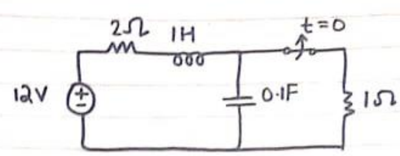
Name: Manaal Waseem Reg. No: FA18-BCE-074

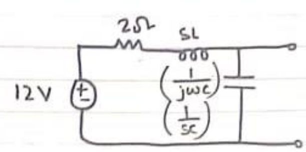
Lab 12

Task 1:

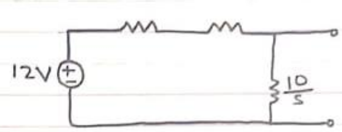
Solution of Circuit:

LAB TASK 1

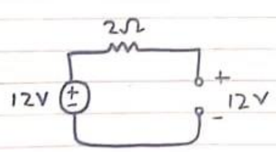




'Initially'



'Transition Phase'



'End Result'

As in the transition phase the equivalent circuit is a normal series circuit, the current through the circuit is given by:

$$I = \frac{V}{R} = \frac{12}{2 + s + \frac{10}{s}}$$

$$= \frac{12}{s\left(\frac{2}{s}\right)+\frac{s(s)}{s}+\frac{10}{s}}$$

$$= \frac{12s}{s^2+2s+10}$$

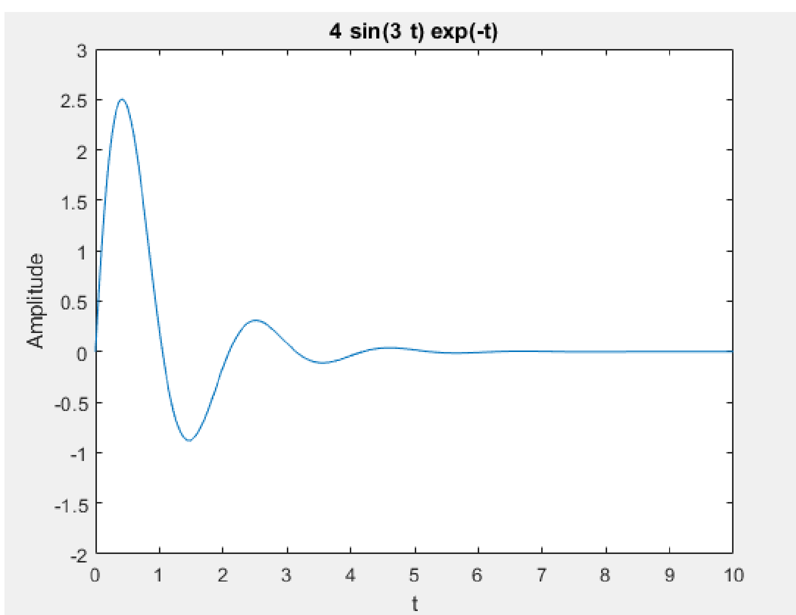
(b) As answer of energy is infinity hence the system is BIBO unstable.

Code:

```
syms t s
Vi=12;
V=laplace(Vi,s);
I=V/(2+s+10./s);
Io=ilaplace(I,t);
ezplot(Io,[0 10]);  %plots the expression over the default domain
ylim([-2 3])
xlabel('t')
ylabel('Amplitude')

E=int(abs(Vi).^2,t,0,inf);
```

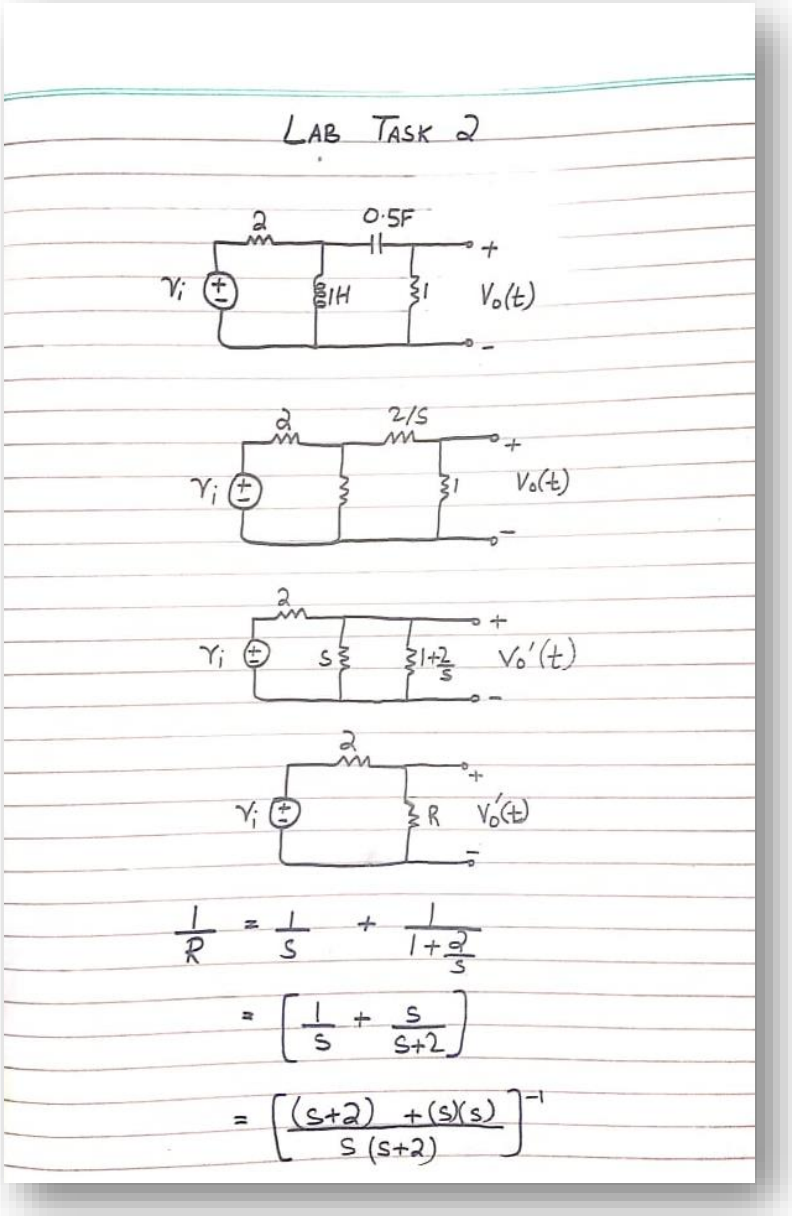
Graph:



System is BIBO Unstable.

Task 2:

Solution of Circuit:



LAB TASK 2

$$\frac{1}{R} = \frac{1}{S} + \frac{1}{1+\frac{2}{S}}$$

$$= \left[\frac{1}{S} + \frac{S}{S+2}\right]$$

$$= \left[\frac{(S+2) + (S)(S)}{S(S+2)}\right]^{-1}$$

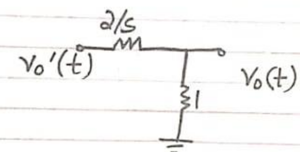
$$= \left[\frac{s+2+s^2}{s^2+2s}\right]^{-1}$$

$$= \left[\frac{s(s+2)}{s^2+s+2}\right]$$

Now, solving this series circuit to get the output voltage;

$$V_o'(t) = V_i\left[\frac{s(s+2)}{s^2+s+2}\times\frac{1}{2}\right]$$

$$= V_i\left[\frac{s(s+2)}{2s^2+2s+4}\right]$$



So now for $V_o(t)$;

$$V_o(t) = V_o'(t)\times\frac{1}{1+2/s}$$

$$= V_o'(t)\times\frac{s}{s+2}$$

$$= V_i\left[\frac{s(\cancel{s+2})}{2s^2+2s+4}\right]\times\frac{s}{\cancel{(s+2)}}$$

$$= V_i\,\frac{s^2}{2s^2+2s+4}$$

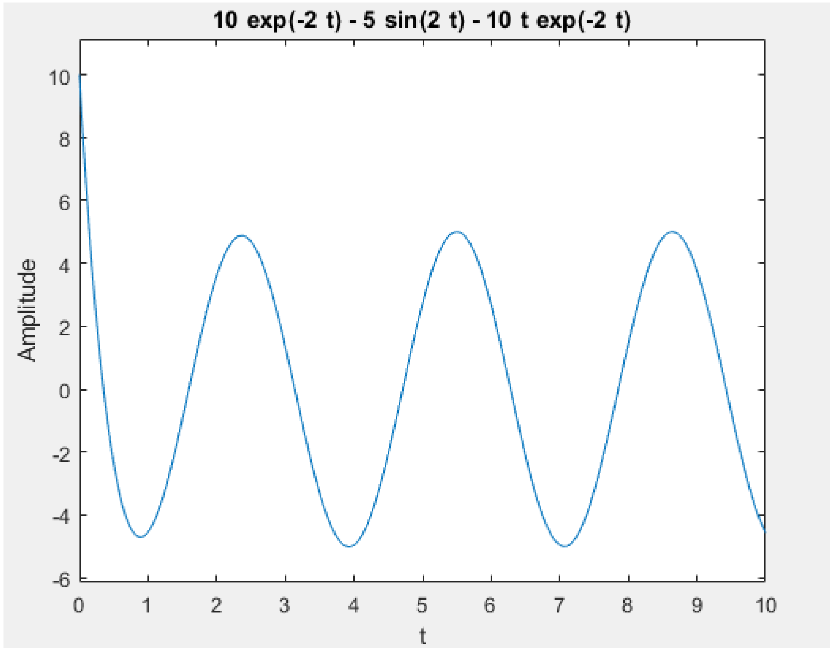
(b) As answer of energy is infinity, the system is BIBO unstable.

Code:

```
syms t s
input=10.*cos(2.*t).*heaviside(t);
lapin=laplace(input,s);
output=lapin.*((s.^2)./(s+2).^2);
vout=ilaplace(output,t);
ezplot(vout,[0 10])  %plots the expression over the default domain
xlabel('t')
ylabel('Amplitude')

E = sum(int(abs(vout).^2,t,-inf,inf));
```

Graph:



System is BIBO Unstable.

Critical Analysis:

In this lab I learnt:

- How to use Laplace command to solve circuit on MATLAB.
- Furthermore, we learnt to determine stability of the system.

THE END