**Department of Electrical Engineering**

**Faculty Member:**  **Kiran Liaqat Dated: 27/04/2021 **

**Semester: 2nd Section: BEE-12C **

**EE-211: Electric Network Analysis**

**Lab 9: Introduction to MATLAB and Transient Analysis Using MATLAB**

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| **PLO4/CLO4** | | **PLO5/CLO5** | **PLO8/CLO6** | **PLO9/CLO7** |
| **Name** | **Reg. No** | **Viva /Quiz / Lab Performance**  **5 marks** | **Analysis of data in Lab Report**  **5 marks** | **Modern Tool Usage**  **5 marks** | **Ethics and Safety**  **5 marks** | **Individual and Team Work**  **5 marks** |
| **Muhammad Umer** | **345834** |  |  |  |  |  |
| **Saad Bakhtiar** | **341150** |  |  |  |  |  |
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**Introduction:**

MATLAB is undoubtedly a very powerful tool for performing numerous tasks such as solving linear systems, signal processing, simulations, etc. A significant advantage of MATLAB over other alternatives is that it is relatively easy to learn and errors are easy to fix. Scripts are also optimized when performing heavy operations and thus, it is a must have software for an engineer.

**Objective:**

After performing this lab, students will be able to:

* Prove various transient analysis data through simulations
* Get familiar with the interface of MATLAB
* Create graphical scripts of RL and RC circuits
* Plot different graphs and use specifiers

**Equipment:**

* MATLAB

**Conduct of Lab**

The students are required to work in groups of three to four; each student must attempt to understand and use the laboratory set-up and conduct at least one or two parts of the requirement experimentation. The lab attendants and Lab Engineer will be available to assist the students.

In case some aspect of the lab experiment is not understood the students are advised to seek help from the teacher, the lab attendant or the assigned Lab Engineer (LE).

# Task # 1

For an R-L circuit, the voltage *v*(*t*) and current *i*(*t*) are given as

***v*(*t*)=10 cos(377*t*)**

***i*(*t*)=5 cos (377*t* + 600)**

**Code:**

t = 0: 0.0001: 20/1000;

v = 10\***cos**(377\*t);

i = 5\***cos**(377\*t + 60\* (pi/180));

plot(t,v,'-r')

hold **ON**

plot(t,i,'-b')

hold OFF

title('Voltage and Current of an RL Circuit')

xlabel('Time','fontsize',12);

ylabel('Voltage and Current','fontsize',12);

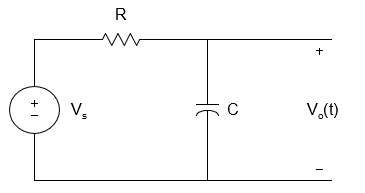
legend('Voltage','Current');

grid **on**;



# Task # 2

Assume that for **the following Figure**: *C* = 10 µF, Vs=10, use MATLAB to plot the voltage across the capacitor if *R* is equal to and **(a) 0.1 kΩ (b) 1.0 kΩ, (c) 10 kΩ**



**RC Circuit**

**Code:**

t = 0: 0.0001: 20/1000;

Vs = 10;

C = 10E-6;

subplot(3,1,1)

R1 = 100;

V = Vs \*(1- **exp**(-(t/(C\*R1))));

axis([0 0.02 0 15]) %(**for** R=100)

plot(t, V, '-b')

title('R = 100')

xlim([0 0.02])

ylim([0 15])

subplot(3,1,2)

R2 = 1000;

V = Vs \*(1- **exp**(-(t/(C\*R2))));

axis([0 0.02 0 15]) %(**for** R=1000)

plot(t, V, '-b')

title('R = 1000')

xlim([0 0.02])

ylim([0 15])

subplot(3,1,3) %%-- **for** 10000

R3 = 10000;

V = Vs \*(1- **exp**(-(t/(C\*R3))));

axis([0 0.02 0 15]) %(**for** R=1000)

plot(t, V, '-b')

title('R = 10000')

xlim([0 0.02])

ylim([0 4])

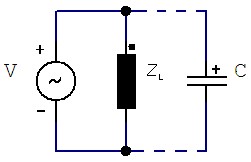






# Task # 3

An inductive load (motor) is connected in series to a 60 Hz - 220 VAC source and dissipates 5.4 kW with a power factor of 0.82. We have to calculate the capacitor that we have to connect in parallel to improve the factor to 0.96.



where

**VRMS = 220 V**

**f = 60 Hz**

**PF = 0.82**

**P = 5.4kW**

***Develop a simple code in MATLAB to find out how to correct the power factor in the system above.***

**Code:**

V = 220;

f = 60;

PF\_1 = 0.82;

PF\_2 = 0.92;

P = 5.4 \* 1000;

THETA\_1 = acos(PF\_1); % before capacitor

Q1 = P \* THETA\_1;

THETA\_2 = acos(PF\_2); % after capacitor

Q2 = P \* THETA\_2;

Qc = P\*(**tan**(THETA\_1) - **tan**(THETA\_2));

C = (Qc / ((2\*pi\*f) \* V^2));

C

