Bangabandhu Sheikh Mujibur Rahman Science and Technology University

Course Code: CSE406
Course Title: Digital Signal Processing Lab

Assignment on: Drawing the signal y(n) = FD[2x(n-5) * 2x(n+5)] on Jupyter Notebook.

Submitted By	Under the Guidance of
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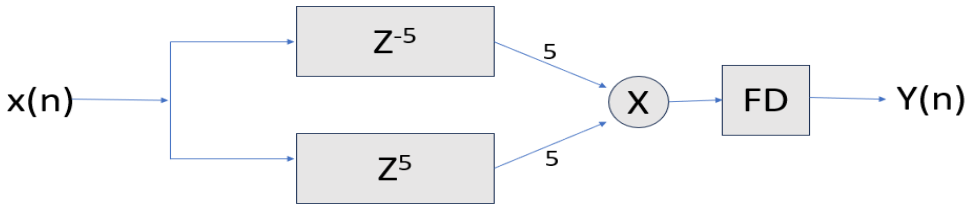
Date of Submission: 7 February, 2024.

Problem Statement: Find



Where, $x(n) = \begin{cases} n^2+n & \text{for } 0<=n<=10 \\ -n^2+n & \text{for } -10<=n<0 \\ 0 & \text{otherwise} \end{cases}$

Solution:

Here for n= -10 to 10, we get non-zero values. So its enough to take n= -15 to 15 range value. 5 extra values take on both positive and negative site because of delay and advancing moved the signal left and right.

So, in short, we need to generate this function:

$$y(n) = FD[2x(n-5) * 2x(n+5)]$$

In [1]:
```
import numpy as np
import matplotlib.pyplot as plt
```

In [2]:
```
n=np.arange(-15,16)
n
```

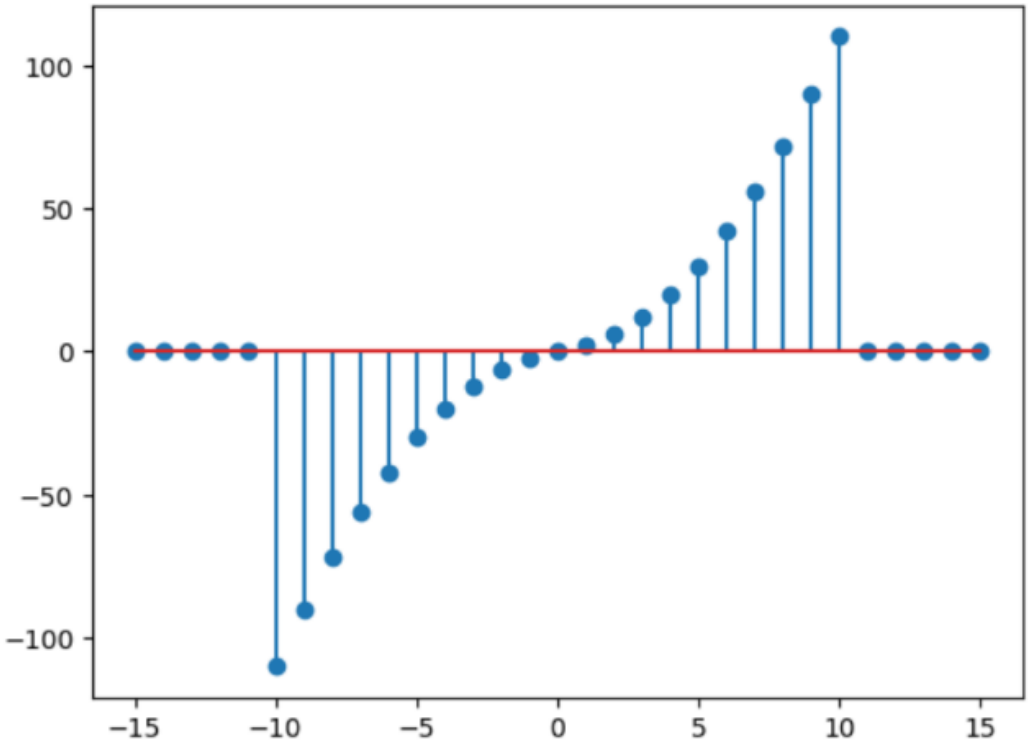
Out[2]:
```
array([-15, -14, -13, -12, -11, -10,  -9,  -8,  -7,  -6,  -5,  -4,  -3,
        -2,  -1,   0,   1,   2,   3,   4,   5,   6,   7,   8,   9,  10,
        11,  12,  13,  14,  15])
```

In [3]:
```
def getxn(i):
    if 0<=i<=10:
        return i*i+i
    elif -10<=i<0:
        return -i*i+i
    else: return 0
xn=[]
xn=np.array([getxn(i) for i in n])
xn
```

Out[3]:
```
array([   0,    0,    0,    0,    0, -110,  -90,  -72,  -56,  -42,  -30,
       -20,  -12,   -6,   -2,    0,    2,    6,   12,   20,   30,   42,
        56,   72,   90,  110,    0,    0,    0,    0,    0])
```

In [4]:
```
plt.stem(n,xn)
plt.show
```

Out[4]:
```
<function matplotlib.pyplot.show(close=None, block=None)>
```



Delay

In [5]:
```
nd = n[0:n.size-5]
nd
```

Out[5]:
```
array([-15, -14, -13, -12, -11, -10,  -9,  -8,  -7,  -6,  -5,  -4,  -3,
        -2,  -1,   0,   1,   2,   3,   4,   5,   6,   7,   8,   9,  10])
```

In [6]:
```
nd=np.array(nd+5)
nd
```

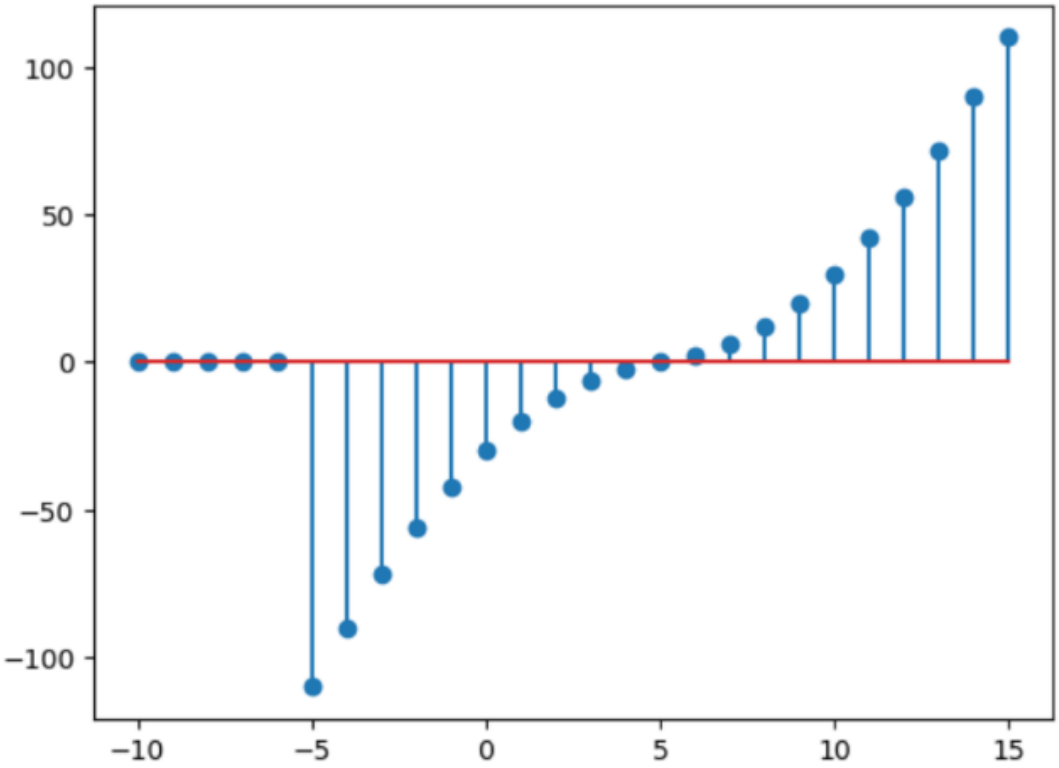
Out[6]:
```
array([-10,  -9,  -8,  -7,  -6,  -5,  -4,  -3,  -2,  -1,   0,   1,   2,
         3,   4,   5,   6,   7,   8,   9,  10,  11,  12,  13,  14,  15])
```

In [7]:
```
xnd=xn[0:xn.size-5]
xnd
```

Out[7]:
```
array([   0,    0,    0,    0,    0, -110,  -90,  -72,  -56,  -42,  -30,
       -20,  -12,   -6,   -2,    0,    2,    6,   12,   20,   30,   42,
        56,   72,   90,  110])
```

In [8]:
```
plt.stem(nd,xnd)
plt.show
```

Out[8]:
```
<function matplotlib.pyplot.show(close=None, block=None)>
```



Advance

In [9]:
```
na=n[5:]
na
```

Out[9]:
```
array([-10,  -9,  -8,  -7,  -6,  -5,  -4,  -3,  -2,  -1,   0,   1,   2,
         3,   4,   5,   6,   7,   8,   9,  10,  11,  12,  13,  14,  15])
```

In [10]:
```
na=np.array(na-5)
na
```

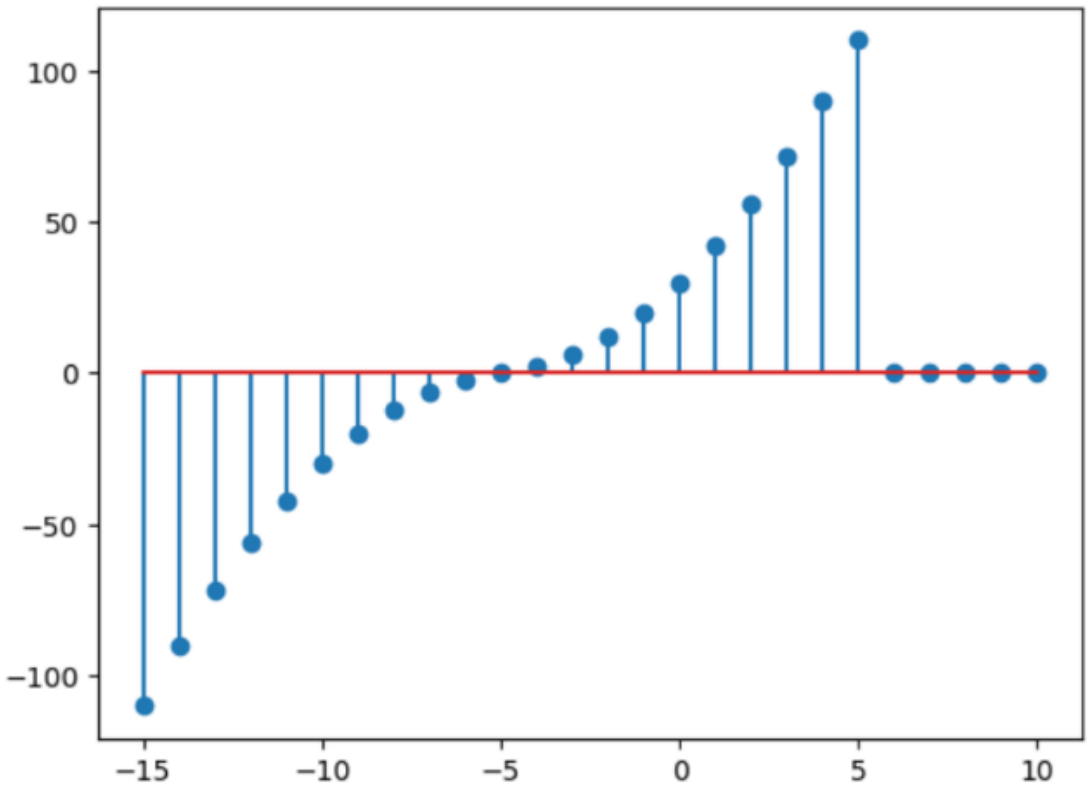
Out[10]:
```
array([-15, -14, -13, -12, -11, -10,  -9,  -8,  -7,  -6,  -5,  -4,  -3,
        -2,  -1,   0,   1,   2,   3,   4,   5,   6,   7,   8,   9,  10])
```

In [11]:
```
xna=xn[5:]
xna
```

Out[11]:
```
array([-110,  -90,  -72,  -56,  -42,  -30,  -20,  -12,   -6,   -2,    0,
          2,    6,   12,   20,   30,   42,   56,   72,   90,  110,    0,
          0,    0,    0,    0])
```

In [12]:
```
plt.stem(na,xna)
plt.show
```

Out[12]:
```
<function matplotlib.pyplot.show(close=None, block=None)>
```



Final Result:

```
In [13]: for i in range(5):
             xnd=np.insert(xnd,0,0)
         xnd

Out[13]: array([   0,    0,    0,    0,    0,    0,    0,    0,    0,    0, -110,
                 -90,  -72,  -56,  -42,  -30,  -20,  -12,   -6,   -2,    0,    2,
                   6,   12,   20,   30,   42,   56,   72,   90,  110])

In [14]: for i in range(5):
             xna=np.append(xna,0)
         xna

Out[14]: array([-110,  -90,  -72,  -56,  -42,  -30,  -20,  -12,   -6,   -2,    0,
                   2,    6,   12,   20,   30,   42,   56,   72,   90,  110,    0,
                   0,    0,    0,    0,    0,    0,    0,    0,    0])

In [15]: y=xna*xnd*4
         y

Out[15]: array([    0,     0,     0,     0,     0,     0,     0,     0,     0,
                    0,     0,  -720, -1728, -2688, -3360, -3600, -3360, -2688,
                -1728,  -720,     0,     0,     0,     0,     0,     0,     0,
                    0,     0,     0,     0])

In [16]: plt.stem(n*-1,y)

Out[16]: <StemContainer object of 3 artists>
```