**Experiment No: 05**

**Experiment Name:** Experimental Study of Practical Application of Causal, Non-causal and Anti causal Signals

**Theory:** The fascinating ideas of causal, non-causal, and anti-causal signals are all included in signal processing and analysis, and each has unique ramifications for comprehending signal behavior. Causal signals display a logical sequence, replicating cause-and-effect interactions since the current and future values are exclusively dependent on the previous values. Numerous systems in the real world, including dynamic systems and natural processes, use this core idea.

Non-causal signals, on the other hand, incorporate dependence on both past and future values, defying conventional causality. They are important in specialized mathematical contexts and abstract signal processing even though they are less understandable. Theorists are intrigued by anticausal signals, a reversal of causality, as they predict future values based on current and previous events. They make a contribution to theoretical frameworks and specific mathematical formulations, yet being difficult to encounter physically.

**Code:**

**Code for Causal Signal:**

```
clear all
clc

x=[1 2 3]
len=length(x)

X=0;
z=sym('z');
for i=0:len-1
   X=X+x(i+1).*z^(-i);
end

disp('z transform');
disp(X);


t=-10:1:10;
p=100*(t<0)+100*(t>0)

plot(t,p);
```

**Code for Anti-Causal Signal:**

```
clear all
clc

x=[1 2 3]
len=length(x)

X=0;
z=sym('z');
for i=0:len-1
   X=X+x(i+1).*z^(i);
end

disp('z transform');
disp(X);

t=-10:1:10;
p=100*(t<10)+100*(t<10);

plot(t,p);
```

**Code for Non-Causal Signal:**

```
clear all
clc
x=[1 2 3 4 5]
%x=input('Enter signal: ')

len=length(x)
index=input('Enter zeroth index: ')
X=0;
z=sym('z');

for i=0:len-index
   X=X+x(index+i).*z^(-i);
end
%disp(X);
for i=1:index-1
   X=X+x(i).*z^(index-i);
end

disp('z transform');
disp(X);
```

```
t=-15:1:15;
p=15*(t<0)+15*(t>0&t<15)

plot(t,p);



%z=-5:5;
%plot(z,X);
```

**Output:**

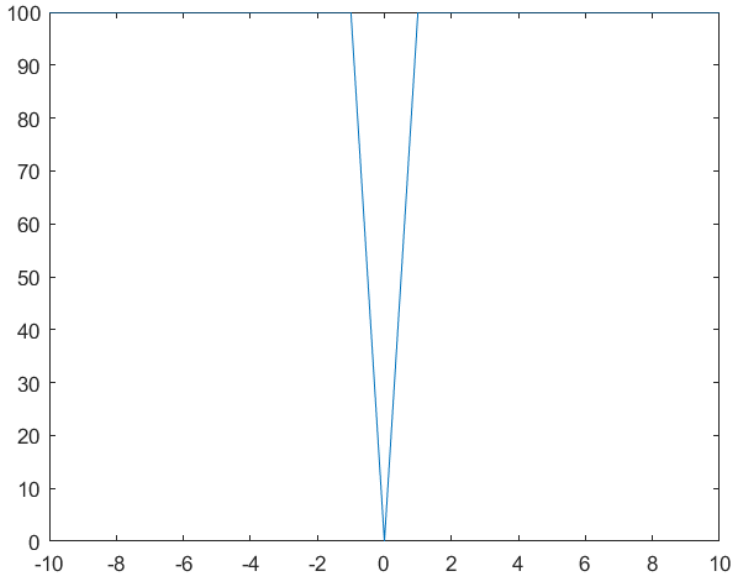


**Fig. 1**: Output for Causal Signal

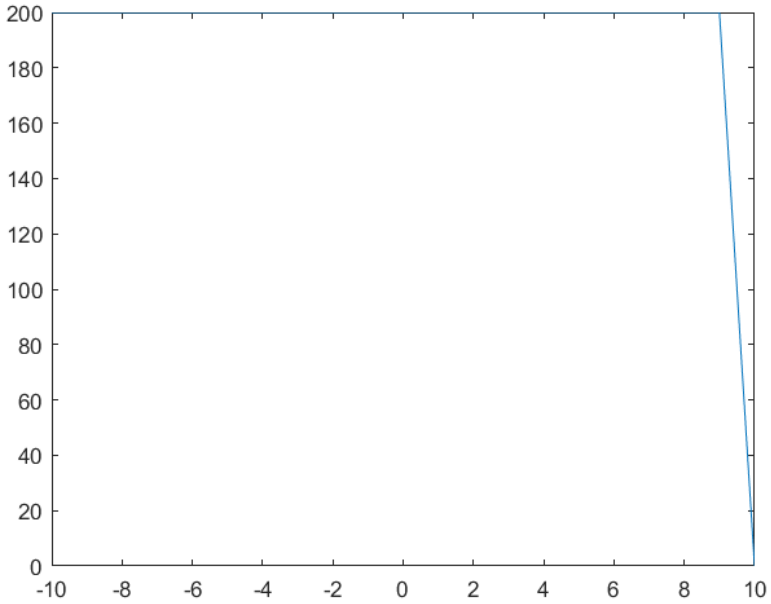


**Fig. 2**: Output for Anti-Causal Signal

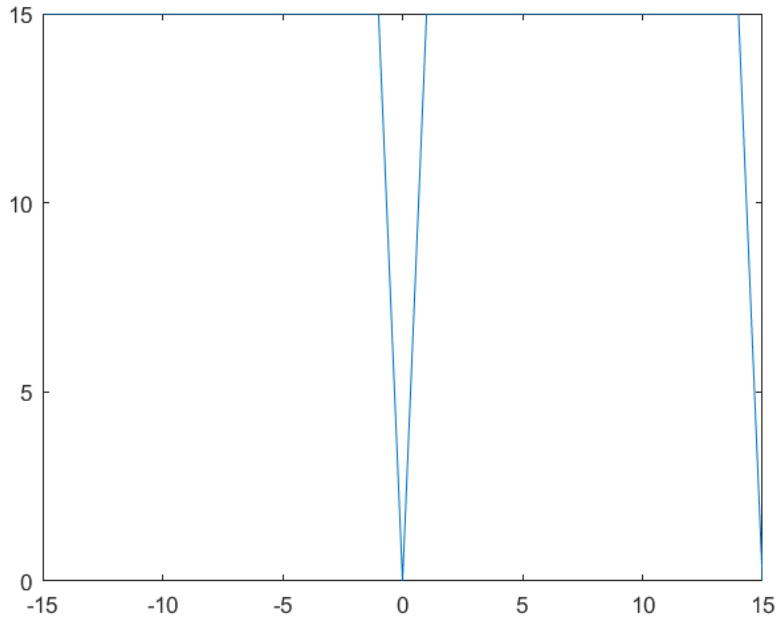


**Fig. 3**: Output for Non-Causal Signal

**Discussion & Conclusion**:

The provided code segments serve as examples of causal, anti-causal, and non-causal signals' features. The z-transform is used by the Causal Signal code to examine a signal's behavior in the past. This is demonstrated with a step function, which has a value of 100 for instances of positive time. The Anti-Causal Signal code investigates signals that depend on future values, on the other hand. This behavior is shown via the z-transform, with a step function showing 100 for instances of positive time. The Non-Causal Signal code analyzes a signal that is affected by both the past and the future. This is shown by the z-transform, which displays a step function with a value of 15 for instances of positive time.