

W6

Name: Mohammed AL Shuaili

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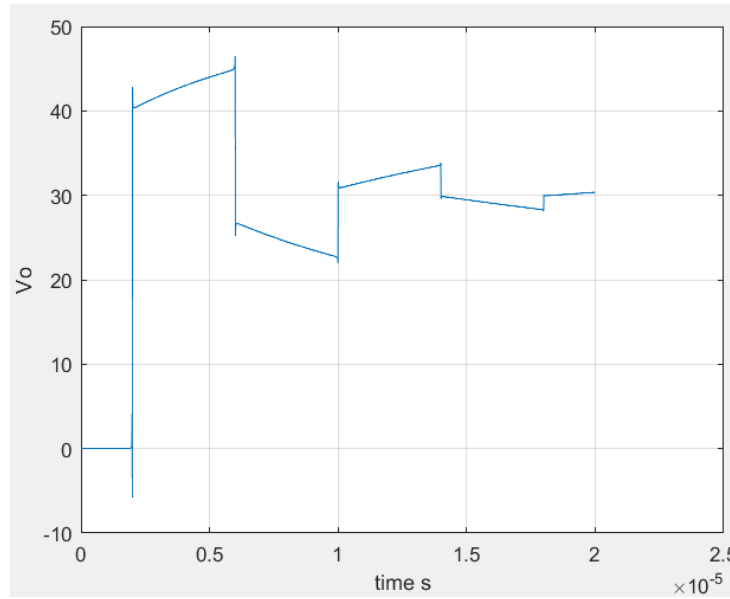
Consider the exact solution that is:

$$Y(s) = \frac{1}{\cosh\left(l\sqrt{(R+sC)(G+sC)}\right)}$$

Consider the following values for the impedance and an input of 30 volts:

$$R = 0.1, C = 10^{-10}, L = 2.5 \cdot 10^{-7}, l = 400, G = 0, v_{in} = 30$$

The unit step response looks as follows:



we can generate Y parameter models out of this, consider 100 points for $f = 9000$ until $9e5$. And 100 points for the output TL.

To simplify this, consider 2 models of Y parameters and follow the same steps for as many Y models.

1. Y_1 = generated from the first 50 pints.
2. evaluate Y_1 at the last 50 points (w_1).
3. subtract the obtain values from the exact given value at (w_1) (i. e, $Y_1(w_1) - exact(w_1)$).
4. use the results to obtain Y_2 ans so on.

The following code will implement this.

```

clear
clc
f = 9e5;
f = linspace(0,f,100+1);
w = 2*pi*f(2:end);
s = i *w;
vo =1./((cosh(400.*(0 + 1e-10.*s).^(1/2)).*(0.1 + 2.5e-7.*s).^(1/2)));
N=1; % number of section basicly 100/N
H_total = @(s)0;
section_size = ceil(length(vo)/N); % Points per section (except last)
for i = 1:N
    start_idx = (i-1)*section_size + 1;
    end_idx = min(i*section_size, length(w));
    seg_idx = start_idx:end_idx;
    w_i = w(seg_idx);
    s_i = 1i * w_i;
    vo_i = vo(seg_idx);
    H_prev_eval = H_total(s_i);

    % Calculate residual response
    vo_residual = vo_i - H_prev_eval;

    % Fit new model to residual
    Hi = generate_yp2(real(vo_residual), imag(vo_residual), w_i);

    % Add to total transfer function
    H_total = @(s) H_total(s) + Hi(s);
end
H = @(s) H_total(s) * 30 ./ s;
v =@(s)30./(s.*cosh(400.*(0 + 1e-10.*s).^(1/2)).*(0.1 + 2.5e-7.*s).^(1/2)));
[y,t]=niltcv(H,50e-6,'pt1');
[y1,t1]=niltcv(v,50e-6,'pt1');
RMSE = sqrt(sum((y-y1).^2)/length(y1));
plot(t,y,t1,y1)
grid on
xlabel('time s')
ylabel('Vo')
legend('approximated','exact');

```

N (number of Y models)	RMSE
1	25.5234
2	27.8445
3	4.9876
4	1.8179
5	8.3383
6	3.6791
7	3.1194
8	3.5229
9	1.6736
10	4.9612
11	Code error

