2016200106021
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Q1:

Write a MATLAB program to compute the first L samples of the inverse of rational Z-transforms where the value of L is provided by the user through the command input. Using this program to compute and plot the first 50 samples of the inverse of following $G(z)$. Use the command stem for plotting the sequence generated by the inverse transform.

$$G(z) = -2 + \frac{10}{4+z^{-1}} - \frac{8}{2+z^{-1}}, |z| > 0.5$$

Code:

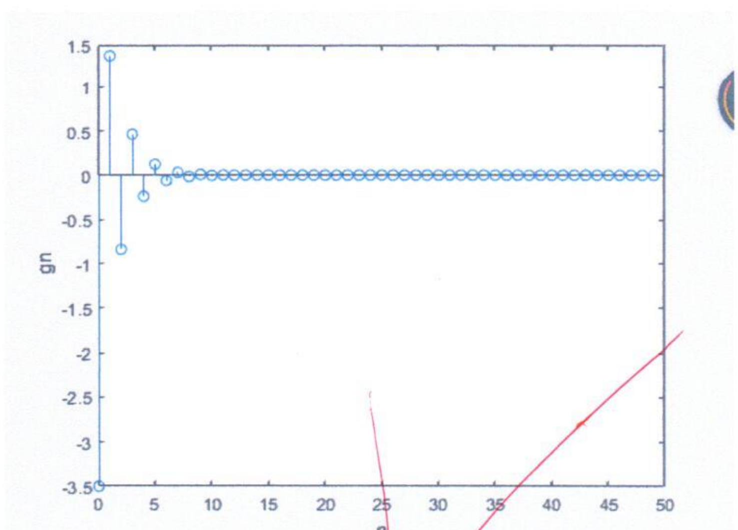
Firstly, convert G(z) into rational form (-28-10Z^-1-2Z^-2)/(8+6Z^-1+Z-2)

```
num=[-28 -10 -2];
den=[8 6 1];
L = input('Number of L = ')
n=[0:L-1];
x=[1 zeros(1,L-1)];
y=filter(num,den,x); stem(n,y)
xlabel('n'),ylabel('gn');
Number of L = 50

L =

    50
```

Result:



Q2:

Generate and plot a sequence

$$x[n] = \sin(\frac{5\pi}{16}n)$$

with $0 \le n \le 50$. Compute the energy of the sequence.

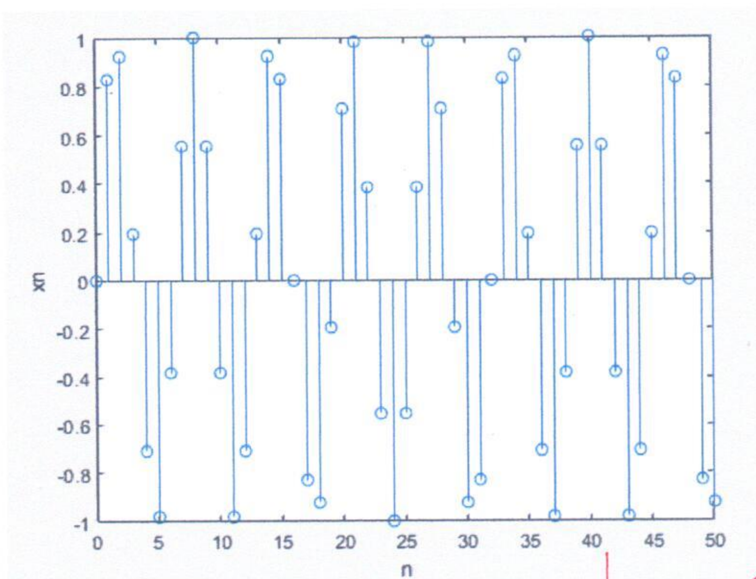
Code:

```
n=[0:50];
x=sin(5*pi*n/16);
stem(n,x)
xlabel('n'),ylabel('xn');
E=sum(power(abs(x),2))

E =

    25.5449
```

Result:



Q3:

Writing a MATLAB program to compute the circular convolution of two length-N sequences via the DFT-based approach. Using this program to determine the following pair of sequences:

$$g[n] = \{7,4,-9,0,2,-5\},\ h[n] = \{1,-1,2,0,10,5\} \text{ or}$$

$$g[n] = e^{j\pi n/4},\ h[n] = 2^n\ 0 \le n \le 15$$

and plot the result sequence.

Code:

1.

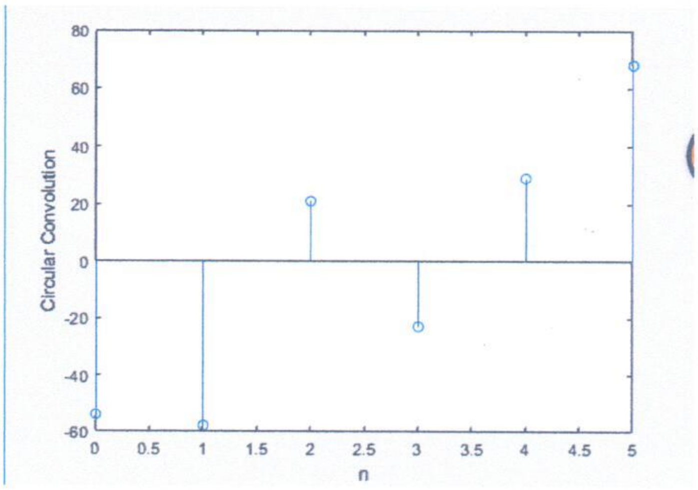
```
n=[0:5];
g=[7 4 -9 0 2 -5];
h=[1 -1 2 0 10 5];
G=fft(g);
H=fft(h);
C=G.*H;
c=ifft(C);
stem(n,c);
xlabel('n'); ylabel('Circular Convolution')
```

2.

```
n=[0:15];
g=exp(j*pi*n/4);
h=power(2,n);
G=fft(g);
H=fft(h);
C=G.*H;
c=ifft(C);
subplot(1,2,1);
stem(n,real(c));
xlabel('n'); ylabel('Circular Convolution Real')
subplot(1,2,2);
stem(n,imag(c));
xlabel('n'); ylabel('Circular Convolution Imag')
```

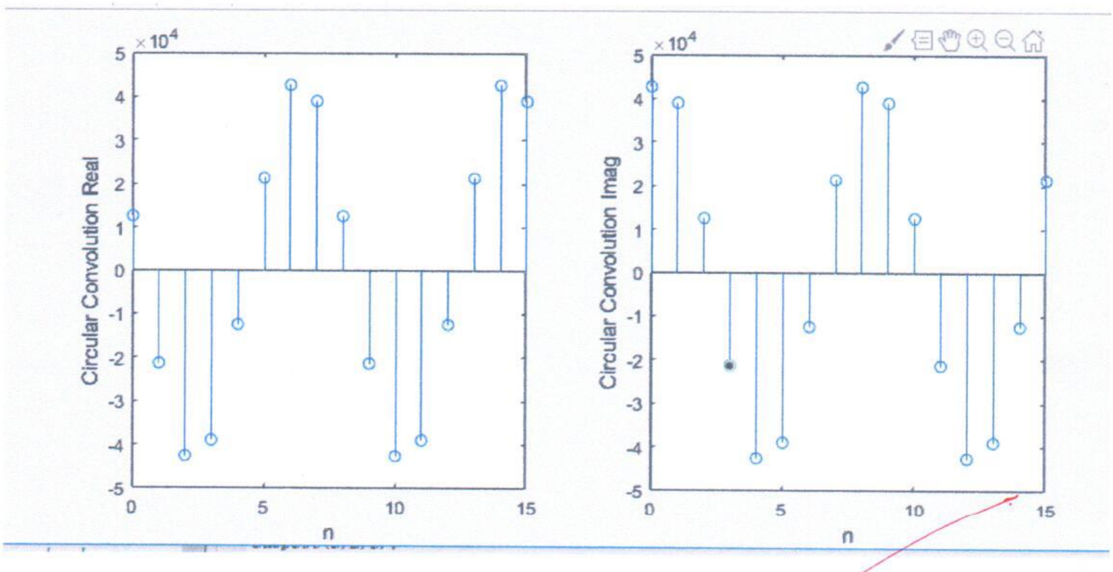
Result:

1.



Circular Convolution
n

2.



× 10^4
Circular Convolution Real
n
× 10^4
Circular Convolution Imag
n

Q4:

Write a MATLAB program to compute and plot the response of input as

$$x[n] = \cos(0.2 * \pi * n)$$

and a causal finite-dimensional discrete-time system characterized by a difference equation of the following form:

$$y[n] + 0.3 * y[n-1] + 0.5 * y[n-2] - 0.72 * y[n-3] =$$
$$1.8 * x[n] + 0.34 * x[n-1] - 1.32 * x[n-2] - 0.86 * x[n-3]$$

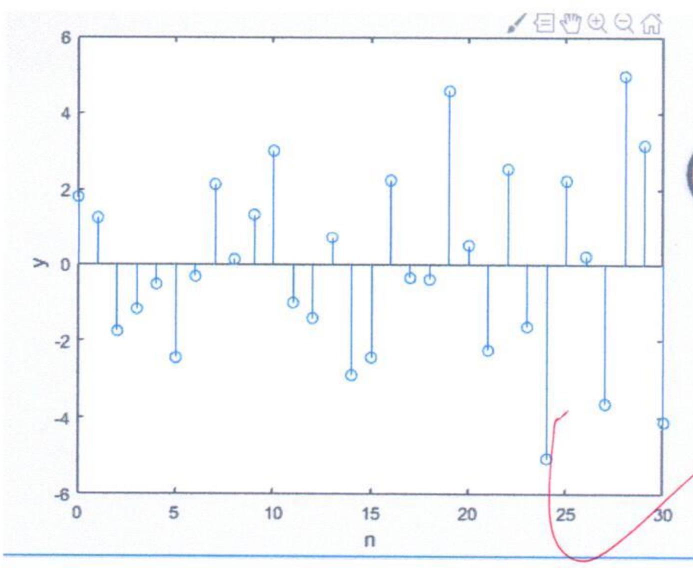
Generate and plot the first 31 samples of the sinusoidal response of the system.

Code:

From the difference equation of this system, the system's response is found to has denominator coefficients: [1 0.3 0.5 -0.72] and nominator coefficients [1.8 0.34 -1.32 -0.86];

```
n=[0:30];
den=[1 0.3 0.5 -0.72];
num=[1.8 0.34 -1.32 -0.86];
x=cos(0.2*pi*n);
y=filter(num,den,x);
stem(n,y);
xlabel('n'); ylabel('y')
```

Result:



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