correlation_first = np.dot(first_signal, circulant(first_signal))

second_signal = np.array([1,2,3,4,5,6,7,6,5,4])
auto_correlation_second = np.dot(second_signal,
circulant(second_signal))

print("Auto-C First: ", auto_correlation_first)
plt.scatter([i for i in range(0,len(auto_correlation_first))], auto_corr
elation_first)
plt.axhline()
plt.xlabel("Time")
plt.ylabel("Value")
plt.title("Auto-Correlation First")
plt.show()

print("Auto-C Second: " , auto_correlation_second)
plt.scatter([i for i in range(0,len(auto_correlation_second))], auto_cor
relation_second)
plt.axhline()
plt.xlabel("Time")
plt.ylabel("Value")
plt.title("Auto-Correlation Second")
plt.show()
```

```
Auto-C First:  [ 10  -2   2  -2   2 -10   2  -2   2  -2]
```

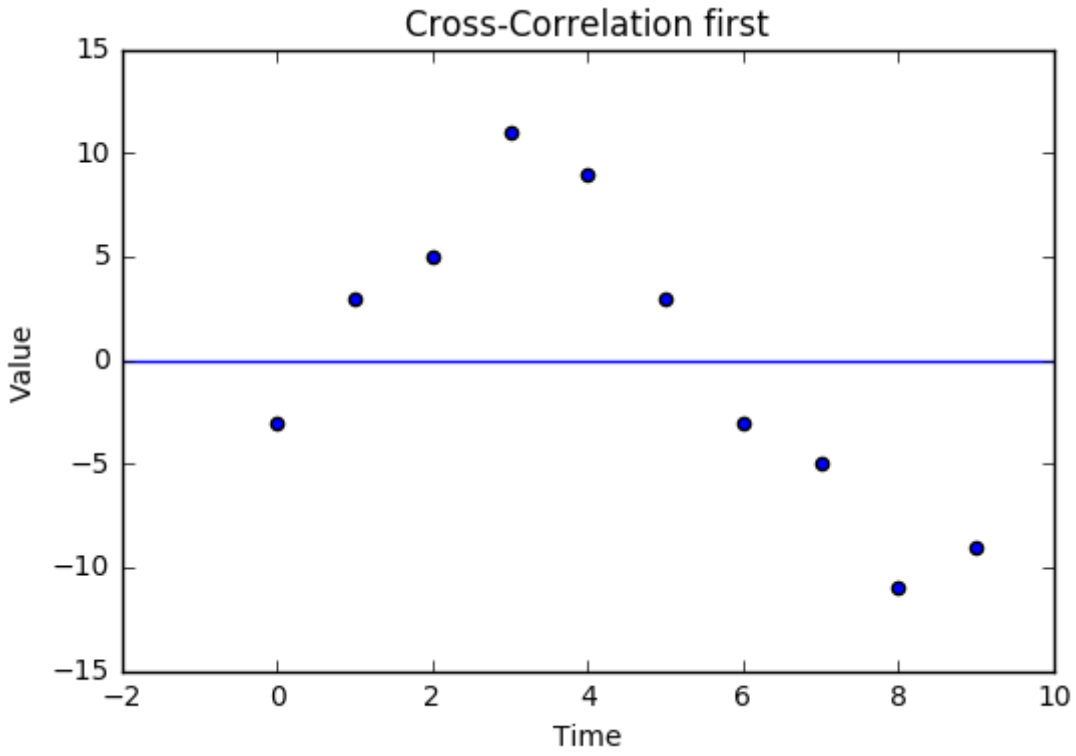



```
Auto-C Second:  [217 208 193 176 161 156 161 176 193 208]
```

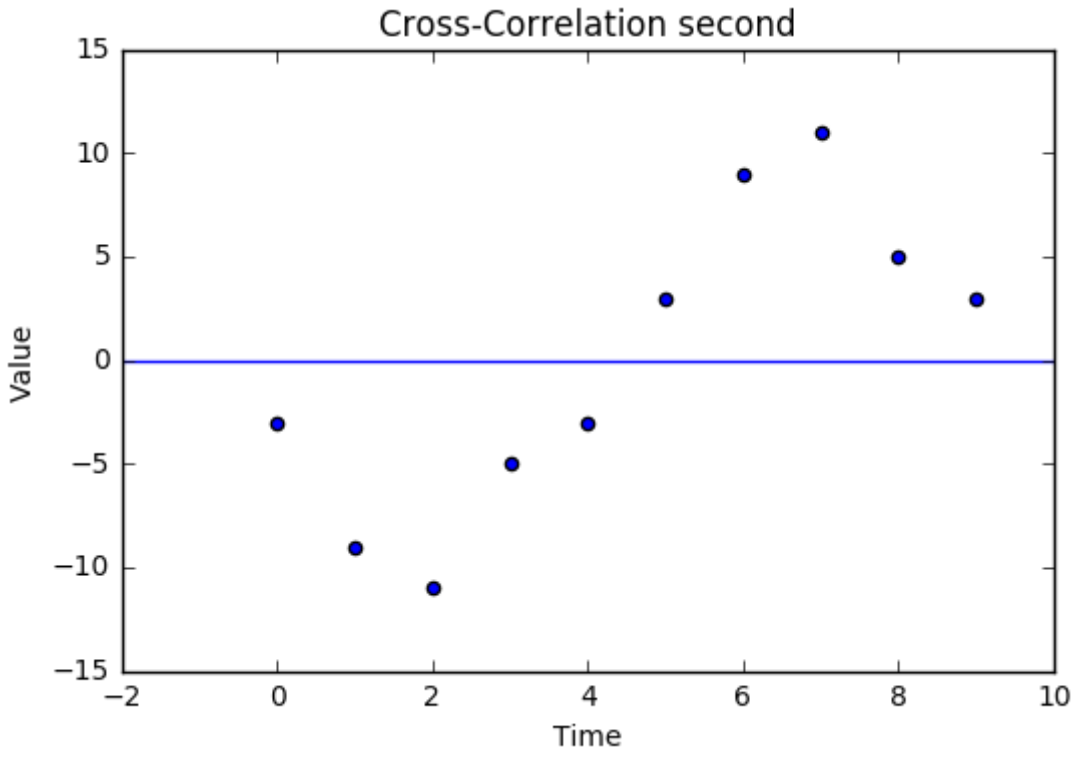


In [14]:
```
signal_first = np.array([1,-1,1,-1,-1,-1,1,-1,1,1]) #From the Image in t
he Question
signal_first_circulant = circulant(signal_first)
signal_second = np.array([1,2,3,4,5,6,7,6,5,4])
signal_second_circulant = circulant(signal_second)
cross_correlation_first = np.dot(signal_first, signal_second_circulant)
cross_correlation_second = np.dot(signal_second, signal_first_circulant)
print("Cross-Correlation first: ", cross_correlation_first)
plt.scatter([i for i in range(0,len(cross_correlation_first))], cross_co
rrelation_first)
plt.axhline()
plt.xlabel("Time")
plt.ylabel("Value")
plt.title("Cross-Correlation first")
plt.show()
print("Cross-Correlation second: " , cross_correlation_second)
plt.scatter([i for i in range(0,len(cross_correlation_second))], cross_c
orrelation_second)
plt.axhline()
plt.xlabel("Time")
plt.ylabel("Value")
plt.title("Cross-Correlation second")
plt.show()
```

```
Cross-Correlation first:  [ -3   3   5  11   9   3  -3  -5 -11  -9]
```




```
Cross-Correlation second:  [ -3  -9 -11  -5  -3   3   9  11   5   3]
```



In [ ]: