W6

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Consider the exact solution that is:

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

The unit step response looks as follows:

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AI-generated content may be incorrect.

we can generate Y parameter models out of this, consider 100 points for 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.

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 |

A graph on a white surface

AI-generated content may be incorrect.A graph of a graph

AI-generated content may be incorrect.

A graph with blue and red lines

AI-generated content may be incorrect.