جامعة الموصل / كلية الهندسة

# قسم الهندسة الكهربائية

## Subject Title: Computer programming (برمجة الحاسوب)

## Subject Code: COMP 206

## Class 2:Power & Machine, Electronic & Communication

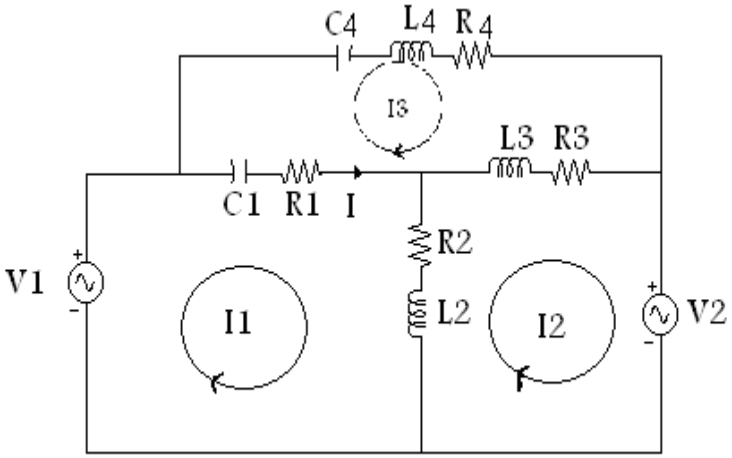
**Instructor : Nagham Hikmat Aziz**

# Course Description (15 weeks) or Outlines

- Introduction to MATLAB , Types of variables, numbers. Expressions.
- COMPLEX NUMBERS , ARRAY OPERATIONS, MATRIX OPERATIONS.
- Application of matrix , Solving set of linear equations.
- Control structures in MATLAB program.
- Plotting commands for 2-D Graphics.
- Function Files.
- Polynomials analysis.
- Solving equation by symbols.
- Numerical Integration.
- Transient Analysis .
- Frequency Response using matlab.

# Figures, Diagrams, or Examples…. etc

Ex: In the circuit shown in Fig(2), draw the current (I) with respect to time for three period of T.R1=5 Ω, R2=10 Ω, R3=6 Ω, R4=7 Ω, L2=1H, L3=3H, L4=0.002H, C1=100 Pico F, C4=1 micro F, V1=220 v, V2=300 v & phase 50, f=50 Hz.

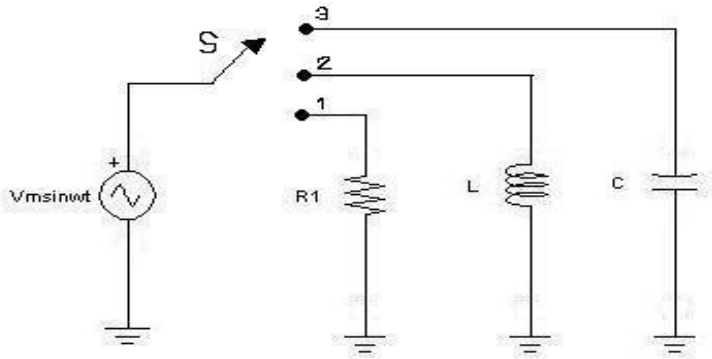



Solution:

```
clc;clear;clc;R1=5;R2=10;R3=6;R4=7;L2=1;L3=3;L4=0.002;C1=100e-6;C4=1e-6;f=50;
ph=50;T=1/f;w=2*pi*f;V1=220;V2=300*exp(j*ph*pi/180);
XC1=1/(w*C1*j);XC4=1/(w*C4*j);XL2=w*L2*j;XL3=w*L3*j;XL4=w*L4*j;
Z1=R1+XC1;Z2=R2+XL2;Z3=R3+XL3;Z4=R4+XL4+XC4;
A=[Z1+Z2 -Z2 -Z1;-Z2 Z2+Z3 -Z3;-Z1 -Z3 Z1+Z3+Z4];V=[V1;-V2;0];
Ic=inv(A)*V;I1=Ic(1);I2=Ic(2);I3=Ic(3);I=I1-I3;
I_mag=abs(I);I_ph=angle(I);
t=linspace(0,2*T);  %%generates a row vector of 100 points linearly spaced between and including 0 and 3T
Ip=I_mag*sin(w*t+I_ph);
I11=abs(I1)*sin(w*t+angle(I1));I22=abs(I2)*sin(w*t+angle(I2));I33=abs(I3)*sin(w*t+angle(I3));
subplot(1,2,2);
plot(t,I33,t,I11,t,I22);title('Current as a function of time');xlabel('time');ylabel('current');
%%% PHASE DIAGRAM%%%%%%%%
I111=[0 I1];I222=[0 I2];I333=[0 I3];
subplot(1,2,1);
plot(real(I111),imag(I111));hold on;plot(real(I222),imag(I222));plot(real(I333),imag(I333));
```

**Ex:** For the circuit shown:V=230v, f=50Hz, R=100Ω ,L=300mH,C=100μF , Using switch command, write a MATLAB program to:

- Find the current.
- Plot the voltage and current waveforms for two period using two subplots.




Solution:

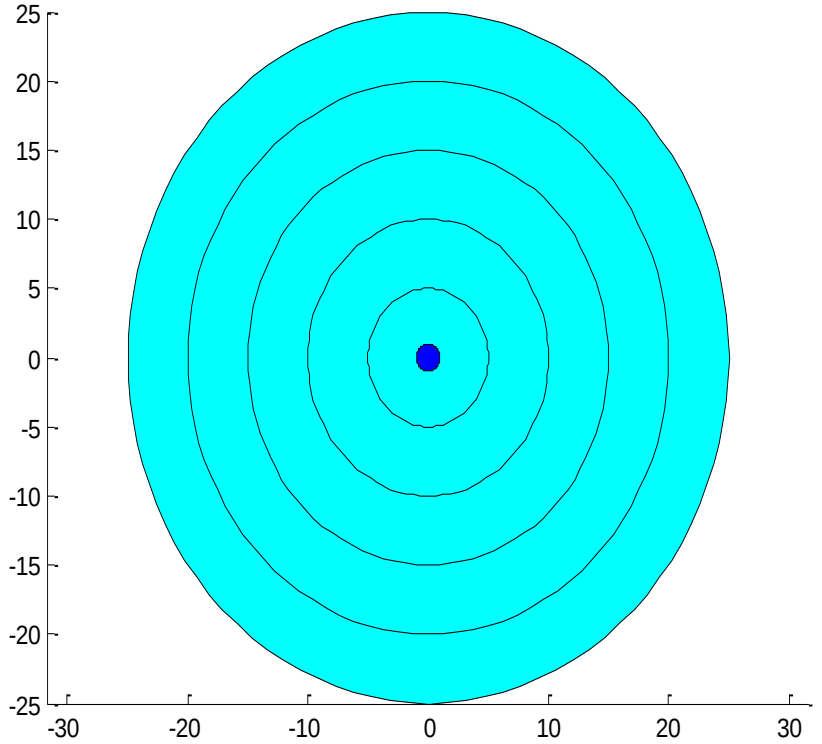
```
V=230;R=100;L=300e-3;C=100e-6;f=50;T=1/f;w=2*pi*f;
S=input('switch no=')
switch S
   case 1
      Z=R;
   case 2
      Z=w*L*j;
   case 3
      Z=-j/(w*C)
end
t=0:T:2*pi;
v=abs(V)*sin((w*t+angle(V))*pi/180);I=V/Z;i=abs(I)*sin((w*t+angle(I))*pi/180);
subplot(2,1,1)
plot(t,v);xlabel('time');ylabel('voltage');
subplot(2,1,2)
plot(t,i);xlabel('time');ylabel('current');
```

**Ex:**

Write a MATLAB program to plot the shape shown in figure below using ***fill command***.

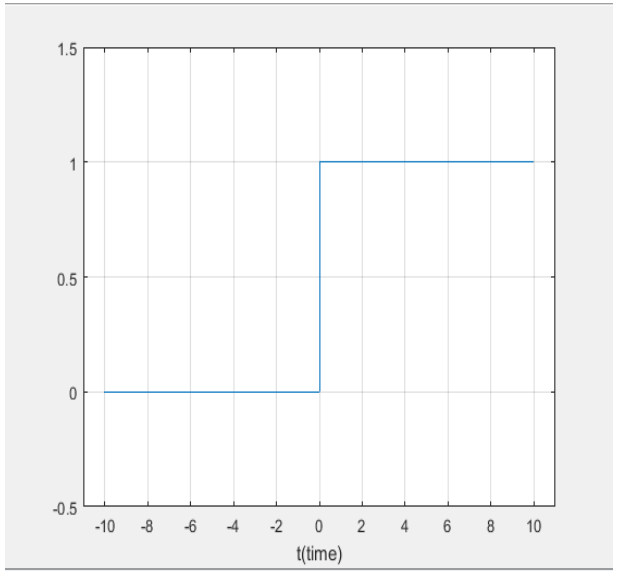
Solution:

```
clc
clear
for k= 25:-5:1
t=0:pi/50:2*pi;
x= k*sin(t);
y= k*cos(t);
fill(x,y,‘g')
hold on
end
fill(sin(t),cos(t),‘b')
```



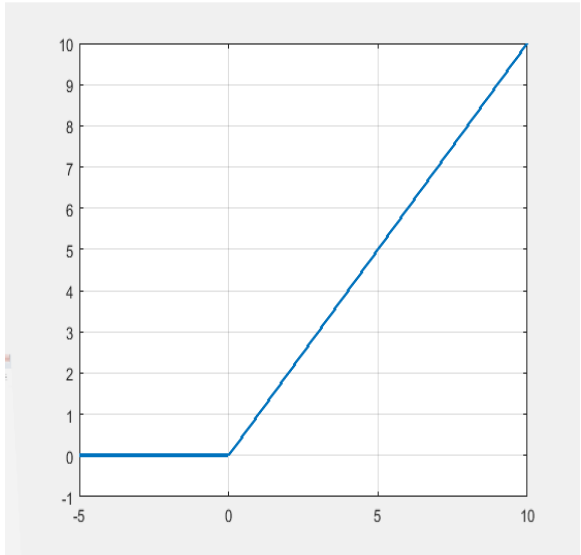
## To plot unit step function ,write the following MATLAB code:

```
clc
close all
t1=-10:0;
t2=0:10;
t=[t1 t2];
u=[zeros(1,11) ones(1,11)];
plot(t,u);
axis([-11 11 -0.5 1.5])
grid on
zoom on
xlabel('t(time)')
ylabel(UNIT_STEP')
```




## To plot Continuous Time Ramp Signal , ,write the following MATLAB code:

```
1 -     t1=-10:0;
2 -     t2=0:10;
3 -     t=[t1 t2];
4 -     u=[zeros(1,11) t2];
5 -     plot(t,u,'linewidth',2)
6 -     grid on
7 -     zoom on
8 -     axis([-5 10 -1 10])
9 -     xlable('t(time)')
10 -    ylable('RAMP_SIGNAL')
```



EX: **Find the second order least square regression model to predict value of y for x=8. Then estimate:**

| x | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|
| y | 2 | 8 | 26 | 50 | 140 | 224 | 350 |

- **The first derivative value of the polynomial at x=3?**
- **The second derivative value of the polynomial at x=2?**
- **The integral equation?**
- **Plot two figures in the same frame and compare between first and second results.**

**(plot between x and y then plot the polynomial curve with x)**

- **How could you increase the accuracy of fitting?**

Solution:

```
x=1:7; y=[2 8 26 50 140 224 350]; n=5;
yy=polyfit(x,y,n)
eq_at_x_8=polyval(yy,8)
frist_der=polyder(yy)
frist_der_at_x_3=polyval(frist_der,3)
second_der=polyder(frist_der)
second_der_at_x_2=polyval(second_der,2)
int_of_equ=polyint(yy)
subplot(2,1,1)
plot(x,y)
subplot(2,1,2)
plot(x,polyval(yy,x))
```

# Textbook or References

- Numerical Analysis Using MATLAB® and Excel®Third Edition, Steven T. Karris.
- ELEMENTARY MATHEMATICAL and COMPUTATIONAL TOOLS for ELECTRICAL and COMPUTER ENGINEERS USING MATLAB , Jamal T. Manassah City College of New York,2011
- ELECTRONICS and CIRCUIT ANALYSIS using MATLAB, JOHN O. ATTIA ,1999.