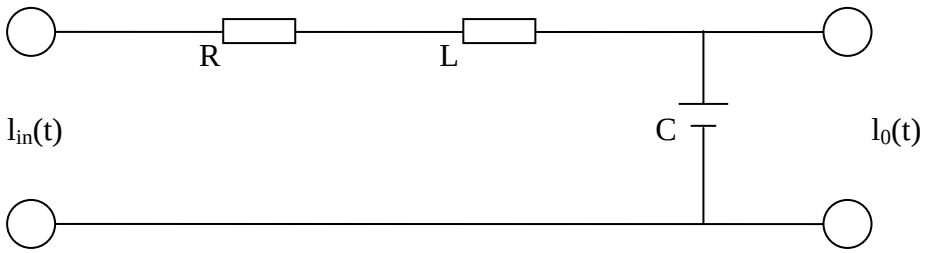
Home Work 3



Define

$l_{in}(0) = 0$

$R = 5$

$L = 0.1$

$C = 10^{-3}$

$l_{in}(t) = (10 \pm 0.25)\sin(100 \pm 1)t$

$t = 0, \Delta, 2\Delta, ..., N\Delta = 10$

$\Delta = 0.01$

Find $l_0(t)$

Step 1 : หา $E(l_0(t))$

Step 2 : หา *Tolerance* ด้วยวิธี Worst case

Step 3 : $E[l_o(t)] \pm Tolerance$

<u>Step 1 : หา $E(l_0(t))$</u>

$$\begin{bmatrix} b & c & ... & 0 \\ a & b & c & ... \\ ... & ... & ... & ... \\ 0 & ... & a & b \end{bmatrix} \begin{bmatrix} l_0(0) \\ l_0(0.01) \\ ... \\ l_0(10) \end{bmatrix} = \begin{bmatrix} A\sin\varpi t \approx \bar{A}\sin\bar{\varpi}t \\ ... \\ ... \\ A\sin\varpi t \approx \bar{A}\sin\bar{\varpi}t \end{bmatrix}$$

$$\underbrace{\left(\frac{LC}{\Delta^2} - \frac{RC}{2\Delta}\right)}_{a} l_0(t-\Delta) + \underbrace{(1 - \frac{2LC}{\Delta^2})}_{b} l_0(t) + \underbrace{\left(\frac{LC}{\Delta^2} + \frac{RC}{2\Delta}\right)}_{c} l_0(t+\Delta) \approx l_{in}(t)$$

$$A\sin\varpi t \approx \bar{A}\sin\bar{\varpi}t \pm \underbrace{\left[\left|\sin\bar{\varpi}t\right|\delta_A + \left|\bar{A}\cos\bar{\varpi}t\right|\delta_{\varpi}\right]}$$

ใช้ใน Step 2

Step 2 : หา *Tolerance* ด้วยวิธี Worst case

$$\begin{bmatrix} Tolerance0 \\ \dots \\ \dots \\ ToleranceN \end{bmatrix} = \underbrace{\left|\begin{bmatrix} b & c & \dots & 0 \\ a & b & c & \dots \\ \dots & \dots & \dots & \dots \\ 0 & \dots & a & b \end{bmatrix}^{-1}\right|}_{\left|A^{-1}\right|} \underbrace{\left|\begin{bmatrix} \left[\left|\sin\bar{\varpi}t\right|\delta_A + \left|\bar{A}\cos\bar{\varpi}t\right|\delta_{\varpi}\right] \\ \dots \\ \dots \\ \left[\left|\sin\bar{\varpi}t\right|\delta_A + \left|\bar{A}\cos\bar{\varpi}t\right|\delta_{\varpi}\right] \end{bmatrix}\right|}_{Interval}$$

Step 3 : $\overline{E[l_o(t)] \pm Tolerance}$

$$\begin{bmatrix} l_0(0) \\ l_0(0.01) \\ \dots \\ l_0(10) \end{bmatrix} \pm \begin{bmatrix} Tolerance0 \\ \dots \\ \dots \\ ToleranceN \end{bmatrix}$$

(ตรวจสอบคำตอบได้จาก HW3.m ใน http://beam.to/statistics)**

Algorithm in Matlab

```
clear;
n=1001;
tic;
a=sparse(n,n);
for i=1:n
   a(i,i)=1-2*0.1*10^(-3)/(0.01^2);
   if i<n
      a(i,i+1)=(0.1*10^(-3)/0.01^2)+(5*10^(-3)/(2*0.01));
   end
   if i>1
      a(i,i-1)=(0.1*10^(-3)/0.01^2)-(5*10^(-3)/(2*0.01));
   end
end
b=zeros(n,1);
c=zeros(n,1);
for i=0:(n-1)
   b(i+1)=10*sin(100*0.01*i);
   c(i+1)=abs(sin(100*0.01*i))*0.25+abs(10*cos(100*0.01*i)*1);
end
b(i+1)=0;
toc
tic;
x=a\b;
toc
tic
w=abs(inv(a));
y=w*c;
lowerl0=x-y;
upperl0=x+y;
toc
```