EGE UNIVERSITY
ELECTRICAL AND ELECTRONICS ENGINEERING

CONTROL SYSTEMS 1

LAB-1

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Editor - C:\Users\Musa OĞURAL\Documents\MATLAB\c_lab1.m

c_lab1.m

```
% musa ogural
% 05190000739
% Control lab-1 31.03.2021

clc;clear;close all;

%1.ornek
syms t a b w s
f=dirac(t)+2*heaviside(t-3)+a*t^2+exp(-5*t)+b*t*sin(w*t);
F=laplace(f)

%2.ornek
F=(11*s+28)/((s+2)^2*(s+5));
f=ilaplace(F)

num=[11 28];
den=conv([1 5],conv([1 2],[1 2]));
[X,Y,Z]=residue(num,den)

%3.ornek
t=0:0.01:10;
vt=7*exp(-t).*(cos(3*t)+sin(3*t)/3)-2;
plot(t,vt)
grid on
xlabel('t')
ylabel('capacitor voltage')
title('capacitor voltage vs time')
```

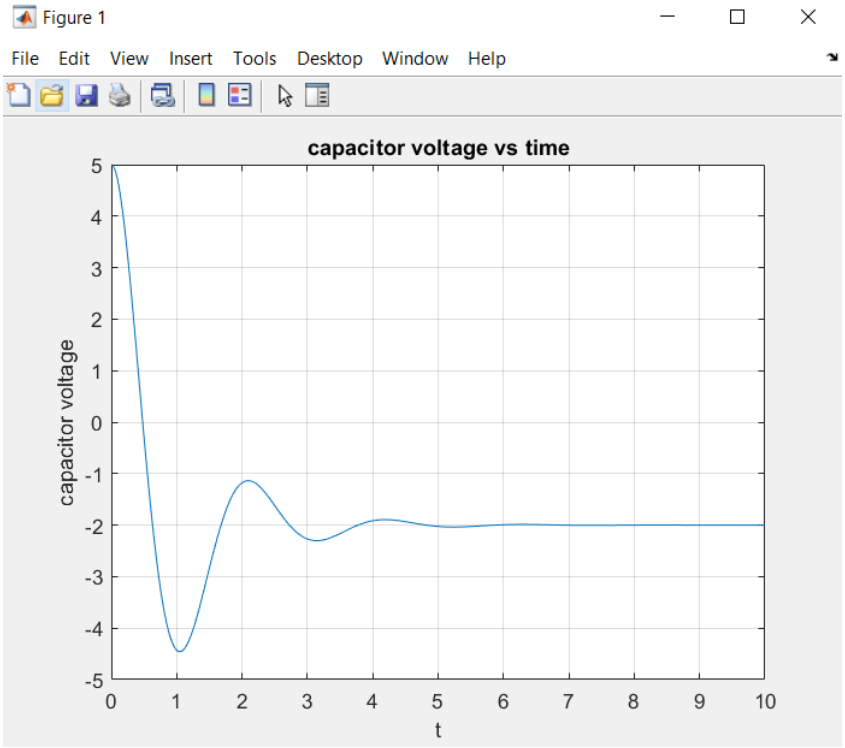
Command Window

```
F =

1/(s + 5) + (2*exp(-3*s))/s + (2*a)/s^3 + (2*b*s*w)/(s^2 + w^2)^2 + 1


f =

3*exp(-2*t) - 3*exp(-5*t) + 2*t*exp(-2*t)


X =

   -3.0000
    3.0000
    2.0000


Y =

   -5.0000
   -2.0000
   -2.0000


Z =

     []

fx >>
```

Workspace

Name	Value
a	1x1 sym
b	1x1 sym
den	[1,9,24,20]
f	1x1 sym
F	1x1 sym
num	[11,28]
s	1x1 sym
t	1x1001 double
vt	1x1001 double
w	1x1 sym
X	[-3.0000;3.0000;2...
Y	[-5.0000;-2.0000;...
Z	[ ]

UTF-8 | script | Ln 7 | Col 1



2-a) $F(s) = \dfrac{11s+28}{(s+2)^2(s+5)} = \dfrac{a}{s+5} + \dfrac{b}{s+2} + \dfrac{c}{(s+2)^2}$

$\dfrac{a}{(s+2)^2}$ $\dfrac{b}{(s+2)(s+5)}$ $\dfrac{c}{(s+5)}$

$11s+28 = a(s+2)^2 + b(s+2)(s+5) + c(s+5)$

$= s^2(\underbrace{a+b}_{0}) + s(\underbrace{4a+7b+c}_{11}) + \underbrace{4a+10b+5c}_{28}$

$a = -b$

$-4b+7b+c = 11$

$4a+10b+5c = 28$

$3b+c = 11$

$6b+5c = 28$

$c = 2$, $b = 3$, $a = -3$

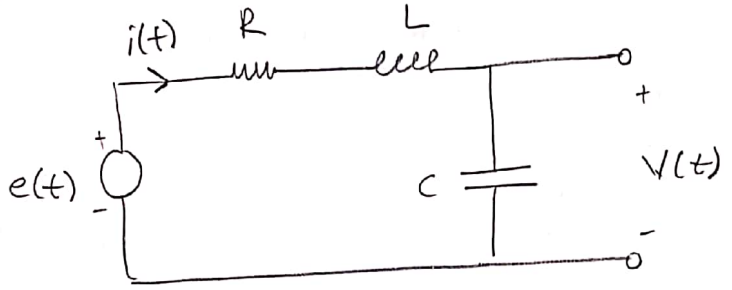
$F(s) = -\dfrac{3}{s+5} + \dfrac{3}{s+2} + \dfrac{2}{(s+2)^2}$

$f(t) = -3\exp(-5t) + 3\exp(-2t) + 2t\exp(-2t)$

2-c) $F(s) = \dfrac{-3}{s-(-5)} + \dfrac{3}{s-(-2)} + \dfrac{2}{(s-(-2))^2}$

$\dfrac{X}{s-Y} + Z$

3-



$e(t) = -2u(t)$

$V(0) = 5V$

$\dot{V}(0) = 0V$

$R1 = 1\Omega,\ L = 0.5H,\ C = 0.2f$

$$e(t) = R.i(t) + L.\frac{di(t)}{dt} + \frac{1}{C}\int i(t)dt$$

$$i(t) = C\frac{dV(t)}{dt}$$

$$\frac{1}{C}\int i(t)dt = V(t)$$

$$\text{output} \longrightarrow V(t) = \frac{1}{C}\int i(t)dt$$

$$i(t) = C.\frac{dV(t)}{dt}$$

$$\frac{di(t)}{dt} = C\frac{d^2V(t)}{dt^2}$$

$$-2u(t) = RC.\frac{dV(t)}{dt} + LC\frac{d^2V(t)}{dt^2} + V(t)$$

$$\frac{-2}{LC}u(t) = \frac{d^2V(t)}{dt^2} + \frac{R}{L}\frac{dV(t)}{dt} + \frac{1}{LC}V(t)$$

$$-20\,u(t) = \frac{d^2V(t)}{dt^2} + 2\frac{dV(t)}{dt} + 10\,V(t)$$

$$-\frac{20}{S} = \left[S^2V(S) - SV(0) - \dot{V}(0)\right] + 2\left[SV(S) - V(0)\right] + 10\,V(S)$$

$$-\frac{20}{S} = \left(S^2+2S+10\right).V(S) - S(5) - 10$$

$$V(S) = \frac{5S^2+10S-20}{S(S^2+2S+10)} \longrightarrow V(t) = 7\exp(-t)\left(\cos(3t)+\sin(3t)/3\right) - 2$$