كـــليـــة التقنية الالكترونية / طرابلس

أسئلة الامتحان النصفي لمادة : دوائر كهربية 2

الزمن: ساعتان

الفصل الدراسي: ربيع 2019

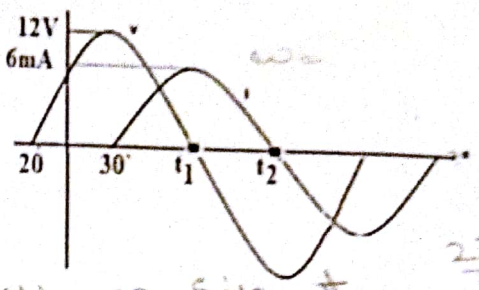
Q1)-

The waveforms of a series AC circuit are shown in the figure.

a)- Write the mathematical expressions for v(t) and i(t) if the frequency is 60HZ.

b)- What is the power factor of this circuit?

c)- Determine the type and value of the elements..



V(t) =12 Sin ωt

2π/T

Q2)-

a)-The sinusoidal waveform is v(t)=60 sin (377t +20°) V , sketch the waveform , and determine

1- Average power. value

2- Effective value.

3- The magnitude of the waveform at t= 6ms

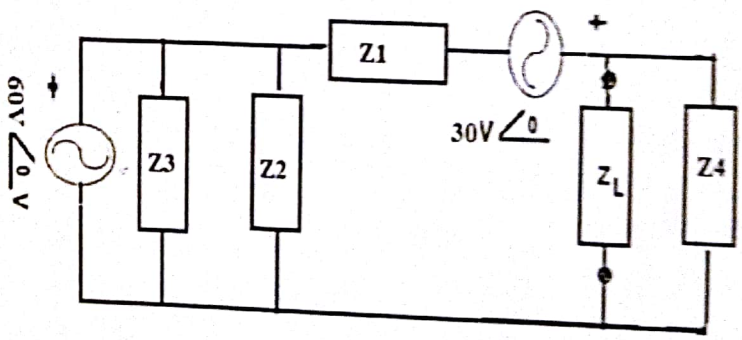
Q3)-

For the circuit shown in the figure.

Z1=4-J6 , Z2= -J6,

Z3=J4 and Z4=2 Ω

Determine the value of Z_L for maximum power to the Load, and find P_{max}.



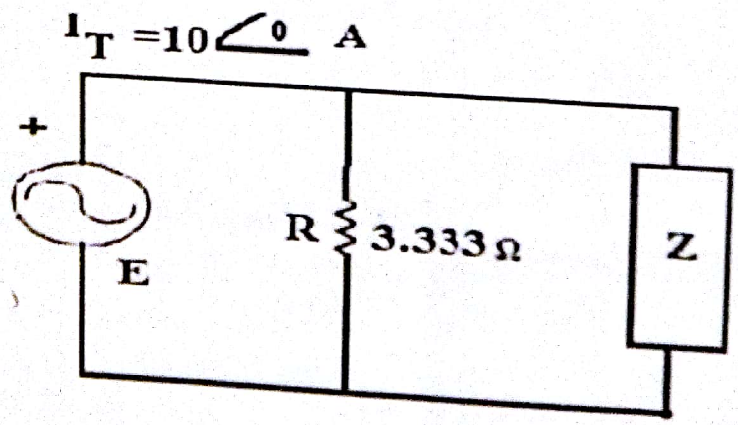
Q4)-

For the circuit shown in the figure, the total current leads the source voltage E by 53.13°

a)- Determine the value of the unknown element.

b)- find E

دائرة مثية



بالتوفيق للجميـــــــــــع / م ..... الشاوش

resistor

Q 1

a) 14 at first we have to determine ω

$\omega = 2\pi f$

$\omega = 2 \times 3.14 \times 60$

$\omega = 376.8$ rad/s

$v(t) = 12 \sin(376.8t + 20^\circ)$ V

$i(t) = 6m \sin(376.8t - 30^\circ)$ A

b) $P_f = \cos|\theta_v - \theta_i|$

$= \cos|20+30|$

$= \cos 50$

$P_f = 0.642$ lagging

c) $E_{eff} = \frac{V_m}{\sqrt{2}} = \frac{12}{\sqrt{2}} = 8.485 \angle 20$ V

$I = \frac{I_m}{\sqrt{2}} = \frac{6 \times 10^{-3}}{\sqrt{2}} = 4.242 \angle -30$ mA

$Z_t = \frac{E}{I} = \frac{8.485 \angle 20}{4.242m \angle -30} = 2k \angle 50\ \Omega$

$2 \angle 50 = 1.285k\Omega + j\,1.532k\Omega$

∴ the elements are $1.285k\Omega$ resistor and $1.532k\Omega$ inductor

L = ?

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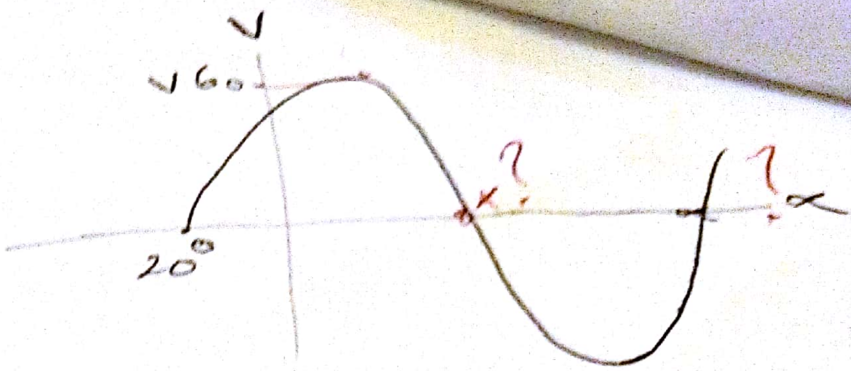
Q2

a 1A



1 the average value = zero because the sin wave is identical wave.

2 $V_{eff} = \frac{V_m}{\sqrt{2}} = \frac{60}{\sqrt{2}} = 42.426V$

3 $v(t) = 60 \sin(377t + 20^\circ)\ V$

$v(6ms) = 60 \sin(377 \times 6 \times 10^{-3} + 20^\circ)\ V$

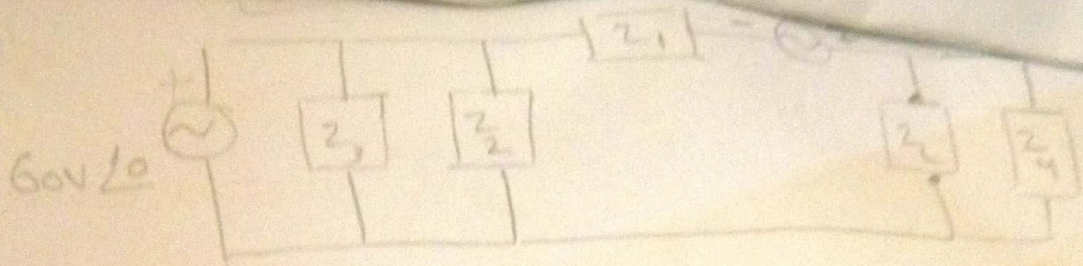
$= 60 \sin(2.262 \times \frac{180^\circ}{\pi} + 20^\circ)\ V$

$= 60 \sin(129.668^\circ + 20^\circ)\ V$

$= 60 \sin(149.668^\circ)\ V$

$\therefore v(6ms) = 30.3\ V$

Q3)



$Z_1 = 4 - j6 = 7.211 \angle -56.309^\circ$

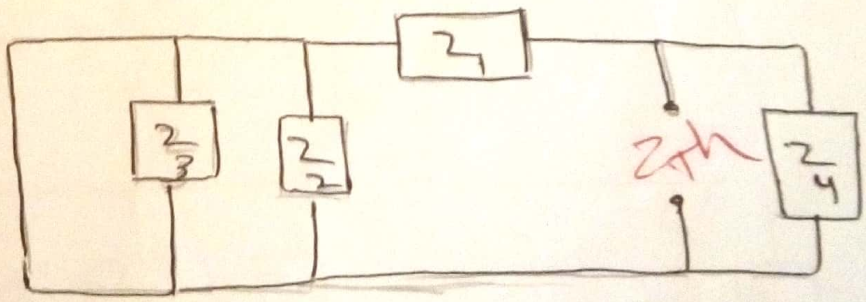
$Z_2 = -j6 = 6 \angle -90$

$Z_3 = j4 = 4 \angle 90$

$Z_4 = 2 = 2 \angle 0$

by using thevenin's theory

$Z_{th} = Z_1 \parallel Z_4$



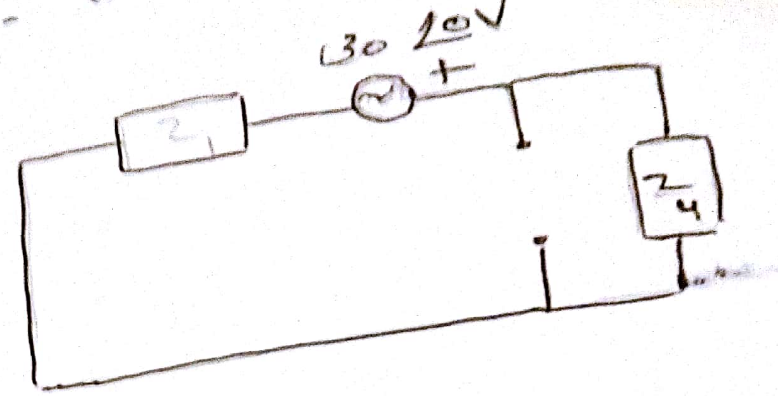
$$Z_{th} = \frac{7.211 \angle -56.309 \times 2}{6 - j6} = \frac{14.422 \angle -56.309}{8.485 \angle -45}$$

$Z_{th} = 1.699 \angle -11.309\ \Omega = 1.666 - j0.333\ \Omega$

$Z_L = Z_{th}^{*} = 1.699 \angle 11.309\ \Omega = 1.666 + j0.333\ \Omega$

$\underline{\underline{E_{th}}}$

$30\angle 0$ V Source active $^{+}E'_{th\,-}$

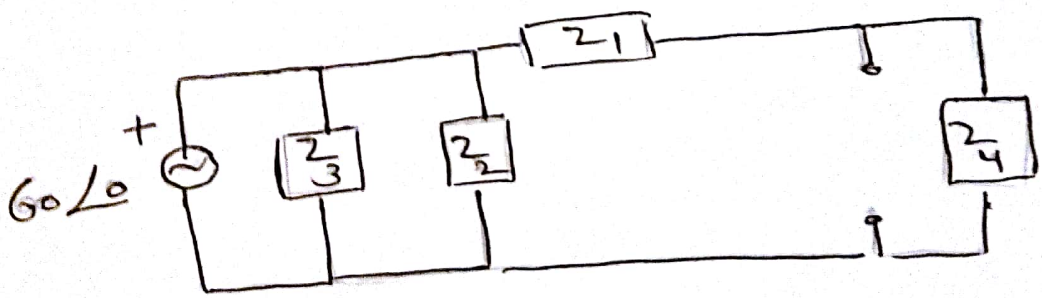


$E'^{+}_{th-} = E_{Z_4}$

by using VDR

$$E'^{+}_{th-} = \frac{30\angle 0 \times 2}{8.485\angle -45} = 7.071\angle 45 \text{ V} = 5+j5 \text{ V}$$

$60\text{V}\angle 0$ Source active E''^{+}_{th-}



$E''^{+}_{th-} = E_{Z_4}$

$E(Z_1 + Z_4) = E_{Source}$

$$E''^{+}_{th-} = \cancel{60\angle 0 \times 7.071\angle} \quad \frac{60\angle 0 \times 2}{8.485\angle -45}$$

$$E''^{+}_{th-} = 14.142\angle 45 \text{ V} = 10 + j10 \text{V}$$

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$$E_{th} = E'_{th} + E''_{th}$$

$$= 15 + j15 = 21.213 \angle 45$$

$$P_{max} = \frac{E_{th}^2}{4Z_{th}} = \frac{(21.213)^2}{4 \times 1.699} = 66.214 \text{ watt}$$

Q4

$I = 10 \angle 0 \ A$

$E = E \angle -53.13 \ V$

$P_f = \frac{G}{Y_t}$ → because Z contains a single element and the circuit has capasitive effect

$\cos 53.13 = \frac{0.3}{Y_t}$

$Y_t = \frac{0.3}{0.6} = 0.5$

$Y_t = 0.5 \angle 53.13$

$Y_t = 0.3 + j0.399$

$Y_t = 0.3 + j0.4$

$Y_t = \underset{R}{3\Omega} + \underset{X_C}{2.5\Omega}$

$E = \frac{I}{Y_t} = \frac{10}{0.5} = 20V$

the unknown element is a capacitor with a value of 2.5Ω