Circuitos Electricos II

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Monitoria Circuitos II

GIT-HUB: ***https://github.com/brrsanchezfi/Circuitos_2022_1***

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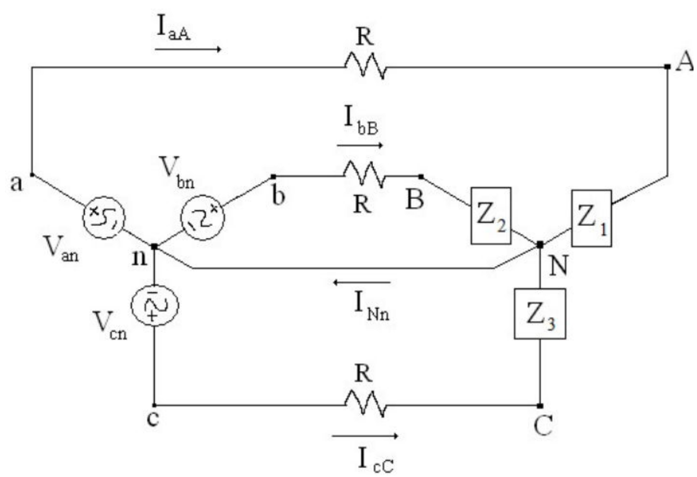
Soluciones propuestas para los ejercicios del taller 2



Analisis en el domio de la frecuencia

matlab symbolico

```
syms I1 I2 I3 V_an V_bn V_cn R Z_1 Z_2 Z_3 %I_aA I_bB I_cC

sys = [V_an - V_bn == I1*(2*R + Z_1 + Z_2) - I2*(R + Z_2);
       V_bn == I2*(R + Z_2) - I1*(R + Z_2); %planteamiento de la matriz de mallas
       -V_cn == I3*(R + Z_3)]
```

```
sys =
```

$$\begin{pmatrix} V_{an} - V_{bn} = I_1 \; (2\,R + Z_1 + Z_2) - I_2 \; (R + Z_2) \\ V_{bn} = I_2 \; (R + Z_2) - I_1 \; (R + Z_2) \\ -V_{cn} = I_3 \; (R + Z_3) \end{pmatrix}$$

```
sol = solve(sys,[I1 I2 I3]); %solucion del sistema

I1 = sol.I1;
I2 = sol.I2;
I3 = sol.I3;

I_aA = simplify(I1)   %corrientes de linea apartir de las corrientes de malla
```

I_aA =

$$\frac{V_{an}}{R + Z_1}$$

```
I_bB = simplify(I2 - I1)
```

I_bB =

$$\frac{V_{bn}}{R + Z_2}$$

```
I_cC = -I3
```

I_cC =

$$\frac{V_{cn}}{R + Z_3}$$

```
Z1 = 5 + 5i;  %valores de impedancias y resitencias
Z2 = 5 + 5i;
Z3 = 5 + 5i;
R_n = 0.5;
```

```
Van = pol2com(100,0);   % Voltajes, polares a complejos
Vbn = pol2com(100,240);
Vcn = pol2com(100,120);

IaA = double(subs(I_aA,[V_an R Z_1],[Van R_n Z1])) %sustitucion de variables
```

IaA = 9.9548 - 9.0498i

```
IbB = double(subs(I_bB,[V_bn R Z_2],[Vbn R_n Z2]))
```

IbB = -12.8147 - 4.0962i

```
IcC = double(subs(I_cC,[V_cn R Z_3],[Vcn R_n Z3]))
```

IcC = 2.8600 + 13.1460i

Potencia compleja

$S = VI^* = |I|^2 Z$

```
S = (Van*conj(IaA) + Vbn*conj(IbB) + Vcn*conj(IcC))*0.5  % el 0.5 es para corregir el RMS
```

```
S = 1.4932e+03 + 1.3575e+03i
```

Potencia de la carga

```
S_carga = (abs(IaA)^2*(Z1) +abs(IbB)^2*(Z2) + abs(IcC)^2*(Z3))*0.5
```

```
S_carga = 1.3575e+03 + 1.3575e+03i
```

Potencia de perdidas

```
S_perdidas = (abs(IaA)^2*(R_n) +abs(IbB)^2*(R_n) + abs(IcC)^2*(R_n))*0.5
```

```
S_perdidas = 135.7466
```

Balance de potencia

```
Balance = round(S - (S_carga + S_perdidas))
```

```
Balance = 0
```

Analisis en el dominio del tiempo

Voltajes expresador en funcion del tiempo y en RMS

```
Van_t = com2pol(Van)     %convierte complejo a polar, VALORES PICO
```

```
Van_t = 1×2
   100     0
```

```
Vbn_t = com2pol(Vbn)
```

```
Vbn_t = 1×2
  100.0000 -120.0000
```

```
Vcn_t = com2pol(Vcn)
```

```
Vcn_t = 1×2
  100.0000  120.0000
```

```
IaA_t = com2pol(IaA)
```

```
IaA_t = 1×2
   13.4535  -42.2737
```

```
IbB_t = com2pol(IbB)
```

```
IbB_t = 1×2
   13.4535 -162.2737
```

```
IcC_t = com2pol(IcC)
```

```
IcC_t = 1×2
   13.4535   77.7263
```

```
clc
syms V_an V_bn V_cn R_L Z_1 Z_2 Z_3 I_aA I_bB I_cC t a1 a2 a3 a4 a5 a6 w

Va= (V_an/sqrt(2))*cosd((w*t) + a1); %funciones en el dominio del tiempo
Vb= (V_bn/sqrt(2))*cosd((w*t) + a2);
Vc= (V_cn/sqrt(2))*cosd((w*t) + a3);
Ia= (I_aA/sqrt(2))*cosd((w*t) + a4);
Ib= (I_bB/sqrt(2))*cosd((w*t) + a5);
Ic= (I_cC/sqrt(2))*cosd((w*t) + a6);


p1 = Va*Ia
```

p1 =

$$\frac{I_{\mathrm{aA}}\, V_{\mathrm{an}} \cos\left(\frac{\pi\ (a_1+t\,w)}{180}\right) \cos\left(\frac{\pi\ (a_4+t\,w)}{180}\right)}{2}$$

```
p2 = Vb*Ib
```

p2 =

$$\frac{I_{\mathrm{bB}}\, V_{\mathrm{bn}} \cos\left(\frac{\pi\ (a_2+t\,w)}{180}\right) \cos\left(\frac{\pi\ (a_5+t\,w)}{180}\right)}{2}$$

```
p3 = Vc*Ic
```

p3 =

$$\frac{I_{\mathrm{cC}}\, V_{\mathrm{cn}} \cos\left(\frac{\pi\ (a_3+t\,w)}{180}\right) \cos\left(\frac{\pi\ (a_6+t\,w)}{180}\right)}{2}$$

```
p1 = subs(p1,[V_an I_aA w a1 a4],[Van_t(1) IaA_t(1) 2*pi*60 Van_t(2) IaA_t(2)])
```

p1 =

$$\frac{10000\ \sqrt{221}\ \cos\left(\frac{\pi\ \left(120\,\pi\,t-\frac{5949492814231875}{140737488355328}\right)}{180}\right) \cos\left(\frac{2\,t\,\pi^2}{3}\right)}{221}$$

```
p2 = subs(p2,[V_bn I_bB w a2 a5],[Vbn_t(1) IbB_t(1) 2*pi*60 Vbn_t(2) IbB_t(2)])
```

p2 =

$$\frac{10000\,\sqrt{221}\,\cos\left(\frac{\pi\,(120\,\pi\,t-120)}{180}\right)\cos\left(\frac{\pi\,\left(120\,\pi\,t-\frac{356843615888613}{2199023255552}\right)}{180}\right)}{221}$$

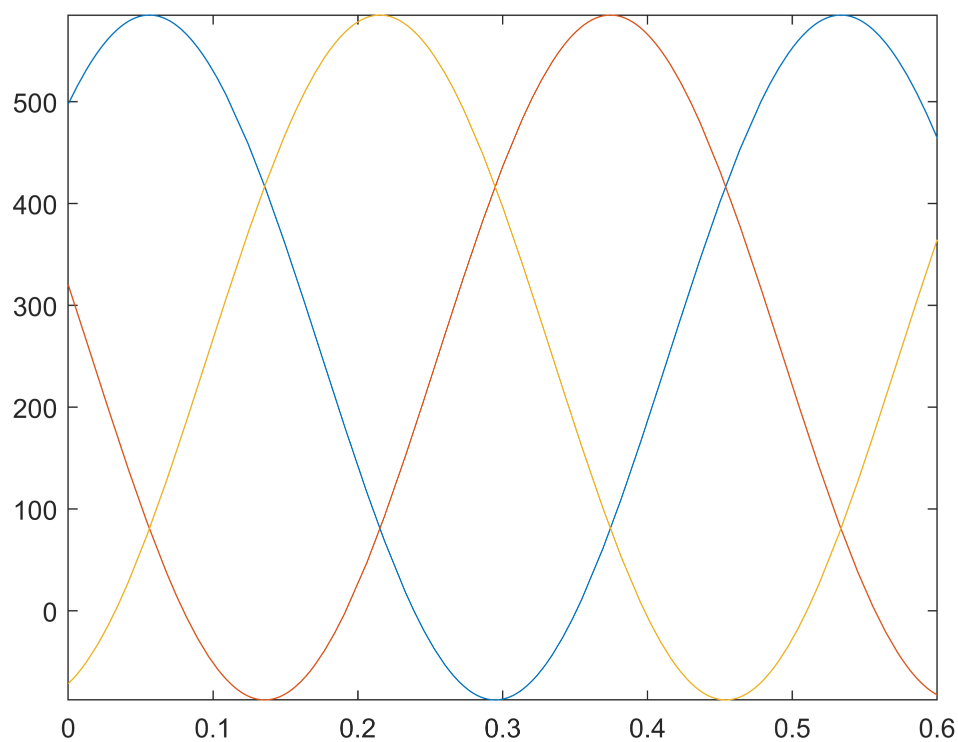
```
p3 = subs(p3,[V_cn I_cC w a3 a6],[Vcn_t(1) IcC_t(1) 2*pi*60 Vcn_t(2) IcC_t(2)])
```

p3 =

$$\frac{10000\,\sqrt{221}\,\cos\left(\frac{\pi\,\left(120\,\pi\,t+\frac{5469502894203743}{70368744177664}\right)}{180}\right)\cos\left(\frac{\pi\,(120\,\pi\,t+120)}{180}\right)}{221}$$

```
p_total = 2*(p1 +p2 +p3); %el 2 es por el valor RMS (VER GUIA PAG 15)

fplot(p1,[0 0.6])
hold on
fplot(p2,[0 0.6])
fplot(p3,[0 0.6])
hold off
```



$$P_W = \frac{1}{T}\int_0^T (v_{an} i_{aA} + v_{bn} i_{bB} + v_{cn} i_{cC})dt$$

```
P_total = ((60)*int(p_total,t,0,(1/(60))))
```

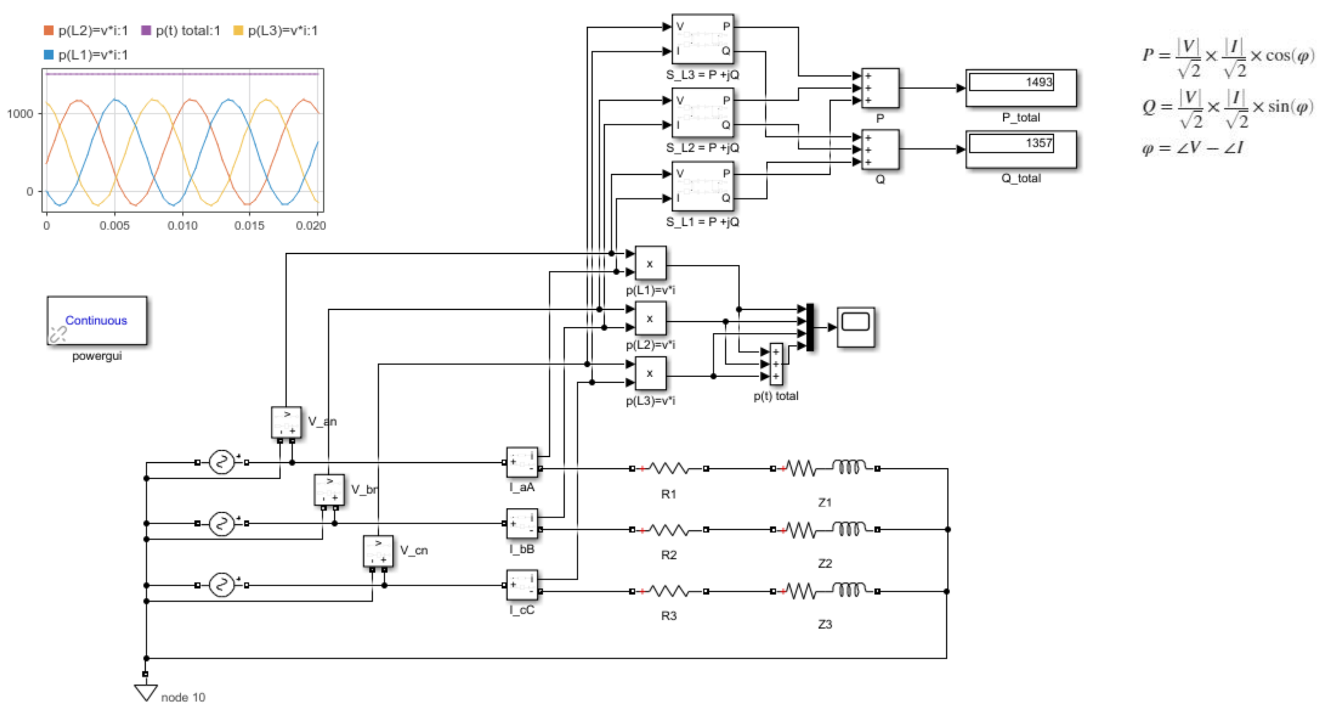
P_total =

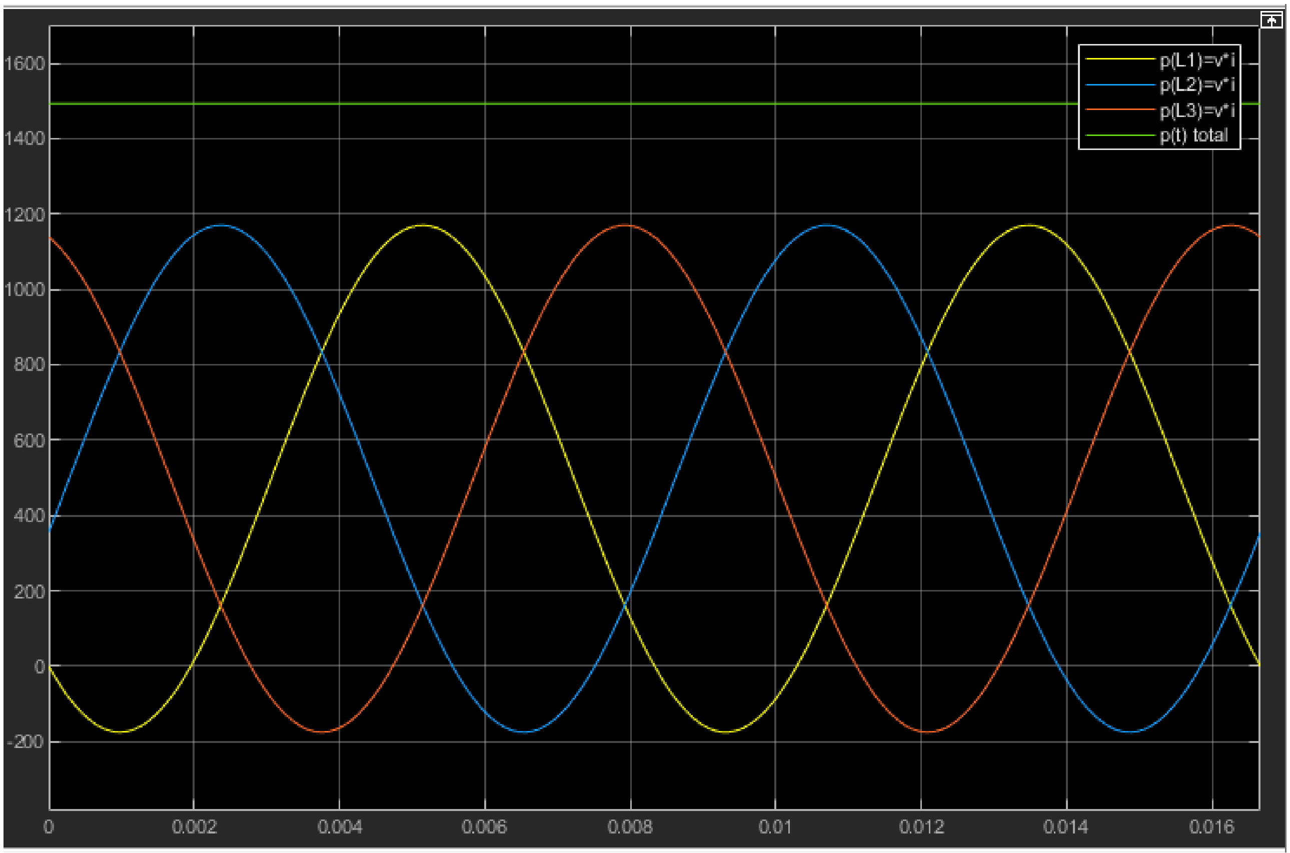
$$\frac{10000\ \sqrt{221}\ \left(\cos\left(\frac{2974746407115937\ \pi}{12666373951979520}\right) + \cos\left(\frac{30986941740791\ \pi}{131941395333120}\right) + \cos\left(\frac{132210951427375\ \pi}{562949953421312}\right)\right)}{221} +$$

```
P_total = double(P_total)
```

P_total = 1.4932e+03

Simulacion






```
function Complejo = pol2com(M,A)  % magnitud, angulo POLAR A COMPLEJO

    Complejo = M * exp (deg2rad (A) * 1i);

end

function Polar = com2pol(Z)

    M=abs(Z); %Magnitud
    A=rad2deg(angle(Z));% angulo

Polar=[M,A];
end
```