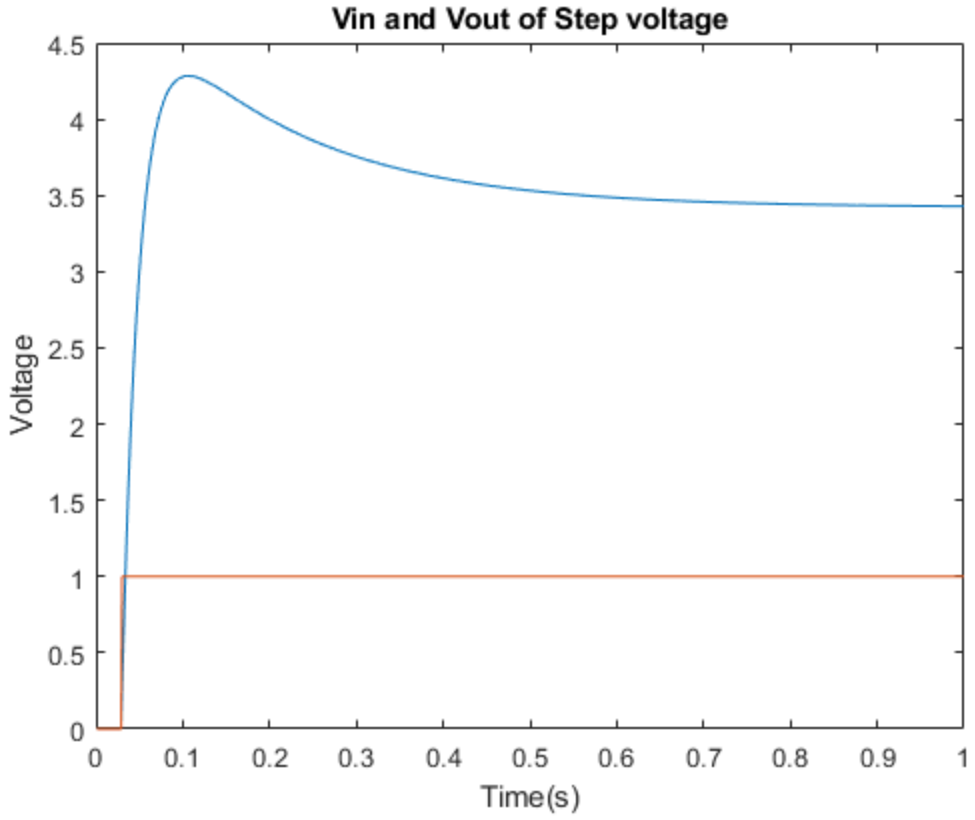
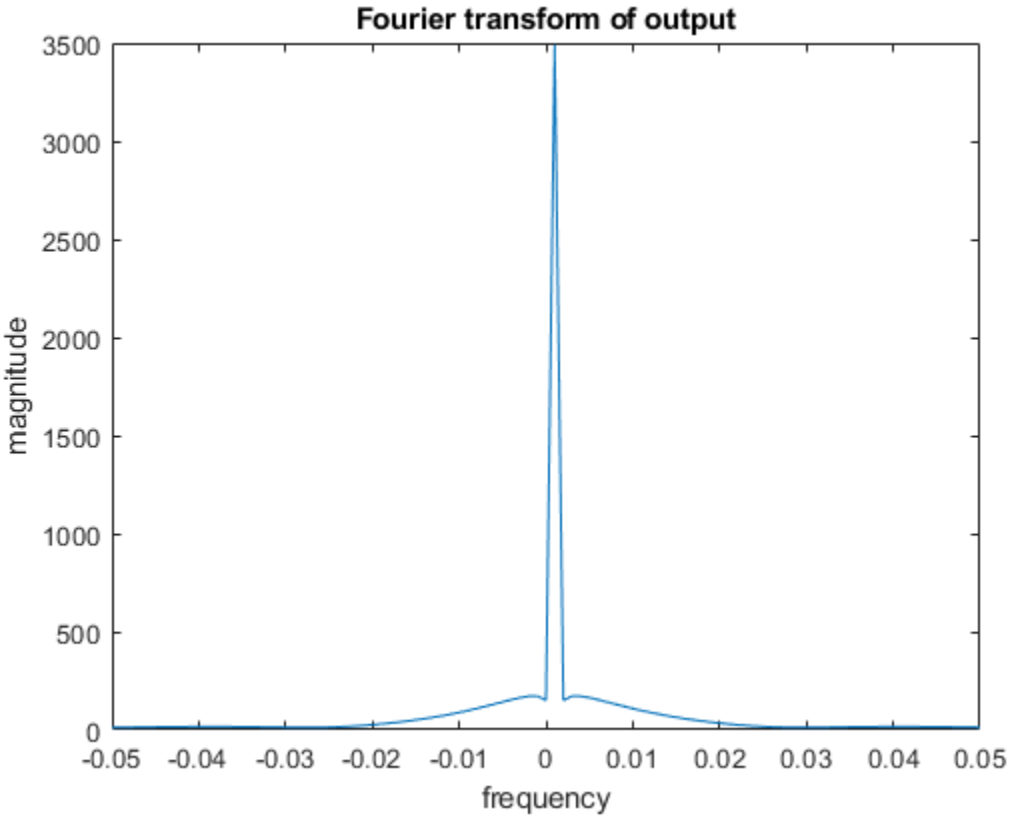
```
clear all

disp('model the equation V4 - aI3 - BI3^2 -CI3^3 as a polynomial and
 solve for it')
disp('This would require a solve for the polynomial per iteration as
 V4 changes')

runTime = 1; %given in seconds
timecuts = 1000;
dt =runTime/timecuts;

R1=1;
C1=0.25;
R2=2;
L1=0.2;
R3=10;
a=100;
b=50;
c=1;
R4=0.1;
Ro=1000;

C = [  0, 0,   0, 0, 0, 0, 0; ...
     -C1,C1,   0, 0, 0, 0, 0; ...
       0, 0, -L1, 0, 0, 0, 0; ...
       0, 0,   0, 0, 0, 0, 0; ...
       0, 0,   0, 0, 0, 0, 0; ...
       0, 0,   0, 0, 0, 0, 0; ...
       0, 0,   0, 0, 0, 0, 0];



I3poly = [c b a 0];
I3roots = roots(I3poly);


G = [     1,             0,  0,    0,                  0,     0,
      0; ...
      -1/R1, (1/R2 + 1/R1), -1,    0,                  0,     0,
      0; ...
          0,             1,  0,   -1,                  0,     0,
      0; ...
          0,             0, -1, 1/R3,                  0,     0,
      0; ...
          0,             0,  0,    0,         I3roots(2),     1,
      0; ...
          0,             0,  0, 1/R3,                 -1,     0,
      0; ...
          0,             0,  0,    0,                  0, -1/R4, (1/R4
 +1/Ro)];
```

```
%Time Stepping function
V1 = 0;
F = zeros(7,1);
%Flist = [V1; 0; 0; 0; 0; 0; 0];
Flist = zeros(7,1,timecuts);
Flist(1,1,30:timecuts) = 1;
Vlist = zeros(7,1,timecuts);

for count  = 2:1:timecuts
    A = C/dt +G;

    Vlist(:,:,count) = A\(C*Vlist(:,:,count-1)/dt +Flist(:,:,count));
    Flist(:,:,count) = Vlist(:,:,count);
end

V1list(1,:) = Vlist(1,1,:);
V2list(1,:) = Vlist(2,1,:);
ILlist(1,:) = Vlist(3,1,:);
I3list(1,:) = Vlist(4,1,:);
V4list(1,:) = Vlist(5,1,:);
Volist(1,:) = Vlist(7,1,:);


figure(1)
plot((1:timecuts).*dt,Volist(1,:))
xlabel('Time(s)')
ylabel('Voltage')
title('Vin and Vout of Step voltage')
hold on
plot((1:timecuts).*dt,V1list(1,:))
hold off

figure(2)
g = abs(fftshift(fft(Volist(1,:))));
plot(((1:length(g))/timecuts)-0.5,g)
xlim([-0.05 0.05])
xlabel('frequency')
ylabel('magnitude')
title('Fourier transform of output')

model the equation V4 - aI3 - BI3^2 -CI3^3 as a polynomial and solve
 for it
This would require a solve for the polynomial per iteration as V4
 changes
```


Vin and Vout of Step voltage
Voltage
Time(s)
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9


Fourier transform of output
magnitude
frequency
0
500
1000
1500
2000
2500
3000
3500
-0.05
-0.04
-0.03
-0.02
-0.01
0.01
0.02
0.03
0.04
0.05

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