القسم....العـــــام..... أسئلة الامتحان النصفي لمادة : دوائر كهربية 2

لطلبة الفصل: ...الثاني.... رمز المادة.....EE102 .. ... التاريخ 15 /08/ 2024

الفصل الدراسي ربيع...2024..... اسم الأستاذ/: .....محـــمـــد الشاوش.... ..الزمن.....120 دقيقة.

المجموعات: من 4 - 7

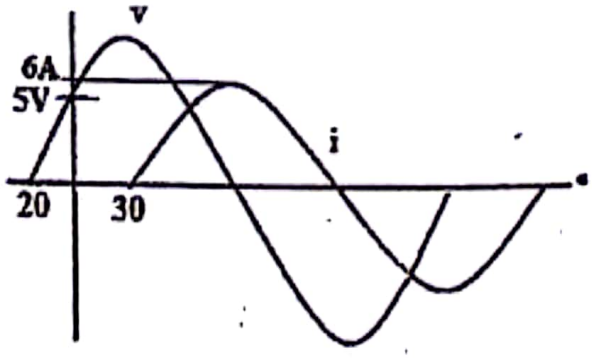
Q1)- **{8 Marks}**

The waveform of a parallel AC circuit are shown in the figure.

a)- Write the mathematical expressions for v(t) and i(t).

b)- Determine the average power (P_{av}) and Pf .

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

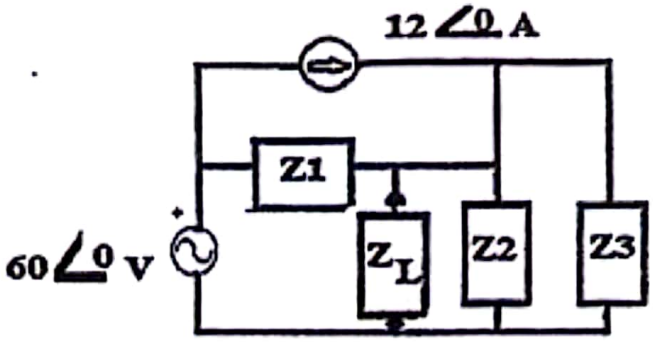


Q2)- **{8 Marks}**

For the circuit shown in the figure.

Z1=2+J2 , Z2=-J2 , Z3=3-J4

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



Q3)- Complete **{6 Marks}**

If i(t)= 10 sin (2π60t), then the frequency is .....Hz, the average value is .....,

,the effective value is ..... and the magnitude of the waveform at t= 10 ms is .....

Q4)- **{8 Marks}**

AC Series circuit shown in the fig,

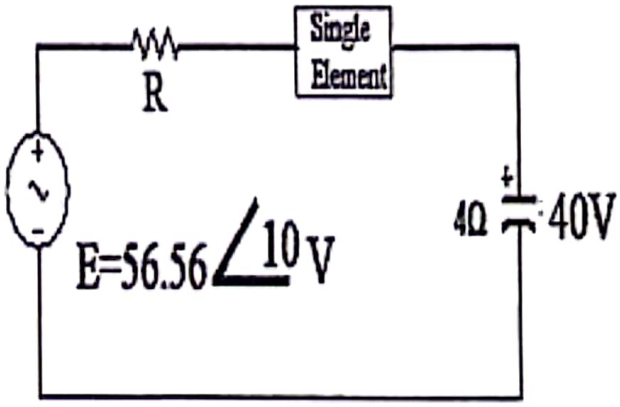
and the circuit has **0.707 Lagging Pf**

a)- Determine R and the unknown single element.

b)-Draw phasor diagram.

c)-Draw impedance diagram.

d)- Find P_{av}.



تمنياتنا للجميع بالتوفيق

Q1)- 18

$i(t) = 6 \sin(\omega t - 30^\circ)$ A (01)

(a) $v(t) = V_m \sin(\omega t + 20^\circ) \Rightarrow 5 = V_m \sin 20^\circ$

$v(t) = 14.619 \sin(\omega t + 20^\circ)$ V (02) $V_m = \frac{5}{\sin 20^\circ} = 14.619$ V

(b) $P_{av} = \frac{V_m I_m}{2} \cos\theta$

$P_{av} = \frac{14.619 \times 6}{2} \cos 50^\circ = 28.191$ W (01)

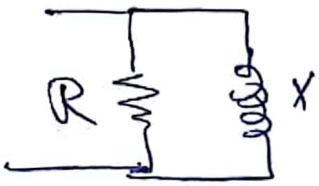
$P_f = \cos 50^\circ = 0.642$ Lagging

(c) Parallel Ac circuit

$Y_T = \frac{I_T}{E} = \frac{6/\sqrt{2} \angle -30^\circ}{14.619/\sqrt{2} \angle 20} = 0.410 \angle -50^\circ$ (S)

$Y_T = \underbrace{0.2635}_{G} - j\underbrace{0.3141}_{B_L}$

$R = \frac{1}{G} = \frac{1}{0.2635} = 3.7951\ \Omega$ (02)



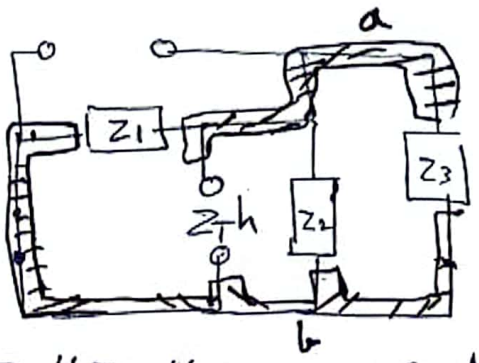
$X_L = \frac{1}{B_L} = \frac{1}{0.3141} = 3.1837\ \Omega$ (02)

(Q2) /8

$Z_1 = 2+j2 = 2.828\angle 45^\circ\ \Omega$

$Z_2 = -j2 = 2\angle -90^\circ\ \Omega$

$Z_3 = 3-j4 = 5\angle -53.13^\circ\ \Omega$



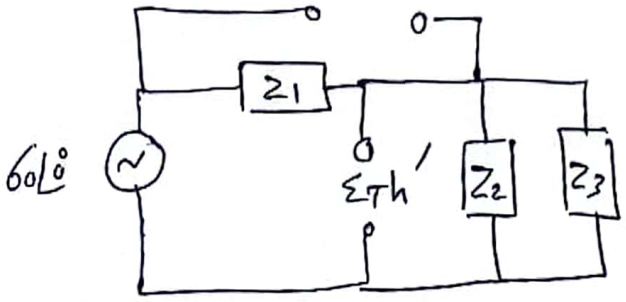
$Z_{Th} = Z_1 // Z_2 // Z_3 = 1.8115\angle -48^\circ$

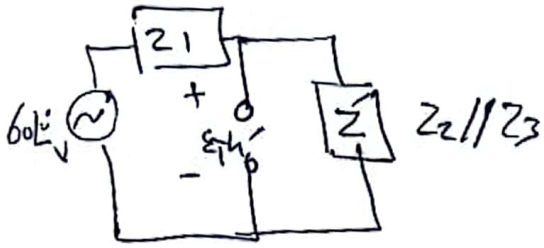
$= 1.2121 - j\,1.346$ (01)

R_{Th} X_{Th}

For max Power to the Load

$Z_L = 1.2121 + j1.346\ \Omega$ (02)





$E_{Th}' = V_{Z'}$ using VDR

$E_{Th}' = \dfrac{60\angle 0^\circ \times Z'}{Z' + Z_1} = \dfrac{60\angle 0^\circ \times 1.491\angle -79.57^\circ}{0.27 - j\,1.466 + 2 + j2}$ (01)

$E_{Th}' = \dfrac{89.46\angle -79.57^\circ}{2.27 + j\,0.534} = \dfrac{89.46\angle -79.57^\circ}{2.332\angle 13.23^\circ} = 38.362\angle -92.73^\circ V$

$E_{Th}'' = V(Z' // Z_1)$

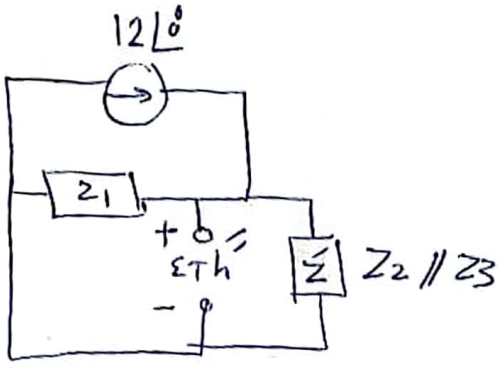
$= 12\angle 0^\circ \times 1.8115\angle -48^\circ$ (01)

$= 21.738\angle -48^\circ\ V$

$E_{Th} = E_{Th}' + E_{Th}''$

$= 38.362\angle -92.73^\circ + 21.738\angle -48^\circ$

$= 55.787\angle -76.822\ V$ (01)



$P_{max} = \dfrac{E_{Th}^2}{4R_{Th}} = 642\ W$ (02)

s)- /6

if $i(t) = 10\sin(2\pi 60t)$, then the frequency is ..60Hz (01),

the average value = Zero A (01), the effective value is 7.07 A (01)

and the magnitude of the waveform at t = 10ms is -5.877A (03)

Q4)- /8

@ $P_f = 0.707$ Lagging $\Theta = \cos^{-1} 0.707 = 45^\circ$

$$I = \frac{V_c}{X_c} = \frac{40}{4} = 10A$$

$$I = 10\angle -35^\circ \text{ A}$$

$$Z_T = \frac{E}{I} = \frac{56.56\angle 10^\circ}{10\angle -35^\circ}$$

$$Z_T = 5.656\angle 45^\circ$$

$$= 4 + j4$$

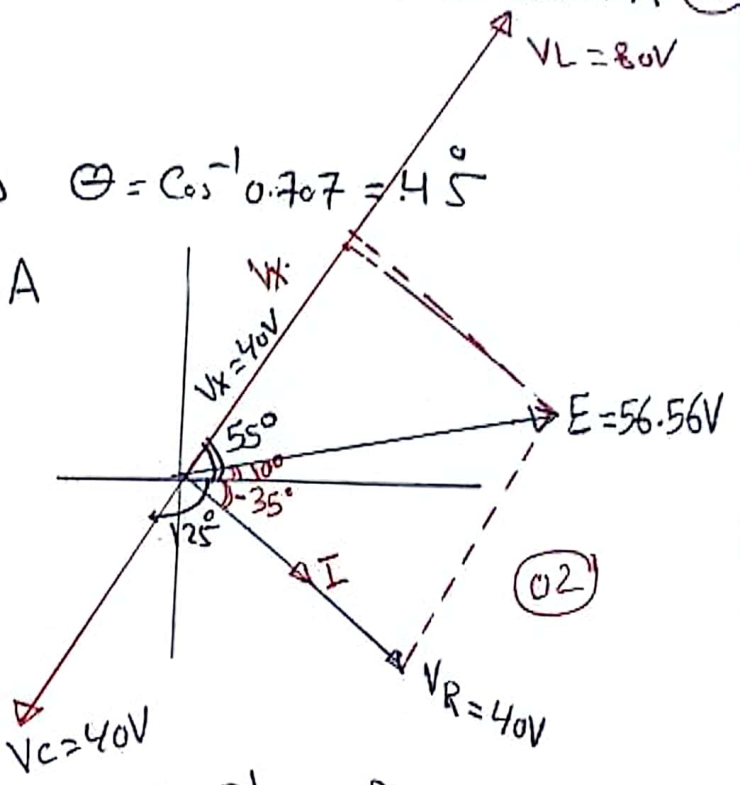
R X_T

Z_T = R + single element $-j4$

$4 + j4$ = R + single element $-j4$

R + Single element $= 4 + j8$

$R = 4\ \Omega$ (02) Single element $= j8$ (02)

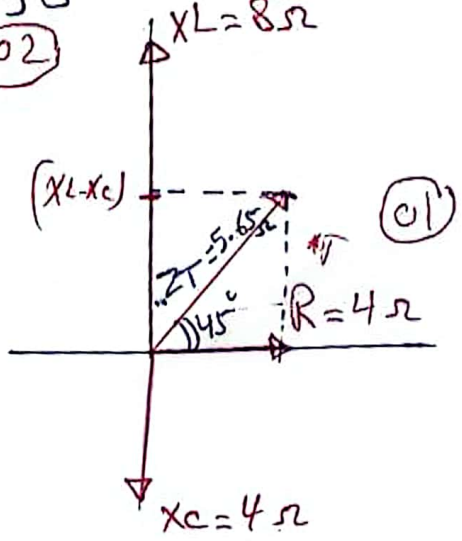


(b) Phasor Diagram (02)

d)- $P_{av} = E.I\cos\Theta$

$= I^2R$

$= (10)^2 \times 4 = 400W$ (01)



(c) Impedance Diagram (01)